Catalog of Air Force Weather Technical Documents 1941-2008

Compiled by: Mr. Gary Swanson

Air Force Weather Technical Library
151 Patton Avenue, Room 120
Asheville, North Carolina 28801-5002

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Director of Operations

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Scientific and Technical Information
Program Manager
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10. ABSTRACT
This catalog lists unclassified technical documents produced by or for the Air Force Weather Agency and its subordinate units from 1941 through 2008. Documents listed include technical reports, technical notes, data summaries, project reports, special studies, and forecaster memos along with availability data and ordering instructions.

11. SUBJECT TERMS

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Nearly all the materials listed here are available from the AFWTL, the Defense Technical Information Center (DTIC), or the National Technical Information Service (NTIS), depending on the type of material and the requestor. Detailed availability information and ordering instructions are provided inside the catalog.

Listings for documents subject to “limited distribution” are indicated by the inclusion of their individual limited distribution statements and “export control” warnings, when applicable.
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Chapter 1

INTRODUCTION

1.1 History of the AWS Technical Publication System

The organization for weather in the Army Air Force’s headquarters during World War II was not the typical AAF staff section in that a large part of its efforts were directed toward doing research, compiling climatological data, and preparing translations of foreign meteorological data. As a result, thousands of technical documents were prepared. Some of these were formally numbered and cataloged, and many are still part of the active AWS technical publication inventory. Others have been maintained as part of the AF Weather Technical Library’s historical holdings. Unfortunately, many of these documents have been lost. Many more remain to be cataloged and archived.

A formal technical publications system began to evolve in the fall of 1945 when the Army Air Forces (AAF) Weather Service started issuing technical reports as “AAFWS TRs,” using the then-current AAF system of base and serial numbers. When the AAF Weather Service became the Air Weather Service in 1946, the report designation was changed to “AWS TR.” The report numbering system was also changed in 1946, and again in 1950. AWS technical reports were divorced from the USAF standard publications system in 1961 to become a separate entity under Department of Defense preparation and publication rules. In mid-1973, there was another numbering system change, with the last two digits of the publication year added to the report number (e.g., “AWS-TR-73-251”). In 1979, formats were changed again to conform to the American National Standard and provide for serial numbering within each calendar year; e.g., “AWS/TR--85/001.” The designators for technical publications changed from "AWS" to "AFWA" when the reorganization occurred in 1997.

The first AWS technical notes (TNs) were published in 1978, but USAFETAC had started issuing them 10 years earlier. Although several “bibliographies” of AWS technical documents were published in the 30-year period following World War II, the first “technical index” (TI) was not issued until 1979. The “index” became a “catalog” in 1985. In July 1985, a detached appendix (TCA) that listed all AWS technical publications bearing distribution limitation statements “B” through “X” was added. But since the reasons for maintaining a separate appendix no longer existed in 1988, the appendix (TCA) and its parent (TC) were merged with the April 1989 edition. Documents subject to “limited” distribution (IAW AFR 80-45) are so annotated in this catalog. Users of the catalog are cautioned to note and observe those limitations carefully.

1.2 How to order from the Catalog

Detailed availability information, office of primary responsibility (OPR), and specific ordering instructions are given at the beginning of each catalog section. Some materials are available only in microfiche and others are available only in low quality microfiche paper copies. Still others may not be available for use outside the AFWTL; in these cases, at least some of the information required can be extracted and provided to qualified requesters by phone, message, or letter. General ordering instructions follow:

- Air Force units (including Air National Guard, Air Force Reserve, and AFIT) order from the AFWTL, 151 Patton Ave Room 120, Asheville NC 28801. Order by technical report number and title via the AFCCC website: www.afccc.af.mil. Note: AFWTL plans to convert most of the paper copies of technical documents into electronic copies. Approximately 1100 of these documents have already been converted. Contact AFWTL for information concerning electronic documents.

- Other Department of Defense (DoD) agencies and bona fide DoD contractors order materials that have been archived at the Defense Technical Information Center (DTIC) by DTIC accession number (AD or ADI) from: DTIC, McNamara Headquarters Complex, 8725 John J. Kingman Road, Fort Belvoir, VA 22060-6218. http://www.dtic.mil/dtic/index.html For materials without AD/ADI numbers, contact the AFWA OPR (office of primary responsibility) given in individual catalog sections. Documents with ATI numbers cannot be computer-requested and must be ordered from DTIC by mail or phone. Non-DoD agencies may request certain materials that have been archived from the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield VA 22161, telephone (703) 487-4650.

- Non-DoD agencies may request certain materials that have been archived there from the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161, telephone (703) 487-4650.
INTRODUCTION

1.3 DTIC/NTIS Cataloging and Numbering System

AWS technical publications are registered with the Defense Technical Information Center (DTIC) and entered into the DTIC database to facilitate technical data exchange within the Department of Defense. DTIC registry allows any DoD researcher access to documents registered there. Certain AWS technical publications (those designated as “Approved for public release; distribution unlimited”) are forwarded by DTIC to the National Technical Information Service (NTIS), where they are assigned another number and made accessible to non-DoD researchers.

1.4 List of Miscellaneous Catalogs and Indices

AWS/TI-79/001 (AD-A177777) Index of AWS Technical Seminars, June 1979. Originally published as USAFETAC-TN-78-001. Lists technical seminars prepared by HQ AWS and other AWS units and reported as of 1 February 1979 in accordance with AWSR 80-3, Technique Development. Seminars listed may or may not still be available from the issuing unit.

AWS/TI-79/002 (AD-760091) Catalogue of Local Forecast Studies, July 1979. Formerly AWS Pamphlet 0-13, January 1973; republished as AWS/TI-79/002 without change. Note that this document lists only those forecast studies that had been prepared before publication of this document; the requirement for collecting and publishing such lists was subsequently dropped. With few exceptions, the documents listed here are available from the AWS Technical Library, Scott AFB, IL 62225-5458.


Chapter 2

TECHNICAL REPORTS

2.1 Air Force Weather Agency

The office of primary responsibility (OPR) for AWS/AFWA Technical Reports (TRs) is AFWA/A3O, 106 Peacekeeper Dr. 2N3, Offutt AFB NE 68113-4039. The documents themselves, however, are published, stocked, maintained, and distributed by the Air Force Weather Technical Library (AFWTL) — see Section 1 for general ordering instructions.

Some of the AWS and AAFWS technical reports listed here (identified as “AD-NONE”) are no longer registered at, or available from, the Defense Technical Information Center (DTIC). These reports have, at some time in the past, been “rescinded” by AFW officials, either because they were thought to have outlived their operational usefulness or because they no longer reflected AFW views. Such reports are included in this catalog and archived in the AFWTL primarily because of their historical value. Despite the fact that they may be technically obsolete, these documents contain irreplaceable information and background on AFW programs, systems, and techniques. They also show the chronological growth and development of AFW’s scientific and technical programs. Note that some technical report numbers are duplicated, a situation that resulted when officials “rescinded” a report, then reused the number.

Most documents listed here are available from the AFWTL in paper. Many have been digitized and are available in .pdf format. Some of the earlier documents are held in only one library copy, or in microfiche reproductions. Check with the AFWTL; although some documents are in poor condition and marginally reproducible, copies will be attempted on request. Documents with a “#” symbol are known to have existed, but cannot be found. If you can provide copies of these, please notify the AFWTL at DSN 673-9019.

AWS TR 45–1 (AD–NONE) Analysis of the Japanese Weather Service, May 1946, 505pp. A detailed analysis and description of the Japanese Weather Service as it was organized and operated during and before WWII. Describes Japanese weather equipment, forecasting and analysis techniques, climatology, oceanography, and more. One copy (bound) archived at AWSTL. Redesignated and archived as AWS TR 200–1.


AWS TR 55–3 (AD–NONE) Determination of Absolute Height and Wind for Aircraft Operations, Weather Division, Hq AAF, September 1944, 100pp. A primer for altimetry. Gives theoretical basis and procedures for various altimetry methods vital to bombing and navigation. Addresses the hydrostatic equation, height determination and forecasting, pressure and radio altimeters, wind and drift determination, true height determination for high-level bombing. Describes and tells how to use aircraft weather instruments.


AAFWS TR 56–1 (AD–NONE) See AWS TR 55-3.


AWS TR 900–5 (AD–NONE) Lectures on the Analysis of Variance and Covariance, by Dr. A. Wald, March 1946, 145pp. Formerly AAFWS TR-220-1, In the absence of an adequate textbook on modern statistics, the AAF Weather Service received permission to print and distribute Professor Wald’s Columbia University lecture notes on the subject. Report recommended for all those engaged in verification, development of Forecasting rules and equations, testing of equipment or procedures, or any other activity employing statistical methods. Includes papers and notes on Sequential Analysis, a technique developed by Professor Wald.


AWS TR 105–1 (ATI72493) The Structure of the Local Winds in the Los Angeles Basin, California, Hq AAF Weather Service Asheville, NC, September 1945, 30pp. Prepared by Former AAF Weather Research Station at University of California at Los Angeles under supervision of Meteorology Department staff as the partial result of a project for forecasting beginning and ending of sea breeze in Southern California and regions of similar climate. Although details are of practical value only to operations in the L.A Basin, the general picture applies to local wind problems in other regions.

AWS TR 105–2 (AD242199) Wind Variability, Maj Hugh W. Ellsaesser, 10 March 1960, 91pp. Designed to give weather forecasters methods for evaluating and applying wind variability data. Data are summarized in graphic and tabular form. Statistical methods for representing variability, data accuracy, and causes of variability are discussed. Past studies of the subject reviewed. Appendix I tells how to use the data in the field; gives sample problems, with solutions.

AWS TR 105–3 (ATI65132) On Vertical Motion in the Atmosphere, Hq AWS, November 1945, 86pp. Contains three papers: (1) “Determination of the Field of Vertical Motion,” by Robert G. Fleagle, Homer T. Mantis, and H.A. Panofsky (surveys history of vertical motion studies, describes techniques for computation, and gives results of tests of these techniques); (2) “A Descriptive Study of the Field of Vertical Motion in a Colorado Low,” by Robert G. Fleagle (a descriptive study of the three-dimensional field of motion in a cyclone); (3) “Computation of Vertical Motion from Constant Pressure Charts,” by James E. Miller (describes a technique believed to be practical For use with constant pressure charts).

AWS TR 105–4 (ATI82074) A Study of Waves in the Easterlies, prepared by the USAC Research Unit of the Ninth Weather Region, Rio Piedras, Puerto Rico (revised edition edited by H. Riehl, 1946), July 1945, 108pp. A published study of weather analysis and hurricane forecasting in the tropics. Study conducted by the Air Corps ITM Research unit attached to the Institute of Tropical Meteorology of the University of Chicago at the University of Puerto Rico, Rio Piedras, PR. Discusses easterly wave formation, structure, weather distribution, maintenance, displacement, intensification, and termination.

AWS TR 105–5 (ATI65136) Tables of Equivalent Potential Temperature for the Standard Constant-Pressure Surfaces, Air Weather Service, 1946, 8pp. Tables of potential temperature in °A for the surface of the earth. Equivalent potential temperatures are given for 1,000, 900, 850, 700, 500, and 300 mb surfaces. Condensation temperature given in °C. A rule for the graphic construction of isopleths of equivalent potential temperature is given.

AWS TR 105–6 (ATI70922) Critique of Verification of Weather Forecasts, Forecast Branch, Weather Division, Hq AAF, January 1944, 84pp. Discusses rationale for forecast verification, gives examples of definitions and concepts, notes on weather classes. With annotated bibliography containing summaries of 55 articles on verification.

AWS TR 105–7 (ATI112490) Final Report on the Use of Symmetry Points in the Pressure Curves for Long-Range Forecasting, by B. Haurwitz, March 1944, 7pp. Final report on study by the Meteorology Department, Massachusetts Institute of Technology. Summarizes study results and explains why the symmetry property of pressure curves (although a common phenomenon) can’t be used for Forecasting.

AWS TR 105–8 (ATI65138) Preliminary Report on Cloud Conditions Over the North Atlantic, January — March 1944, by 2Lt Albert W. Badanes, September 1944, 23pp. Weather observations over the North Atlantic were made, with particular reference to cloud formations, by three C-54 weather airplanes, from January through March 1944. Data was obtained on “flyable” days; conclusions are for conditions, routes, and tracks forecast as “flyable.” About 15% of flying time was spent in cloud. Average altitude was about 20,000 ft. Forms of icing encountered separated into types. Frontal cloud structure studied to discover any regular layer-like vertical pattern with clear spaces through which aircraft could be routed. Fronts classified as cold, warm, or occluded, with further separation into “strong,” or “weak” types. Data indicate it is usually possible to fly in the clear through any front except a strong occlusion. Optimum night levels for various types of cloud conditions are tabulated.

AWSTR 105–9 (AD–NONE) A Rational Method of Constructing High Altitude Weather Maps, August 1944, 7pp. Describes method for drawing 20,000-foot and
10-kilometer charts to partly overcome lack of wind or pressure observations.

AWS TR 105–10 (ATI72476) Preliminary Report of Meteorological Program of San Jose Island, Panama. Weather Division, Hq AAF, September 1944, 23pp. The results of a study at San Jose Island to determine the influence of jungle vegetation and terrain on those meteorological elements of importance to the diffusion of gas clouds in the jungle.

AWS TR 105–11 (ATI72849) Non-Frontal Cumulus Clouds on the North Atlantic Routes, AAF Weather Station, Massachusetts Institute of Technology, January 1945, 16pp. Preliminary report on a climatological and statistical study of the frequency, height, and location of non-frontal or air-mass cumulus clouds on three of the principal North Atlantic routes during January, February, and March of 1944. Results compiled from observations made by six AAF weather officers flying the Atlantic in C-54 weather reconnaissance planes.

AWS TR 105–12A (ATI65147) Preparation of a Classification Graph East Asia—West Pacific Synoptic Region, January 1899 through June 1939, Part I, Meteorology Department, California Institute of Technology, February 1945, 93pp, by William H. Rempel and Newton C. Stone. Fundamental, ideal synoptic sequences for the East Pacific synoptic region are provided as basis for analogues to be used in the preparation of extended forecasts.

AWS TR 105–12B (AD–NONE) Classification Graph East Asia—West Pacific Synoptic Region, January 1899 through June 1939, Part II, CIT-AAF Research Unit, December 1944, 6pp, by William H. Rempel and Newton C. Stone. As an aid in selecting analogues, the classification graph presents a visual index of similar daily synoptic patterns with modifications for January 1, 1899, through June 30, 1939. Ideal types indicated by color blocks. Note: This report not available from DTIC; a few color copies are archived at AFWTL.

AWS TR 105–13 (ATI72495) A Checklist for Forecasting Southern California Stratus, by Morris Neiburger AAF Research Weather Station, University of California at Los Angeles, 1945, 35pp. A short report on a joint Army-Navy-Weather Bureau study conducted during the 1944 stratus season under the auspices of the Joint Meteorological Committee. Illustrates how the knowledge of stratus behavior derived from the 1944 studies and combined with other forecasting tools give promising forecast results.


A progress report in the development of a classification graph for the East Asia, West Pacific, and North American synoptic regions. Purpose of investigation was to develop a reliable and efficient method of analogue selection. Forty years (1899-1939) daily synoptic sea-level Northern Hemisphere historical weather was used as the data source. Preliminary investigation revealed the existence of several well-established 3-day synoptic sequences that recur with high frequency. A brief description of the principal features of each synoptic weather type for the region is given. Preliminary types have been developed for all seasons. All data shown in composite charts and graphs.


AWS TR 105–15 (ATI114522) Analysis and Forecasting of Tropical Cyclones of 1944 in the Caribbean Sea and Western Atlantic Ocean, With the Aid of Aircraft Reconnaissance Reports and Rawins, extracts from report by Maj I.I. Porush, May 1945, 30pp. A study of 11 tropical disturbances, storms, and hurricanes that entered or were formed in this area in 1944.

AWS TR 105–16 (ATI70921) Direct Observational Methods for the Determination of Swell Characteristics From Aircraft, Weather Division Hq AAF, June 1945, 8pp. Outlines procedures for making simple observations of sea swell from a moving airplane. No special instruments or devices are needed, but some type of floating marker may be helpful in making an independent determination of wave period.

AWS TR 105–17 (ATI72846) Forecasting Tops of Non-Frontal Cumulus Clouds in Polar-Air Outbreaks over the North Atlantic, AAF Weather Station, Massachusetts Institute of Technology, September 1945, 44pp. Gives initial procedures and discusses specific forecasting problems. Provides test of the method and conclusions. With references and weather ship data appendix.

AWS TR 105–18 (ATI65129) Computation of Approximate Ballistic and Differential Ballistic Winds Over Japan by Use of the Wind at Bombing Altitude, Hq AWS, May 1945, 4pp. A statistical study of winds at Tateno, Japan, in an attempt to find a good approximation of the ballistic wind knowing only the wind at bombing altitude. Study based on upper air observations at Tateno for 1923-1936.

AWS TR 105–19 (AD242217) Catalogue of Predictors Used in Local Objective Forecast Studies, by Capt Charles S. Cushman, 15 July 1960, 85pp. Provides AWS activities a catalog of predictors that have been used in
existing forecast studies. Data is in tabular form, by category; for example, thunderstorms, precipitation fog/stratus, ceiling/visibility, wind, temperature/frost, miscellaneous.

AWS TR 105–20 (ATI65125) The Relation Between Average Monthly Cloudiness and the Average Number of Clear and Cloudy Days, AAF Weather Service, October 1942, 7pp. Describes a new relationship between average cloudiness (percent) and type of day (clear, ptly cldy, cldy). Tables & graphs.

AWS TR 105–21 (AD–NONE) Sky Brightness and Illumination Data for Scandinavia, European Russia, the Arctic, and Washington, D.C., February 1943, 49pp. Admittedly based on scant data from all locations, including U.S.S.R.’s Institute of Actinometry and Atmospheric Optics and Washington, D.C.


AWS TR 105–23 (AD–NONE) Simultaneous Ceilings at Reyjavik and Akreýri, Iceland, 1942, 2pp. Adapted from U.S. Weather Bureau (Statistics Division) Special Report 9. Results are from correlation tables prepared for 1937 and 1938.

AWS TR 105–24 (AD–NONE) Status and Methods of Long Range Forecasting, Weather Information Branch, Hq AAF, September 1943, 18pp. A summary of long range forecasting capabilities, circa 1943. From the introduction: “Long range weather forecasts are prepared and disseminated by the Weather Information Branch of Headquarters Army Air Forces on the premise that a long range forecast of value is the connecting link between climatology and short range forecasting, and is necessary as an aid to tactical planning of military operations.”

AWS TR 105–25 (ATI65128) Study of Length of Record Needed to Obtain Satisfactory Climatic Summaries for Various Meteorological Elements, Weather Information Branch, Hq AAF, November 1943, 15pp. Results of a study to determine number of years required to obtain a relatively constant frequency distribution of various weather elements, including: visibility, cloud height, cloudiness, rain persistence, wind speed.

AWS TR 105–26A (ATI29456) Short Range Forecast Verification Program, November 1943, 31pp. From the latter part of 1941 until late 1943, the AAF’s Weather Information Branch conducted experiments to ascertain desirable methods of forecast verification. Specific tests were conducted from August to December 1942, during which a selected group of Weather Information Branch made special short range forecasts for representative stations in North America. Traditional verification methods were found inadequate, but newer methods (described) were also found and tested.


AWS TR 105–30 (AD–NONE) Forecasting by Statistical and Synoptic extrapolation, by Maj R.A. Bundgaard, May 1944, 318pp. A resume of a mathematically derived method to predict flow patterns in the upper troposphere. Discussion founded on hypothesis that all surface disturbances of a weather map are closely related to changes in air flow at some upper level, say the 500-mb surface.


AWS TR 105–32 (ATI91843) Forecasting and Related Problems in China, Weather Division, Hq AAF, December 1944, 25pp. A collection of papers on various subjects related to weather forecasting in China. Papers selected from those submitted by USAAF forecasters working in China; they represent a resume of techniques and ideas they acquired there.

AWS TR 105–33 (AD–NONE) Synoptic Weather Associated with Rhine Floods, Weather Division, Hq AAF, December 1944, 65pp. A study of synoptic situations leading to the flooding of the Rhine lowlands, as requested by the Commanding General, Advance Headquarters, USSTAF. Discussions of a number of situations representative of flooding along the Rhine are given; enough climatic information is provided to give background for the synoptic situation. Hydrology is not considered. Bibliography.

AWS TR 105–34A/B (ATI72446) Weather and Climate of China — Parts A and B (Synoptic), Weather Division, Hq AAF, March 1945, 573pp. Part A (by Dr Edwin R. Biel, Rutgers University) is a general discussion of the climate of China, together with data accumulated from
various published sources at the University of Chicago. Part B consists of frequency distributions of weather elements and operational tables for selected stations compiled by the Weather Division’s Climatological Section. Note: Hardbound version at AWSTL; not available from DTIC.

AWS TR 105–34C (ATI72446) Weather and Climate of China — Part C (Climatic), Weather Division, Hq AAF, March 1945, 69pp. A discussion of the synoptic features of the weather in China, with examples of synoptic weather maps illustrating the various features. Part C by Capt John V. Finch and associates of the 2d Weather Region. Note: Hardbound version at AWSTL; not available from DTIC.

AWS TR 105–35 (ATI72894) Regions of Orographic Lifting and Foehn with Northwesterly and Southwesterly Gradient-Wind Flow, (from Herman Flohn, Witterung und Klima in Deutschland, 1942), AAF Weather Service, undated, 4pp. Includes two maps showing northwesterly and southwesterly flow, two pages of accompanying notes.


AWS TR 105–44 (ATI65137) Preliminary Correlations of the Synoptic and Winds Aloft Charts with High Winds on the Natal-Ascension Track, by TSgt A.W. Orr and Sgt S. Tomashefsky, 1945, 63pp. A study to correlate synoptic features with “high winds” (equal to or greater than 20 knots from 50° to 130° on the entire Natal-Ascension track). Study performed because 21-23 knot headwinds found sufficient to cancel about 80 percent of Ascension-bound flights. Charts, tables, conclusions.

AWS TR 105–45 (ATI66145) Forecasting Summer Fog at Shemya, by Capt Dale E. Leipper, 1 June 1945, 54pp. A four-part study: Basic considerations of the problem, forecast graphs, forms, and instructions, method development and statistics, and charts and instructions for applying the system at other stations.

AWS TR 105–46 (ADA297000) Aircraft Icing Over Northwest Europe, by 1Lt Holt Ashley, 2 June 1946,
15pp. Report based on data from 9th Weather Reconnaissance Sq (Prov) flying P-51B and P-51D aircraft on 1340 successful tactical weather reconnaissance missions from 3 June 1944 to 3 May 1945. One or more instances of icing reported on 307 missions—only three aircraft forced to turn back or land because of icing. Data breakdown by seasons. Conclusions. Note: One archive copy available only at AWSTL.

AWS TR 105–47 (ATI65142) Briefing Aids: Northwest Ferry Routes, February 1946, 105 p. Discusses problems and techniques of weather forecasting in mountainous areas. Describes briefing aids for Northwest Ferry Route. The lee-trough phenomenon used for accurate analysis and forecasting in mountainous areas such as northwestern Canada is considered. Techniques used to obtain upper-air data for forecasting are summarized. General techniques for forecasting the ferry route from Whitehorse, YT, to Fairbanks, and for the Watson Lake area, are outlined.


AWS TR 105–49 (ATI65153) A Study of Harmattan Haze at Maiduguri, Nigeria, by Capt Thomas P. Condron, December 1944, 13pp. Harmattan haze, more intense and persistent at Maiduguri than at any other 19th Weather Region station, consists of settled dust particles and is caused by cold northerly circulation around the eastern periphery of the Azores High or the southeastern periphery of the Russian High. This circulation sweeps across North and Central Africa behind a cold front associated with an intense Mediterranean Low. Northeasterly circulation is almost always present during harmattan season. Strong outbreaks don’t arrive unless there is a well developed high in North Africa. Included: Data for forecasting harmattan haze onset, tables for forecasting intensity.


AWS TR 105–52 (ATI65123) Pilot Interviews: Composite Pirep of 7500 Trips Through the Tropical Front, by Capt Leo Alpert, November 1944, 104pp. Prepared from completed questionnaires issued by the 6th Weather Region’s Research Team. Questionnaire responses represent the experiences of Army and Navy pilots who made repeated flights through the equatorial front. Compiled to give weather forecasters a better understanding of the front’s physical composition, movement, and intensity.

AWS TR 105–53A (ATI65143) Forecasting Manual Tripoli to Karachi — Part One: October-November-December, by Capt Thomas P. Condron et al., October 1944, 94pp. The first in a series of four seasonal reports prepared by the 19th Weather Region’s Research Section. Reports outline principal forecasting problems along the Tripoli-Karachi route and give techniques for their solution. Included: Discussions of Mediterranean Low, climatology data for Tripoli, Benghazi, Cairo, Deversoir, Lydda, Habbaniya, Teheran, Abadan, Bahrein, Sharjah, and Karachi. Charts and tables. Note: All four manuals (including the three below) registered under same DTIC number, all on roll film negatives at DTIC. Low quality paper copies on file at AWSTL.


AWS TR 105–53C (ATI65143) Forecasting Manual Tripoli to Karachi — Part Three: April-May-June, April 1945, 68pp. Note: Low quality paper copies at AWSTL.

AWS TR 105–53D (ATI65143) Forecasting Manual Casablanca to Karachi — Part Four: July-August-September, July 1945, 122pp. Note: Low quality paper copies at AWSTL.

AWS TR 105–54 (ATI65139) Analysis and Forecasting of Tropical Cyclones with Special Reference to the Atlantic Ocean, by Gordon E. Dunn, USWB, January 1944, 35pp. A study of the characteristics, development, detection, movement, and forecasting of the tropical cyclone. Includes report on recon flight in the area of the 12 October 1943 tropical storm southwest of St Lucia.

Allen Riley, 10 November 1944, 11pp. Investigates probability of successful bomb runs when sky obscured by cloud. Probability tables would be of tactical-significance if a rule of thumb method could be found to determine the average distance between clouds. When target attacked with less than about 50% probability, it appears that small independent bomb elements, sufficiently spaced over the target, represent best bombing practice.

**AWS TR 105–56 (ATI65155)** *Rain-Cloud Weather Reports Associated with the Frontal Passage of 17-20 December 1943 in Panama*, November 1944, 51pp. A study of rain clouds observed on radar during wet season passage of a “norther,” or tropical cold front. Note: DTIC copy low contrast—not reproducible.

**AWS TR 105–57 (ATI65133)** *Radar Storm Detection—Panama 1944*, 1945, 122pp. Discusses findings of the 6th Weather Region’s Radar Section during the Panama wet season of 1944. Main purpose is to give weather forecasters comprehensive knowledge of radar observation methods and limitations of the Rarep code. Fundamental radar principles are included in an appendix, along with a discussion on the use of the Rarep code.

**AWS TR 105–58 (ADA800407)** *Pressure Tendency as an Aid in Single-Station Forecasting for Tropical Areas*, by Lt George L. Landgren and Maj Gerald M. Leies, March 1945, 14pp. In equatorial regions, changes in sea level pressure are very small when compared to those in temperate latitudes. This report presents the results of a study to determine the magnitude and characteristics of pressure tendencies at one tropical weather station (Pitoe Strip on Morotai Island in the Netherlands East Indies) to determine whether or not they are a satisfactory single-station forecasting tool. The study concludes that pressure tendencies in themselves are not a satisfactory tool for single-station tropical forecasting.

**AWS TR 105–59A (ATI65144)** *The Utilization of 500 Millibar Charts in Forecasting for the China Area—Spring Season*, by Capt Robert B. Orton, June 1945, 6pp., 10 charts. Forecasters at the Weather Central have been analyzing 500 mb charts since 1 December 1944. The decision to draw charts for this level was based primarily on a need for accurate wind forecasts at and above this level, and any value derived from their use in forecasting actual weather was considered of less importance. A study was therefore begun to determine what use might be made of the 500 mb chart in answering some of China’s forecasting problems. Study period: 15 February 1945 to 15 May 1945—findings are outlined here.

**AWS TR 105–59B (ATI83514)** *The Paths and Characteristics of Migratory Anticyclones in Southeast Asia*, by Capt Robert B. Orton, July 1945, 15pp., 31 charts. This report acquaints forecasters who have little access to weather data outside the geographical borders of China with some of the weather phenomena that occur beyond the northermost reporting stations but that are closely associated with weather in China.

**AWS TR 105–60 (ATI78584)** *A Wave-Front Method of Minimal Flight Planning*, by D.T. Perkins, October 1949, 7pp. A geometrical method for minimal-flight planning, formally similar to the application of Huygens’ principle, is described. The method uses a simple geometrical construction applied to the contour field as an aid in attaining best possible flight paths from time and fuel economy standpoints. The construction affords a simple and practical extension to three-dimensional night planning, a problem that appears to be outside the scope of the differential method.

**AWS TR 105–61 (ATI73177)** *An Analysis of the Sea Breeze in the Boston Area*, by Maj William E. Klein, et al., June 1945, 78pp. Documents an extensive sea breeze study in the Boston area during 1944. Mean and extreme values of SB characteristics are tabulated, and the importance of coriolis force in causing steady clockwise turning of the wind during SB periods is illustrated. The dependence of the sea-breeze effect on friction and curvature of coastline, as well as various methods for evaluating the sea breeze effect are discussed.

**AWS TR 104–62 (ATI84239)** *The Computation of Air Trajectories*, by Maj A.F. Gustafson, June 1950, 30pp. From time to time, AWS forecasters are required to compute air trajectories. Procedures have not been adequately treated in the literature nor standardized among meteorologists. This report critiques various existing methods and determines the procedure that is most accurate and feasible with the synoptic data generally available.


converting pressures reduced to various levels to pressures reduced to sea level.


AWS TR 105–67 (ATI83513) The Frontology of North China, by Capt Robert B. Orton, September 1945, 91pp. Report confined to discussion of characteristics and behavior of fronts affecting weather conditions in north China—an area arbitrarily defined as that part of China proper north of 30° north. Conclusions based primarily on data collected, and synoptic charts drawn, at the Weather Central, Hsinching, From December 1943 to September 1945. As radiosonde data from east China were lacking during this period, pre-war soundings were used. Analysis of these data in east China primarily the work of Dr Chang-Wang Tu, supplemented by work of other Chinese meteorologists.

AWS TR 105–68 (ATI11292) Dew-Point Charts, January 1951, 5pp. Provides standard methods for computing and reporting dew point and dew point depression (from data obtained with Psychrometer ML–313/AM) in night level and ascent/descent sounding weather reconnaissance reports.


AWS TR 105–72 (ATI119241) Dew-Point—Relative Humidity Conversion Chart, April 1951, 5pp. For aerial recon weather observations; provides a direct graphic method for converting from dew point temperature to relative humidity and vice versa.

AWS TR 105–73 (ATI98238) Forecasting Fog in the Brahmaputra Valley, by 1st Lt Donald E. Martin and MSGt Paul W. Bauer, March 1951, 17pp. Presents certain practical aids to forecasting fog in the Brahmaputra Valley of India and to aid in indoctrinating forecasters new to the area. Methods outlined in this report used successfully by numerous forecasters in India during WWII.


AWS TR 205–75 (ATI98239) An Example of Easterly Wave Analysis in the Western Pacific July 9-16, 1945, by Dr Reid A. Bryson, March 1951, 11pp. Initially a part of Dr Bryson’s doctoral dissertation to the University of Chicago. Summarizes techniques in use while Bryson was on active duty as a major at the Guam Weather Central in the latter days of WWII. Notes that ordinary analysis techniques are generally unsatisfactory for study of easterly waves, and that they must be supplemented by time-sections, streamlines, and specialized cloud observations.


AWS TR 105–78 (ATI114511) Forecasting the Typhoons of 1949 with Special Reference to the Use of Streamline Analysis, August 1951, 92pp. Prepared by the Typhoon Post-Analysis Board at Anderson Weather Central, Guam, primarily for indoctrination of inexperienced tropical forecasters.

AWS TR 105–79 (ATI114514) Non-Frontal and Other Types of Thunderstorms in the Lee of the Rocky Mountains, by Capt John B. Young, December 1945, 35pp. Report acquaints forecasters with basic types or thunderstorms that occur in states east of the Rockies; namely, Kansas, Nebraska, Colorado, New Mexico, and the Panhandle regions. Issued by AWS August 1951.


**AWS TR 105–82 (ATI122474) An Area Forecasting Study for the Southeastern United States**, by Brig Gen J.J. George and Capt R.D. Roche, USAFR, November 1951, 53pp. Study concentrates on types of weather that are generally a problem to aircraft operations in the southeastern United States, and is confined largely to synoptic situations causing low ceilings, stratus, and fog.

**AWS TR 105–83 (ATI122473) Notes on Forecasting for Re-supply Operations to Canadian Arctic Stations 1951**, November 1951, 16pp. Includes discussions of several broad-weather patterns for terminals at: Resolute Bay, Mould Bay, Isaachsen, Eureka Sound, Alert Bay, Thule. Also includes general discussions of haze, cloud cover, twilight, convection, blocking effects, frontal analysis.


**AWS TR 105–85 (AD–NONE) Chromov’s Synoptic Rules**, February 1952, 24pp. Amendment No. 1, March 1952, 2pp. Translated from Russian. Consists of 177 rules intended as practical forecasting aids, published in 1937 by Dr S.P. Chromov, a Russian meteorologist. First issued by 28th Weather Squadron as a technical note from DA Sub-Project 80.11. Contents as published were not evaluated, and publication was not to be construed as official AWS approval of Dr Chromov’s views. Rescinded June 1960.


**AWS TR 105–90 (AD–000119) Forecasting the Long Waves in the Upper Westerlies**, June 1952, 40pp. A summary of several methods for forecasting motion and development of wave patterns in the upper Westerlies, along with limitations or these methods. Especially designed for forecasters in weather centrals concerned with upper-level forecasting.

**AWS TR 105–91 (ATI147201) The Occurrence of Strong Winds at Thule**, by Capt A. Ehrlich, May 1952, 8pp. Study initiated as a result of request for assistance in forecasting the very strong, super-gradient winds that occur frequently at Thule, Greenland. Although specifically aimed at Thule winds, techniques may be applied to other stations, especially along the west coast of Greenland.


**AWS TR 105–93 (AD029380) A Description of Some Methods of Extended-Period Forecasting**, March 1954, 90pp. Change A, October 1954, 1pp. A brief description of the various methods or systems for extended range forecasting that appear to have any rational meteorological basis; mean circulation methods used by the USWB and the AWS discussed in greater detail. Since most of these methods are controversial, no final opinions or decisions on their validity can be made.


studies. Only forecasters at Turner and certain other bases in the southeast will be able to make direct operational use of this report, but forecasters at locations troubled with advection stratus fog, radiation fog, mixing-radiation stratus, and pre-warm front stratus will find the discussions useful.

AWS TR 105–96 (AD017729) Analysis and Wind Flow at the 50- and 25-MB Levels, by Dr A. Kochanski, May 1953, 76pp. Describes investigations of region above 100 mb (50,000 ft), particularly at 50 and 25 mb (82,000 ft), in attempt to derive techniques for analysis of constant-pressure charts and a picture of the wind flow.


AWS TR 105–98 (AD074309) Use of Geostrophic Distance in Analysis and Forecasting, Maj G. DeGiacomo, September 1954, 13pp. Proposes another way to consider geostrophic wind on maps and wind scales.

AWS TR 105–99 (AD003774) Tables for Computing Constant Absolute Vorticity Trajectories, by H. Wobus, et al., 17 December 1952, 12pp. Contains tables for computing CAV trajectories entered on larger area weather charts to forecast the long wave in the westerlies, as explained in AWSM 105–90; useful at weather centrals and area forecast centers.

AWS TR 105–100/1 (AD095566) Anomalies in the Northern Hemisphere 700-mb 5-Day-Mean Circulation Patterns, April 1956, 26pp. Provides background for use of the so-called “Martin anomaly charts” in AWS TR 105–100/2. Based on studies by Lt Col Donald E. Martin that led to technique for forecasting large-scale pressure patterns with anomaly charts. Suggestions for use in 5-day, 24- to 72-hour forecasting.

AWS TR 105–100/2 (AD095567) Atlas of 700-mb, Five-day Mean Northern Hemisphere Anomaly Charts, July 1955, 39pp. For use with AWS TR 105 100/1; gives more explicit instructions for 24- to 72-hour forecasting.

AWS TR 105–101 (AD145387) Memorandum on Density-Altitude, second revision, September 1957, 7pp. Purports to “provide such information on density-altitude as Air Weather Service personnel are likely to need.”

AWS TR 105–102 (AD043882) Final Report on the AWS Sferics Evaluation Project (1951), by Capt C.E. Jensen, August 1954, 152pp. Give full results or AWS project to evaluate the meteorological worth of Sferics; history, planning, conclusions, project personnel and cost. Includes photos, maps, charts, references.

AWS TR 105–103 (AD–005226) An Analysis of Some Contrail Data, February 1953, 13pp. This report presents the results of an analysis of contrail observations to see whether a forecasting technique proposed by AWSM 105–100, April 1952, was valid. Data used in checking validity from B-36 and B-47 aircraft in U.S., F-84 and F-86 in Europe.


AWS TR 105–107 (AD013056) Mean Monthly Maps of 300-, 200-, 100-, 50-, and 25-mb Surfaces Over North America, by Dr Adam Kochanski, April 1953. A new series of mean contour and isotherm charts for the higher levels of the atmosphere of operational interest, but for which no charts (or only inadequate ones) have been available heretofore. Oversize (10” X 14”).

AWS TR 105–108 (AD020871) Temperatures at the 10-mb (101,000-foot) Level, by Dr Adam Kochanski, May 1953, 33pp. Extends discussion of levels above 200 mb, begun in AWS TR 105–96, to 10 mb, which is as high as present radiosondes reach with any frequency and accuracy. Preview of problems with analysis and forecasting at 10 mb.

AWS TR 105–109 (AD030340) Forecasting Sudden 700-mb Height Changes in Key Areas, by Maj A. Ehrlich, April 1953, 5pp. Extract 1 of a larger report. Key area covered: At 60°N, from 0° to 10°E, over the western end of the Scandinavian Peninsula.


AWS TR 105–112 (AD–NONE) *A Further Analysis of Contrail Data*, December 1953, 40pp. Like AWS TR 105–103, which analyzed data collected earlier, this report tests validity of technique proposed by AWSM 105–100, Forecasting Jet Aircraft Condensation Trails. Also tests a piston-engine contrail technique.

AWS TR 105–113 (AD–NONE) *The AWS Runway Air-Density Program*, October 1953, 21pp. The results of a survey of requirements for runway temperature observations. Includes analysis of distribution of differences found between runway and instrument shelter temperatures.

AWS TR 105–114 (AD022231) *Wind Extrapolation Device (AWS-WPC-10-4)*, by Maj G. DeGiacomo, November 1953, 10pp. Discusses some of the vectorial operations that can be performed with the newly designed Wind Extrapolation Device.


AWS TR 105–116 (ADA954915) *Tables for Computing Horizontal Distance of Pilot Balloons (30 Gram) for Use with the ML–462)/UM-Nozzle*, November 1953, 121pp. A reprint of United States Weather Bureau Tables (WB Form 1043). Tables designed to replace slide rule in computing horizontal component of a 30-gram pilot balloon’s distance from theodolite at any given whole minute after release.

AWS TR 105–117 (ADA955095) *Tables for Computing Horizontal Distance of Pilot Balloons (100 Gram) for Use with the ML–462)/UM-Nozzle*, November 1953, 151pp. A reprint of United States Weather Bureau Tables (WB Form 1043). Tables designed to replace slide rule in computing horizontal component of a 100-gram pilot balloon’s distance from the theodolite at any given whole minute after release.


AWS TR 105–121 (AD060095) *Winds Over 100 Knots in the Northern Hemisphere*, by Maj Frank W. Murray, January 1955, 67pp. Number 6 in a series of background reports for AWS Manual 105–50. Report discusses conditions under which very strong winds are likely to be observed in the free atmosphere (3,000 to 60,000 ft). Only actual wind reports used in study. Principal characteristics of winds over 100 knots were directional distribution, frequency distribution with height, and associated shear. Special study of winds over 100 knots at lower latitudes and special study of winds much stronger than 100 knots.


AWS TR 105–123# (AD–NONE) Title & status Unknown.


AWS TR 105–126 (AD074310) Memorandum on Effect of Engine Power Setting on Contrail Formulation and Intensity, by Herbert S. Appleman, August, 1954, 6 pp. Based on a study of 2,000 observations by F-84 aircraft, part of a program to test validity of the Appleman contrail curves (AWSM 105–100). Evaluates effects of power setting on contrail formation.


AWS TR 105–129 (AD079472) Thermal Structure and Vertical Motion in the Lower Stratosphere, by Dr Adam Kochanski, December 1954, 36pp. Number 8 in a series of background reports for AWS Manual 105–50. Gives synoptic characteristics of temperature and wind flow from the tropopause to 70 mb in latitudes 35-70°N. UCLA models of thickness for the 300-200 and 200-100 mb layers and of isotherm patterns for 200 and 100 mb are described.


AWS TR 105–132 (AD101313) Preliminary Results of Project CLOUD TRAIL, by Dr Robert D. Fletcher, February 1956, 23pp. Gives findings based on winter and spring data collected in Project CLOUD TRAIL. Data used to improve forecasting of contrails, cirrus, and high-level turbulence.

AWS TR 105–133 (AD075863) Accuracies of Radiosonde Data, by V.S. Hardin, September 1955, 12pp. Summarizes best available information on errors in radiosondes in current use in USA. Elementary discussion of statistical terms and concepts used for expressing accuracy or error is discussed.

AWS TR 105–134 (AD069809) Evaluation of M. Grappe’s Extended Period Forecasting Technique, by Maj R.C. Bundgaard, May 1955, 20pp. In 1950, Roger Grappe of the French Meteorologie Nationale developed a method of extended period forecasting for periods up to 30 days, based in large part on the concept of singularities. After Mr Grappe visited Hq AWS for trials and verifications, an extended forecasting method using some of Grappe’s procedures was developed. This report summarizes the results of various AWS experiments with the Grappe method, with conclusions.


AWS TR 105–137 (AD072807) Atlantic-European Weather Types, 1899-1945: Classification, Calendar, Uses and Climatology, by Lt Col Olaf Njus, August 1955, 40pp. Contains description of classification of weather types for the Atlantic-European area, a type-catalog or calendar in digital form showing the types for each day of the years 1899-1945, a suggested color code for making the calendar into a chart, discussion of the uses of the types and calendar, and statistical tables showing type climatology for the period.


Thomas H. Simmonds, October 1955, 8pp. A continued evaluation of those techniques not covered by Part I.


AWS TR 105–141 (AD097052) *Studies of 2-Hour and 4-Hour Upper-Wind Variabilities Over Nevada*, February 1956, 9pp. Special wind sounding data from Nevada Proving Ground for 1 March to 1 May 1954 at 2- and 4-hour intervals are analyzed statistically for layers 6-14, 16-20, 25-35, and 40-50 thousand feet.

AWS TR 105–142 (AD107275) *Wind, Temperature and Their Variabilities to 120,000 feet*, by Adam B. Kochanski, May 1956, 34pp. Number 9 in a series of background reports For AWSM 105–50. Acquaints forecasters with variability (or persistence) of wind and temperature up to 120,000 feet. Data for four sections close to the 70°W meridian and ranging from 28°N to 61°N, and for months of August 1954 and January 1955.


AWS TR 105–146 (AD218559) *Estimating the Probability of Hurricane-Force Winds Affecting an Air Base*, by Capt S.J. Kimball, June 1958, 15pp. Provides an objective means for estimating the chances of a base being affected by hurricane winds of a storm whose forecast track indicates a possibility that that base will be struck. Tables and nomograms for Atlantic/Caribbean and western North Pacific.

AWS TR 105–147 (AD141542) *Clear-Air Turbulence From 25,000 to 45,000 Feet Over the United States*, by LeRoy H. Clem, July 1957, 13pp. Presents findings of a study of high-level turbulence obtained from Project Cloud Trail aircraft. Turbulence observations collected above 25,000 feet by aircraft flying in vicinity of upper-air sounding stations. Report shows that high-level turbulence may be associated with recognizable synoptic features and that it has systematic geographical and seasonal variations.


AWS TR 105–149 (AD218079) *A Digest of Objective Methods for Forecasting Strong Surface Winds (Southwestern United States — Early Spring)*, by Thomas H. Simmonds, April 1959, 83pp. A guide to forecasting strong, gusty surface winds in Southwestern United States. Data from fifteen air bases used in study.

AWS TR 150 (AD254659) *Air Density Profiles for the Atmosphere Between 30 and 80 Kilometers*, by Roderick S. Quiroz, January 1961, 46pp. Presents data for 65 individual air density soundings taken 1947-1958 and at altitudes from the equator to 75°N. All values reduced to grams/cubic meter. Data from several rocket firings above the mesopause included.

AWS TR 151 (AD254761) *Seasonal and latitudinal Variations of Air Density in the Mesosphere (30 to 80 Kilometers)*, by Roderick S. Quiroz. March 1961, 16pp. The results of analysis of mesosphere data, along with four other soundings. Lowest densities found in winter in arctic latitudes. At 65 km, mean winter density 60% of mean summer density. Seasonal variation in mid-latitudes relatively small—less than 5% below 50 km, maximum of 13% at 66 km. Latitudinal gradient greatest in winter at around 65 km. Gradient directed northward from mid-latitudes, 2% per degree (at 65 km): smaller gradient directed equatorward from mid-latitudes. At mid-latitudes, standard deviation of density varies from 4% (of mean density) at 30 km to about 20% near 60 km,
removing nearly constant to top of the mesosphere. In Arctic latitudes, standard deviation varies from 11% at 30 km to a maximum of about 40% near 60 km, decreasing to about 30% at 80 km.

**AWS TR 152 (AD261937) Preparing the Regional Surface Prognosis at the Tokyo Weather Central**, by Major Herbert Edson, April 1961, 58pp. A semi-objective procedure for preparing 30-hour regional surface prognoses at the Tokyo Weather Central on an operational basis. These prog charts normally cover an area of some 55 degrees of latitude by 140 degrees of longitude.

**AWS TR 153 (AD259120) Percentiles of Air Density at Station Level**, by Adam Kochanski, May 1961, 42pp. Method given for estimating certain percentiles of density at station level for any discrete point over Northern Hemisphere. Main operational problem requiring knowledge of density distribution concerns SAC bombers included.


**AWS TR 155 (AD325003) Effects of Variable Atmospheric Density on the Deceleration of Re-Entry Vehicles**, by Karl R. Johannessen and Charles F. Roberts, August 1961, 37pp. The results of a study requested by AFBMD and Space Technology Laboratories. The report deals with the problems of determining the air-burst height of the inertially-programmed fuzing system in the Mark 3 Re-Entry Vehicle. A general study is made of the influence of atmospheric density on re-entering space vehicles. As an application of the study a special diagram, the Theta, Omega-Diagram, was designed where Theta represents the virtual temperature of air in degrees absolute and omega represents a nondimensionable pressure variable. The Theta, Omega-Diagram is used to compute the density influence on the GE Mark 3 Re-Entry Vehicle by simple graphical means from conventional radiosonde data. A numerical expression for calculating the climatological distribution of the density influence is also given. The method is general and may be applied to any re-entry problem where density is a factor.

**AWS TR 156 (AD262399) Radiation Effects on Manned Space Flight**, by Herbert S. Appleman, August 1961, 9pp. With the recent flights of man into near space and with the proposal for lunar flights by 1970, it has become urgent to examine the hazards of radiation on the crews or these vehicles. This report is a general survey or the types of radiation hazards that are of importance, together with a discussion of their origin, probability of occurrence, feasibility of shielding, and prospects for forecasting. Rescinded February 1970.


**AWS TR 158 (AD244597) High Level Turbulence**, by J. Clodman, G.M. Morgan, Jr., and J.T. Ball, New York University, September 1960, 84pp. Reprint of final report under contract No. AF19(604)-5208. Authors worked under Project Director, Prof Miller of Department of Meteorology and Oceanography at New York University during an evaluation of clear air turbulence forecasting methods. Hq AWS requested and got permission to reprint the contract report verbatim.

**AWS TR 159 (AD267339) Estimates of Altitudes with Specified Probabilities of Being Above All Clouds**, by Irving Solomon, October 1961, 18pp. Results of efforts by USAF Climatic Center to determine graphic method for estimating probabilities of being above all clouds. Results provided designed as basic planning tool for long-range purposes.

**AWS TR 160 (AD268018) Wind Variability at 150,000 Feet**, by Herbert S. Appleman, October 1961, 7pp. The advent of the X-15, Dyna-Soar, and other vehicles operating at very high altitudes requires increased Familiarity with winds above normal radiosonde levels. This report uses available rocketsonde data to determine...
The Climatological Wind
and Density

AWS TR 160 (AD029375) Bibliography on Small-Scale
Time and Space Variations in the Free Atmosphere,
March 1954, 6pp. Designed to be of interest to activities
designing and testing upper-air measuring equipment or
aircraft, missiles and accessories. Also of interest in
solving upper-air diffusion, synoptic analysis problems.
Formerly AWSP 0-14—redesignated AWS TR 160 by
AWS/DNTI ltr, 1 Feb 74.

AWS TR 161 (AD269491) Climatic Aspect of Ballistic
Wind and Density, by William C. Spreen, Rolf M.
Climatological behavior of ballistic wind and density is
examined, using means of equally weighted values of
upper-air wind and density at altitudes 2 km apart. These
mean values are termed integrated wind and density,
respectively. Three integrated values or wind and density
are used—one for the atmosphere below 12 km, another
for the atmosphere below 16 km, and one for the zone
below 24 km. Data from 25 stations in the northern
hemisphere, chosen from widely diverse climatic regimes,
are used. Specific aspects of behavior examined: Effects
of variability on short-period means; comparison of
monthly and seasonal statistics; effects of restricted
amounts of data; and relation of integrated density to
integrated wind.

AWS TR 162 (AD272183) Climatological Probability of
Fallout from Multiple Nuclear Detonations, by Capt
Thomas D. Potter, January 1962, 8pp. Gives a method for
determining climatological probability of fallout from
multiple nuclear detonations. A general procedure for a
simple case of two detonations, based on probability of
two events occurring together, was developed by applying
a vector regression equation to effective wind variables
at the two points of detonation. This was followed by an
extension of the development to include three or more
detonations.

AWS TR 163 (AD436538) Wind-Shear Effects on
Airspeed, by J.A. Brown (Trans World Airlines), March
1962, 18pp. A change in airspeed will occur whenever an
aircraft traverses from one wind condition to another in
less time than aircraft ground speed can adjust to the new
wind component. Recommended flight procedures
include allowances for these variations; there is no danger
of getting into difficulty as long as proper airspeed is
maintained. Extreme conditions of wind shear
encountered during approach can be hazardous if corrective
action not taken immediately on thrust and/or
flight control settings. Knowing how various types of
wind shear can affect airspeed should help pilots
anticipate the effects of windshear and allow them to take
prompt and appropriate action.

AWS TR 164 (AD286695) Estimating the Probability of
Operationally-Critical Wind Speeds Affecting an Air
Base During the Passage of a Tropical Cyclone, by H.S.
Appleman, August 1962, 22pp. Balancing the cost of
protection against the damage incurred by tropical storms
requires certain decisions, such as whether to tie down or
evacuate aircraft, delay construction projects, remove
missiles from firing pads, etc. Decisions to take such
actions is based primarily on expectancy of occurrence of
wind speeds above a critical value considered hazardous
to the installation. To balance cost of protection against
damage incurred at an unprotected base, commanders
must know the probability of an installation being struck
by above-critical wind speeds. In June 1958, AWS
published a report (AWS TR 105–146, AD 218 559) that
outlined a method for computing total probability of
above-critical wind speeds affecting an airbase at some
time during passage of a hurricane or typhoon. A
 technique was developed for obtaining the instantaneous
probability of strong winds affecting a base at each hour
during the storm’s passage, and a somewhat different
approach was used to obtain the hour-by-hour
instantaneous probability. This report describes both
techniques, as well as several new ones.

AWS TR 164/1 (AD298945) Amendment to TR 164,
January 1963, 8pp.

AWS TR 165 (AD293168) Forecasting Density Altitude,
by Capt Norman N. Richardson, November 1962, 31pp.
Prepared primarily as a result of problems associated with
helicopter operations at remote sites. Provides nomogram
and simple, step-by-step instructions for forecasting
density altitude. Includes extensive table of machine
computed density altitude values.

AWS TR 166 (AD299776) The Climatological Wind
and Wind Variability Between 150,000 and 200,000
Feet, by Herbert S. Appleman, March 1963, 6pp. An
extension of AWS TR 160, based on availability of more
rocketsonde data. Data used came from first eight
volumes of the Meteorological Rocket Network Data
Reports, with soundings made intermittently from
October 1959 to August 1961. Although considerably
more data used than for AWS TR 160, size of sample still
so small, and accuracy of observations still so questionable,
that numerical results obtained, especially
of the standard deviation, must be considered tentative.
Rescinded.

AWS TR 166 (AD256922) Bibliography of Documents
Prepared by Weather Staff Sections of Headquarters
Army Air Corps and Headquarters Army Air Forces,
1937—June 1945, April 1961, 60pp. Formerly AWSP 0-
18/2—redesignated AWS TR 166 by AWS/DNTI ltr, 1
Feb 74. Several thousand technical documents were
prepared by the organization for weather of the Army Air
Forces during WWII. A selected number of those
documents are listed here. Appendix lists U.S. War
Department publications on weather or applicable to AAF weather operations.

AWS TR 167 (AD436603) Estimated Frequencies of Specified Cloud Amounts Within Specified Ranges of Altitude, by Irving Solomon, April 1963, 53pp. Study designed to provide military planners, design engineers, and AWS personnel with estimates of frequencies in which specified cloud amounts will be encountered within specified altitude ranges. Information shown by isopleths on Northern Hemisphere base maps for midseason months. These data will furnish inputs for strategic planning of environmental support to a system or operation; for example, selecting design criteria for equipment, determining feasibility of an operation, and establishing long-range operational plans. Tactical, or short-range, planning should be based on synoptic weather forecasts that give go/no-go advice.

AWS TR 168 (AD337244) Programs For Determining the Minimum Re-entry Dispersion Due to Atmospheric Variability, by Karl R. Johannessen, May 1963, 48pp. The results of a study requested by the Ballistic Systems Division, AFSC, to examine meteorological factors during re-entry of Project Sleigh Ride vehicles. An optimum fuzing program, which helps eliminate burst-height errors caused by meteorological fluctuations, emerges as a result of this study.

AWS TR 169 (AD422637) Computation of Atmospheric Refractivity on the USAF Skew T, Log P Diagram, by Karl R. Johannessen, September 1963, 7pp. Elements needed to compute refractive index are pressure, temperature, and dew point. Vertical distribution of these quantities is recorded and displayed on Skew T, Log P diagram (AWS WPC 9-16), from which refractivity can be read directly from traces of temperature and dew point. Refractive index can be evaluated directly from the plotted sounding without an external nomogram, and necessary height values can be entered. Accuracy and range of computations should cover AWS detachment applications.


AWS TR 171 (AD420921) Relative Humidity Errors Resulting from Ambiguous Dew-Point Hygrometer Readings, by H.S. Appleman, September 1963, 7pp. Instruments currently used in weather stations for measuring humidity work very well at high temperature, but become increasingly inaccurate at temperatures below freezing because of the small amount of water vapor in the air. Consideration is being given to using a dewpoint hygrometer, an instrument able to detect small quantities of moisture with great accuracy. Over a considerable temperature range below 32°F, unfortunately, the instrument may record either dew point or frost point. This study was to determine whether this ambiguity would lead to significant error in computed relative humidity. It was found that the effect was large enough to affect accuracy of current techniques for forecasting moisture-dependent phenomena and suggests instrument designs that eliminate the problem.

AWS TR 172 (AD344505) Effects of Atmospheric Variability on the Mark 15 Re-entry Vehicle, by Karl R. Johannessen, 1 September 1963, 53pp. Report considers the effects of the variable atmosphere on the inertial component of the Mark 15 Re-Entry Vehicle. Contains closed form expression for altitude deviation of output signal and gives a survey of the statistical distribution of the deviation as a function of geographical location and season for several programmed burst altitudes.

AWS TR 173 (AD422862) A Preliminary Analysis Of Mean Winds To 220,000 Feet, by H. S. Appleman, October 1963, 5 pp. In a recent study based on meteorological rocket wind measurements, the author reported a number of findings on the winds between 150,000 and 200,000 feet (see Introduction below). Using the additional data now available, the present paper carries the analysis up to 220,000 feet. It is shown that both the winter westerlies and summer easterlies reach their maximum intensity near the 200,000-foot level, above which they decrease. It was also found that the spring reversal from winter westerlies to summer easterlies begins above 220,000 feet and then proceeds downward; the autumn reversal from easterlies to westerlies, however, appears first near the 210,000-foot level, followed with a short lag by reversals at both higher and lower altitudes. The north-south component again proved relatively insignificant in comparison to the east-west component. Rescinded.

AWS TR 173 (AD259710) Technical Publications and Documents of Air Weather Service Field Activities, Part One: 1945-61, with a Chronology of AWS Organizations, 1945-61, 30 June 1962. Formerly AWSP 0-17/1 — redesignated AWS TR 173 by AWS/DNTI ltr, 1 Feb 74. Lists technical publications and miscellaneous informal documents issued by AWS field activities since the end of WWII.

AWS TR 174 (AD244550) Technical Publications and Documents of Air Corps and AAF Field Weather Activities, Part Two: 1937-1945, with a Chronology of AC and AAF Regional Organizations 1937-1945, September 1960, 60pp. Change A, 19 February 1960, 1pp. Formerly AWSP 0-17/2 — redesignated AWS TR 174 by AWS/DNTI ltr, 1 Feb 74. Lists documents prepared by various field weather service activities or the Air Corps from 1937 to 1941 and the Army Air Forces.
from 1941 to 1945. Chronology of AC-AAF weather organizations included.


AWS TR 176 (AD440548) Diffusion Forecasting for TITAN II Operations, by Lt Col R.L. Miller and Capt F.H. Miller, 10 February 1964, 32pp. Provides meteorologists with information and procedures to use as a basis for answering questions and giving advice on atmospheric diffusion of TITAN II propellants. Includes tables and graphs based on new and improved prediction equation developed at AFCRL and using combined Dry Gulch, Ocean Breeze, and Prairie Grass data.


AWS TR 178 (AD353247) Least Dispersion of the Mark 12 Re-entry Vehicle, by Karl R. Johannessen, September 1964, 54pp. Analyzes the re-entry induced dispersion of the Mark 12 Re-Entry Vehicle and defines a fuzing program that results in the least dispersion in a given impact region. The result of a request from Ballistic Systems Division/AFSC, Norton AFB.

AWS TR 179 (AD602765) Danger to Jet Aircraft from Lightning, by Herbert S. Appleman, 1 July 1964, 6pp. This report presents the latest available information on lightning hazards to jet aircraft. Included are the temperature and altitude range where most strokes are encountered, a brief discussion of the type of damage likely to be incurred, and a somewhat more detailed look into the possibility of fuel-tank explosions due to lightning and electrostatic discharge. Although the possibility of explosion is small, aircraft with JP-4 fuel are generally more vulnerable than those using gasoline or kerosene. It is concluded from this and other hazards associated with JP-4 that jet passenger aircraft, at least, should use kerosene fuels where possible. Superseded by April 1971 revision.

AWS TR 179 (rev) (AD724092) Lightning Hazard to Aircraft, by Herbert S. Appleman, April 1971, 13pp. Gives latest available information on lightning hazards to jet aircraft. Included are temperature and altitude ranges where most strikes are encountered, a brief discussion of likely damage, and a more detailed look into possibility of fuel-tank explosion due to lightning and electrostatic discharge. Although the possibility of explosion is small, aircraft with JP-4 fuel are generally more vulnerable than those using gasoline or kerosene. It is concluded from this and other hazards associated with JP-4 that jet passenger aircraft, at least, should use kerosene if possible.

AWS TR 180 (AD609305) Preliminary Operational Application Techniques for AN/TPQ–11, by United Aircraft Corporate Systems Center with technical assistance from ARACON Geophysics Co., September 1964, 106pp. Report based on recent studies and Analyses using a modified prototype AN/TPQ–11 Radar Cloud Detecting Set. Data resulted in modifications incorporated in production set now being placed in USAF inventory. Simultaneous with modifications was a plan to interpret improved data for forecasting. This document reflects preliminary conclusions and provides firm reference for the recognition and interpretation of most cloud types. By periodic updating and extrapolation of permanent facsimile record, it’s possible to forecast arrival and cessation of precipitation, sunshine, and fog breakup at AN/TPQ–11 sites. In addition, probable icing and turbulence can be forecast for areas adjacent to AN/TPQ–11 installations.

AWS TR 181 (AD446389) On the Origin and Climatology of Noctilucent Clouds, by R.S. Quiroz, August 1964, 29pp. A review of existing concepts of constitution or origin of noctilucent clouds. A mechanism is suggested that might explain their apparent dependence on latitude. Their frequency of occurrence with respect to latitude, longitude, time of year, and other factors, is analyzed in detail. Year-by-year changes in number of occurrences are considered in relation to the “11-year” sunspot cycle. A comprehensive sample of data on cloud movement is summarized, although in view of the highly complicated field of motion in noctilucent clouds, this subject is difficult to treat satisfactorily. Comparison made of rocket samples of particle size and concentration, with values deduced from polarization measurements.


• Volume 1 (ADA041877) Text, January 1965, 198pp. A comprehensive reference in radio-radar

- Volume 2 (ADA041878) Appendices, March 1965, 162pp. Contains appendices to volume 1 of same title. Included are tables of the CRPL exponential reference atmosphere, ray tracing diagrams (of Wong), and nomograms and maps with instructions for determining and forecasting D-values. Origin of these materials and general procedures for use explained in volume 1.

**AWS TR 184 (AD466187) General Application of Meteorological Radar Sets**, by R.J. Boucher, R. Wexler, and United Aircraft Corporation Systems Center with technical assistance from ARACON Geophysics Co., March 1965, 126p. This report provides a general introduction to the principles and uses of weather radar.

**AWS TR 185 (AD609493) Practical Interpretation of Meteorological Satellite Data**, by William W. Widger, Jr., Paul E. Sherr, and C.W.C. Rogers of ARACON Geophysics Co., September 1964, 427pp. Consolidates information pertinent to operational interpretation of meteorological satellite data, specifically for AWS forecasters. Extracts, integrates, and summarizes material available in literature and technical reports through early 1964. Topics include coverage, scale, and resolution of satellite data, operationally available data formats, coordination with other meteorological data, cloud type interpretation, key features observed in pictures, extratropical vortex interpretations, other synoptic and mesoscale features, interpretations of tropical data, and contributions of satellite data to weather forecasting. Procedures for integration of satellite and conventional data, and for use of satellite data to provide improved synoptic analyses, are included. Guidance for operational interpretation, application, and value of infrared data for atmospheric windows is provided, looking toward time interpretation, application, and value of infrared data for use in weather forecasting.

**AWS TR 186 (AD630289) Estimating Mean Cloud and Climatological Probability of Cloud-Free Line-of-Sight, by Lt Col John T. McCabe, November 1965, 31pp.** Describes a method that provides an estimate of probability of cloud-free line-of-sight between any two levels at any angle to the horizon for locations having standard surface-observed cloud data. Method uses mean cloud amount between surface and each higher kilometer level to estimate mean cloud amount at any level, the mean cloud amount above any level, and the mean cloud amount between any two levels. Analyses of sunshine and total cloud cover by time of day provide a basis for estimating probability of cloud-free line-of-sight through the whole atmosphere as a function of mean total cloud cover and viewing angle. This relationship used to estimate probability of cloud-free line-of-sight at any angle between any two levels for which mean cloudiness between levels is known or estimated. Height vs distance profiles of estimated probability of cloud-free line-of-sight can be prepared manually or by computer for any kilometer height reference levels.

**AWS TR 187 (AD639566) Regression Equations for Specifying Atmospheric Density Above 30 KM from Observational Data at Radiosonde Altitudes**, by Roderick S. Quiroz and 1st Lt Gary J. Thompson, August 1966, 34pp. Analysis of a small rocket data sample from the Soviet observing site at Heiss Island (81 degrees N) indicated a high correlation between density of the upper stratosphere and the temperature and pressure at certain altitudes in the lower stratosphere. Strong density-temperature and density-pressure relationships may be anticipated under certain conditions from consideration of the hydrostatic equation and the equation of state, the latter differentiated with respect to height. Large samples of rocket observational data for a northerly and a southerly station were specially processed to yield correlation coefficients for all possible pairs of altitudes between 20 and 60 km. Knowledge of maxima in the vertical profiles of the correlation coefficients then made it possible to construct regression evaluations with minimum standard error of estimate. It is shown that such equations may be used to predict density satisfactorily at altitudes up to about 50 km from radiosonde observational data on the thermodynamic state of the lower stratosphere. Incidental to development of the prediction equations is a discussion of the observed patterns of the intra-level correlation of density with temperature and pressure and the inter-level correlation of density with temperature, pressure, and density, to 80 km.

**AWS TR 188 (AD645118) Technique Development Reports—1966**, edited by Col D.E. Marlin, November 1966, 156pp. A collection of papers on topics selected from projects under development in the AWS Technique Development Program. At the May 1966 Technique Development Conference in Washington, DC, Dr Jule Charney, serving as AWS consultant, led discussion on many of topics in this report. Contents:

- “Some Objective Analysis Techniques Suitable for Neanalysis.” by Capt Paul Janota, pp 1-16.
“Weather Reconnaissance Data-Reduction Program,” by Lt Col S.L. Williams, pp 113-133.
“Numerical Cloud Prediction,” by Lt Col H. Edson et al., pp 135-143.

AWS TR 189 (AD649345) Wind Shear and Turbulence over Selected Stations of the Air Force Western Test Range, by Lloyd V. Mitchell, December 1966, 31pp. Gives wind-shear data for three areas of Air Force Western Test Range (AFWTR), and turbulence data applicable to AFWTR for portions of the Northern Hemisphere. Method described and used for estimating means and standard deviations or wind shears for smaller layers using wind-shear data measured through thicker layers. Estimates of turbulence frequency and intensity based on relationship between wind shear and turbulence.
Mean wind shear and wind shear variability maxima occur at approximately 40,000, 55,000, 130,000, and 220,000 Feet with minima at 100,000 and 150,000 feet. Turbulence frequency and intensity maxima occur near 30,000, 130,000, and 220,000 feet with minima near 45,000, 120,000, and 150,000 feet.

AWS TR 190 (AD651389) An Investigation of Atmospheric Density Between Altitudes of 180 km and 300 km, by Lt Col Leonard L. DeVries, November 1966, 130pp. Knowledge of atmospheric density and variation at satellite altitudes needed for operational support of several military activities. Atmospheric density data computed from decay rates of more than 40 satellites orbited during a 5-year period analyzed. Multiple regression equations derived to specify density at 10-km intervals at altitudes from 180 to 300 km as a function of solar activity, time of day, time of year, and combinations. Density values depicted by these regression equations then compared with density data not used during derivation of equations. Results indicate that multiple regression analysis and associated screening procedure can produce equations from which computed density values are in close agreement with observed density data. Results lead to conclusion that no single density model can meet all needs. Results also indicate that characteristics of a density model should be selected to fit purpose for which model intended. Four possible density models designed for different purposes suggested.

AWS TR 191 (AD642429) Atmospheric Humidity Atlas — Northern Hemisphere, by I.I. Gringorten, H.A. Salmela, I. Solomon, and Maj J. Sharp, August 1966, 151pp. Includes 120 plates showing water vapor distribution in the atmosphere of the Northern Hemisphere. There are 20 plates in terms of mixing ratio at surface and 100 plates in terms of surface dew point and dew point at the 850-, 700-, 500-, and 400-mb levels. Distributions of other measures of moisture, including vapor pressure, frost point, water-vapor density, and mixing ratio aloft, are obtainable from distribution of the dew points. Plates are useful to designers estimating effects of atmospheric water vapor on aerospace hardware and for those concerned with operation and storage of equipment. Frequency distribution plates, from 5 to 95 percent, are especially useful in estimating duration or persistence of moist conditions, as illustrated by several examples.


AWS TR 194 (AD649619) Climatological Probability of Aircraft Icing, by Lawrence G. Katz, January 1967, 29pp. Presents seasonal Northern Hemisphere isopleth charts depicting climatological probability of aircraft icing at 5,000, 10,000, 15,000, and 20,000 Feet. Also describes method used in determining these probabilities and discusses data used. Supersedes AWS Technical Report 182.

AWS TR 195 (AD709727) Variability of the Monthly Mean Zonal Wind, 30-60 km, by Lloyd V. Mitchell, April 1970, 84pp. An analysis of the monthly mean zonal wind and the standard deviation of the zonal wind about the monthly mean. Data are presented in tables, analyses in time (months)-altitude (30 to 60 kilometers) cross-section as well as profiles for selected levels. Station-by-station variability of the monthly mean zonal wind, 30 to 60 kilometers, is discussed. There is a discussion of the altitudinal, latitudinal, monthly, and seasonal variations with a designation of four seasons: Winter: (dominated by westerlies but with occasional easterlies), November through March; Spring: (transition of westerlies to easterlies), April and May; Summer: (persistent
easterlies), June through August; and Fall: (transition of easterlies to westerlies), September and October.

A summary collection of 47 presentations made at the AWS Technical Exchange Conference, Monterey, CA, 4-7 April 1967. Authors represented Air Force, Army, Navy activities and their contractors, Environmental Science Services Administration (ESSA), and several universities. Contents:

- “Some Solutions to Weather Analysis Problems through the Use of Satellite Data,” by Edward Ferguson, ESSA, pp 1-10.
- “Application of Satellite-Picture Interpretation Principles to Analysis in Sparse Data Regions,” by Maj Golden K. Farr, 6WW, pp 11-32.
- “APT Use at Fuchu AF Weather Central,” Capt Lee G. Dickinson, 1WW, pp 39-41.
- “The Effect of Physical Foreshortening on Sunspot Area Measurements,” by Capt Ronald T. Podsiadlo, 6WW, pp 119-120.
- “Computer Ray-Tracing Techniques to Determine the Effects of Ionospheric Tilts to MUFs,” by Alfred F. Barghausen and James W. Finney, ESSA, pp 138-143.
- “Numerical Modeling Efforts of 3 Weather Wing,” by Lt Col Herbert Edson, 3WW, pp 200-201.
- “Onset of Widespread Rain During Southeast Asia Summer Monsoon,” by Marvin Lowenthal, USAECOM, pp 224-225.
• “The Tropical-Analysis and Forecasting Model Running Operationally at FWC Pearl Harbor,” by Capt John G. Joern, 1WW, pp 243-244.
• “A Low-Level Circulation Model for Diagnostic and Prognostic Applications,” by Maj R.A. Derrickson and Capt Paul Janota, 3WW, pp 276.
• “Surface Observations of Snow and Ice for Correlation with Remotely Collected Data,” by Michael A. Bilello, CRREL, pp 285-293.

AWS TR 197 (AD661979) **Summaries of Pressure, Temperature, and Density Over Cape Kennedy AFS, Including Periodic Density Variations**, by Maj Edward V. Von Gohren, August 1967, 35pp. Summaries of Arcasonde 1A Meteorological Rocket thermodynamic data for Cape Kennedy AFS based on 1964-1966 data. Extremes, means, and standard deviations as functions of month and season shown for altitudes 80,000 through 200,000 feet. Data statistically treated to provide estimates of seasonal, diurnal, and interdiurnal periodicities at 160,000 feet over Cape Kennedy. Nomogram of atmospheric density as function of local time and month included.

AWS TR 198 (AD659760) **Radiosonde Dew-Point Accuracies 40°C to -40°C**, by Lloyd V. Mitchell, August 1967, 27pp. In most literature, accuracies for radiosonde-measured atmospheric moisture expressed in terms of relative humidity; i.e., percent of saturation. This report presents radiosonde-measured atmospheric moisture accuracies in terms of dew point; i.e., saturation temperature. Dew-point root-mean-square (RMS) errors presented in tables and in nomograms. Table and nomogram included for temperatures between 0 and 40°C and for temperatures between -40 and 0°C. Dew-point accuracies are least for high temperatures and low dew points, and greatest for low temperatures and high dew points, in each temperature group. AWS TR 198A, January 1968.

AWS TR 199 (AD668125) **An Evaluation of the Operational Utility of Direct Readout Infrared Satellite Data**, by Capt Serhij Pilipowskyj, March 1968 21pp. Study evaluates the utility of direct-readout infrared data on the basis of data obtained from Nimbus I and II spacecraft. Both spacecraft provided infrared data to a NASA central readout station. High-resolution infrared data (HRIR) recorded on 70mm film is of photographic quality. Data sample limited to September 1964 and May thru November 1966, the operating lifetimes of the infrared systems. A large number of HRIR pictures were available for this evaluation, along with several DRIR data samples. DRIR pictures obtained from Joint Typhoon Warning Center (JTWC), Guam, where a Navy APT set had been modified to receive DRIR data. Additional study input came from a Navy DRIR evaluation, from a number of technical publications on this subject, and from personal contact with those who had worked with DRIR data.

AWS TR 200 (AD744042) **Notes on Analysis and Severe-Storm Forecasting Procedures of the Air Force Global Weather Central**, by Robert C. Miller, May 1972, 183pp. This collection of notes discusses various types of severe-weather air masses, how severe weather systems form, which variables best define the existence and intensity of severe weather, and how to use local information to better forecast the occurrence or phenomena at individual stations. Specifically, wind gust and hail size forecasting techniques and the usefulness of various stability indexes are presented. A chapter on severe weather in tropical air masses is included. The revised material concentrates on the application of computer-derived aids to severe weather forecasting produced by the Air Force Global Weather Central. Foremost among these aids are analyses and prognoses of the severe weather threat (SWEAT) index. With Change 1, 31 January 1973.

AWS TR 200-1 (AD–NONE) See AWS TR 45-1.

operational requirements for weather radar data in 1980s and write plan for developing weather radar of the 1980s (WR/1980). Includes discussion of needs for weather radar data, employment concepts, preliminary operational requirements, technical approach for development, related R & D activities, phasing of work, and recommendations.

AWS TR 202 (AD672221) Climatological Estimates of Clock-Hour Rainfall Rates, by Lt Col Donald C. Winner, June 1968, 30pp. Report expounds on an empirical method for estimating clock-hour rainfall rates for a station when the mean annual rainfall amount and mean annual number of days with measurable rainfall are known. A climatic weighting factor is introduced in the annual number of days with measurable rainfall are known. A climatic weighting factor is introduced in the calculations, using Thornthwaite’s “moisture index.” Nomograms for estimating clock-hour rainfall rates for temperate and tropic regions included. Change: AWS TR 202/1 A, October 1968.

AWS TR 203 (AD671995) Air Weather Service Weather-Modification Program, by Herbert S. Appleman, May 1968, 17pp. Describes several AWS fog dissipation projects and gives results of field tests. (1) Project COLD FOG: Dissipation of supercooled fog with dry ice cakes suspended from tethered balloons. (2) Project COLD COWL: An operational project to dissipate supercooled fog with crushed dry ice dropped from an aircraft. (3) Projects COLD WAND and COLD HORN: Dissipation of supercooled fog by direct injection of liquid propane and carbon dioxide. (4) Project COLD FAN: Repeat of COLD HORN, but with the addition of a powerful vertical fan to blow resulting ice crystals aloft. (5) Project WARM FOG: Dissipation of warm fog with engine exhaust heat from parked and running C-141 aircraft.

AWS TR 204 (AD672028) Interrelation of Ionospheric Sporadic E with Thunderstorms and Jet Streams, by Maj Thomas D. Damon, May 1968, 27pp. Reports on the occurrence of ionospheric sporadic E clouds from radio amateurs operating on a frequency near 50 megahertz are analyzed on a synoptic scale and compared with the occurrences of thunderstorms and jet streams. A mechanism is suggested for the observed relationship between ES and thunderstorms. No definite conclusion drawn on a possible relationship between ES and jet streams.

AWS TR 205 (AD668439) The Operational Dissipation of Supercooled Fog: Project COLD COWL 1967-1968, by Herbert S. Appleton, April 1968, 16pp. In the winter of 1967-1968, AWS carried out its first operational weather-modification program at Elmendorf AFB. An AWS weather reconnaissance aircraft (WC-130E) was used to seed supercooled fog with dry ice. A prescribed night path was flown a specified distance upwind from the target area; crushed dry ice was disseminated at rates of 12.5 or 25 pounds per mile. It was found that a clearing generally occurred in 30 to 45 minutes. The only real failure occurred in a case that may have been an ice fog; in addition, proper positioning of the cleared hole proved a major problem throughout the program. Despite these difficulties, an estimated 200 successful take-offs and landings were made using artificially produced clearings. Supplemental tests carried out using airborne liquid CO2 dispensers and silver iodide pyrotechnics.

AWS TR 206 (AD671935) Finite-Difference Methods Used in Models of the Atmospheric Boundary Layer, by Maj Lynn L. LeBlanc, June 1968, 18pp. Describes and comments on several finite-difference methods for solving equations considered in modeling the planetary boundary layer. Three implicit finite-difference schemes and one explicit scheme discussed, each is considered in view of required computer running time.


- “Navy Applications of METSAT Data,” by R.M. Nilsenstue, pp 31-33.
- “Present and Future Status of ESSA Satellite Program,” by Dr C.A. Spohn, pp 41-44.
• “Real-Data Forecasting with the NCAR General Circulation Model,” by D.P. Baumhefner, pp 118-131.
• “Select Products of the ESSA Weather Modification Program,” by H.K. Weickmann, pp 132-151.
• “U.S. Navy Program in Weather Modification,” read by CDR F.F. Duggan, Jr., pp 160-164.
• “U.S. Army’s Program in Weather Modification,” by E.M. Frisby, pp 165-166.

AWS TR 208 (AD671506) Estimating Conditional Probability and Persistence, by Col John T. McCabe, June 1968, 23pp. Describes statistical model and automated techniques that provide estimates of conditional and persistence probability of meteorological events for periods to 48 and 24 hours, respectively. For use when conditional/persistence frequencies not obtainable by directly processing observational data. Model considers diurnal variability of event by assuming joint probability according to elliptical distributions defined by known (or estimated) hourly unconditional probabilities and lag correlation coefficients obtained from previously summarized data. A computer program performs integrations by transforming elliptical distributions to circular normal with rotated axes, then counts number of mil-frequency units in each of the joint probability zones. Comparison of conditional and persistence probability estimates of categorized cloud cover and ceiling/visibility events with observed frequencies of occurrence show root-mean-square differences of 5 to 15%.

AWS TR 209 (AD680424) Final Report on the Air Weather Service FY 1968 Weather Modification Program: Projects WARM FOG, COLD FOG III, COLD WAND, COLD HORN, AND COLD FAN, November 1968, 54pp. Includes final reports on five separate fog-dispersion tests conducted by AWS during the winter of 1967-1968. One project (WARM FOG) involved fog temperatures above 32°F; four projects (COLD FOG III, COLD WAND, COLD HORN, and COLD FAN) dealt with supercooled fogs. Each project reported separately with conclusions and results summarized for all except Project COLD FOG III.

AWS TR 210 (AD676295) The Use of Trajectories in Terminal Forecasting, August 1968, 57pp. The winter trajectory test program was conducted as part of the AWS forecaster assistance program. Objective was to determine if three-dimensional trajectories derived from the output of the AFGWC six-level forecast model are useful in preparation of terminal Forecast. Hq AWS personnel used trajectory data to evaluate forecasts prepared at detachments in central and eastern United States and to modify some of these forecasts. Trajectory data improved the 4-month verification of terminal forecasts by 3.1 percent. Tests conducted in 1 Wea Wg and 2 Wea Wg, results from these overseas tests discussed. Forecast procedures and application or objective rules developed during winter evaluation described in several case studies.

AWS TR 211 (AD680425) Objective Forecasting, by Philip Williams, Jr., 1968, and Objective Forecast Studies and Their Evaluation and Verification, by CMSgt Donald N. Seay, December 1968, 53pp. A reprint of two articles on “objective forecasting studies.” The first reprinted from an August 1968 USWB Western Region report, the second from 7WW Technical Note No. 6, February 1967. Current ways to prepare and verify objective forecast studies by station forecasters are presented; a discussion on proper selection of predictors and uses in the studies is included. Samples of objective studies for use with various forecast elements are outlined. AWS TR 211/1A, June 1971.

AWS TR 212 (AD786137) Application of Meteorological Satellite Data in Analysis and Forecasting, June 1969, 223pp. Also issued as ESSA Technical Report NESC 51, November 1971. Includes Supplement 1, November 1971, 70pp. Supplement 2, March 1973, 65pp. Report is a joint effort of the Applications Group, National Environmental Satellite Center (NESC), now the National Environmental Satellite Service (NESS); the Naval Air Systems Command Project FAMOS; and the Satellite Section, USAF Environmental Technical Applications Center (ETAC). Topics include: Satellite cloud atlas and glossary; synoptic cloud patterns; application of satellite data to synoptic analysis in the tropics; local phenomena; infrared.

AWS TR 213 (AD691811) Second Annual Survey Report on the Air Weather Service Weather-Modification Program (FY 1969), by Herbert S. Appleman, June 1969, 18pp. In the second year of its full-scale weather-modification program, AWS carried out four supercooled-fog dissipation projects: two airborne and two ground-based. Airborne techniques using crushed dry ice and silver iodide fuses can now be considered fully operational, but testing will continue to optimize equipment and technique. The ground-based liquid-propane technique has justified an operational test program using a network of fixed propane dispensers. Results of the ground-based warm-fog dissipation test indicate that using sized sodium nitrate offers a solution.
AWS TR 214 (AD726984) Guide to Local Diffusion of Air Pollutants, by Maj Gordon A. Beals, May 1971, 86pp. A guide on local air pollution for forecasters with no prior experience in diffusion. Discusses fundamentals of micrometeorology and diffusion in the lower layers; their relation to determining air pollutant dispersion and concentration amounts is explained. Calculations of pollutant concentrations using accepted techniques are discussed; solution of actual air pollution problems shown in the appendix. Includes graphs and nomograms used in solving air pollution problems.


AWS TR 216 (AD–NONE) List of Translations on Meteorology and Atmospheric Physics, compiled by Rosa E. Hay. In three volumes:


“Survey of Progress and Plans in Tropical Meteorology Experiments,” by Dr E.J. Zipser, pp 178-188.


“Precipitation Augmentation,” by P. Squires, pp 244-246.

AWS TR 218 (AD698333) Preparation of Terminal Forecast Worksheets, October 1969, 10pp. Discusses importance or systematic procedures in preparation of terminal forecast. Use of a TAF worksheet is recommended and characteristics of a good worksheet are described. Sample worksheet included.

AWS TR 219 (AD706392) Forecasting Gusty Surface Winds in the Continental United States, by Andrew Waters, January 1970, 76pp. Contains case studies of strong surface wind gust occurrences that occur under specific conditions in certain designated areas called “wind boxes.” There are ten such wind boxes within the contiguous United States. Actual cases included, with several of the main weather charts used in forecasting gust occurrences. Procedures given are a relevant part of method used by the Military Weather Warning Center in forecasting gusty surface winds.

AWS TR 220 (AD745098) Aircraft Icing Climatology for the Northern Hemisphere, by Maj Edward D. Heath and SMSgt Luther M. Cantrell, June 1972, 77pp. Update of AWS methodology used to determine climatological probability of aircraft icing throughout the Northern Hemisphere. Gives isopleth charts of the 1,000, 850, 700, and 500 mb surfaces for each month. Station listing and locator chart give area coverage of data used in computer calculations. Prepared for AF Systems Command in response to request for information on aircraft icing probability from near surface to 40,000 feet.

AWS TR 221 (AD729764) A Study of Stratospheric Emitters Based on Infrared Radiometersonde Measurements, by Maj Serhij Pilipowskyj and Prof James A. Weinman, August 1971, 58pp. Analysis of downward-directed infrared irradiances measured in the lower stratosphere indicated that reasonable limits on the gaseous components of the atmosphere were not able to account for the irradiances observed between 14 and 24 km. Additional emitters were therefore assumed to exist at these altitudes. Information on the spatial and temporal distributions of the stratospheric emitter from an analysis of some 400 measurements taken during the 1962-1967 period. Results indicate that while this phenomenon is global in scope, it is most evident in the tropics at altitudes between 15 and 18 km. Time series of daily radiometersonde ascents carried out during the Line Islands experiment indicated that the emitter has high persistence in the tropics. A series of synoptic-scale ascents made over the central United States one night indicated that the emitter has great variability in the mid-latitudes. No long-term trends in the concentration of the emitter in the tropics or in the mid-latitudes could be determined.

AWS TR 222 (AD733338) Comparative Meteorological Testing of the AMT-13 Dropsonde and JOOX-Series Rawinsondes in an Environmental Wind Tunnel, by 1st Lt B.P. Severin, August 1971, 90pp. This report describes a test program conducted at the Arnold Engineering and Development Center (AEDC), Tullahoma, Tennessee. The purpose of the test was to determine accuracy and response characteristics of temperature and relative humidity measurements made by AMT-13 Dropsonde and JOOX-Series Rawinsondes. Temperature measurements of both systems found to be accurate to within ±1.0°C and both would respond to temperature change rates equivalent to 5°C per 1,000 feet of vertical atmosphere without significant loss of accuracy. Humidity measurements of both systems were within the specified plus or minus 5% to 7% relative humidity accuracy, but the AMT-13 dropsonde humidity accuracy degraded rapidly upon encountering liquid moisture. A shield to protect the dropsonde humidity sensor from direct moisture contact was fabricated and tested; it virtually eliminated the water-induced inaccuracies.

AWS TR 223 (AD709364) Operational Utilization of the AN/TPQ–11 Cloud Detection Radar, June 1970, 57pp. A reprint of AFCRL Report–70–0335, by Wilbur H. Paulsen, Pio J. Petrocci, and George McLean. Fifty-three AN/TPQ–11 Cloud Detection Radars were procured for USAF use, most by AWS. Since these sets are capable of furnishing a great deal of meteorological data not otherwise available, AWS asked AFCRL to determine the effect of geographical and seasonal variations on AN/TPQ–11 observations. AN/TPQ–11 Cloud height records at eight widely separated AF bases are analyzed for possible variations in interpretation that might be required as a function of location or environment. Modes of operation necessary to obtain useful records with maximum information are specified, and examples of records for various meteorological situations are shown.
These records are analyzed, and a number of maintenance procedures are suggested to assist in obtaining high quality records.

AWS TR 224 (AD730622) Introduction to Lightning and Other Electrostatic Phenomena, by Capt Nixon A. Adams, August 1971, 51p. Points out importance of understanding basic physical principles of the lightning stroke, the lightning flash, and certain other electrostatic phenomena. Several varied theories on creation of negative and positive charge centers in cumulonimbus clouds presented. Integral parts of a single lightning flash covered in detail.

AWS TR 225 (AD–NONE) Use of Asynoptic Data in Analysis and Forecasting, 11 March 1960, 27pp. Formerly AWSM 105–10 (Reprinted: January 1979). Suggests and illustrates ways to make optimum use of asynoptic weather reports. Applies to all AWS forecasting activities and serves as study material for in-station training and schools. Gives procedures for plotting, displaying, and analyzing recon data, airps, upper air soundings, surface data. Applications in briefing, forecasting, and met watch are discussed. This report is not available from DTIC — refer requests to AFWTL.

AWS TR 226 (AD707118) Introduction to Jet-Engine Exhaust and Trailing Vortex Wakes, by Lt Col Dale N. Jones, April 1970, 34pp. A survey of available literature on aircraft wakes. While not the final word on the subject, the survey is a good general representation of techniques and problems.

AWS TR 227 (AD117710) Constant-Pressure Trajectories, September 1956, 86pp. Reprinted to correct typos, 1958. Formerly AWSM 105–47. Published as an aid to constructing trajectories for constant-pressure balloon flights. Several current methods from usual upper-level, constant-pressure contour or flow charts are described. New “AWS Method” developed by Dr Karl R. Johannessen, Hq AWS, is also presented in two sections: operational and theoretical.

AWS TR 228 (AD047587) Forecasting Upper-Level Winds, Part One, Forecasting by Vorticity Techniques, June 1954, 50pp. Formerly AWSM 105–50/1, supersedes AWS Technical Report 105–90, which is now rescinded. Discusses the use of principles of absolute and relative vorticity in forecasting mid-tropospheric flow patterns for periods up to 72 hours. The early chapters deal with the so-called Rossby waves, or long waves in the westerlies.

AWS TR 229 (AD117709) Forecasting Upper-Level Winds, Part One, Forecasting by Vorticity Techniques, Appendix B: Vorticity—An Elementary Discussion of the Concept, August 1956, 27pp. Formerly AWSM 105–50/1A. Provides the necessary back-ground for the application of the vorticity concept to current forecasting techniques and procedures. Schematic models are used to illustrate the applicable principles and to demonstrate how vorticity is measured.

AWS TR 230 (AD717197) Forecasting Upper-Level Winds, Part Two: Differential Analysis in the Troposphere, August 1954, 51pp. Formerly AWSM 105–50/2; redesignated TR 230 May 1970. Change 1 (Appendix VI) added 8 November 1960. Prepared as a manual for forecasters in weather centrals. Describes techniques developed for analysis of constant-pressure charts in the troposphere by means of so-called thickness-analysis. Various tables and nomograms to facilitate the procedure are included. Appendix VI describes the use of 12-hour NWP Prognoses as the basis for construction of upper-air contour analyses in areas of sparse data.

AWS TR 231 (AD283404) Forecasting for Aerial Refueling Operations at Mid-Tropospheric Altitudes, July 1957, 110pp. Formerly AWSM 105–52, Reprinted January 1979. Considers problem of forecasting clouds in the aerial refueling layer from 15,000 to 20,000 ft. Previous investigations of clouds at mid-tropospheric levels are reviewed. Preliminary charts of seasonal frequency of unsuitable conditions for refueling in the 15,000 to 20,000 ft layer given for the Northern Hemisphere north of 20°N.

AWS TR 232 (AD072927) Meteorological Aspects of Pressure Pattern Flight, December 1954, 63pp. Formerly AWSM 345-1. A primer for pressure-pattern flight and night planning. Includes history, concept, basic principles for pressure-pattern flying. Comprehensive bibliography. Aids in the form of nomograms, templates, and tables are included. The procedures are applicable to jet aircraft, but this phase of the subject still under investigation and development.

AWS TR 233 (AD716391) Some Techniques for Short-Range Terminal Forecasting, by Clay G. Russell September 1970, 51pp. Formerly AWSM 105–51/1. Describes several techniques for short-range terminal forecasting. Areas discussed are procedures for graphical extrapolation, nephanalysis, forecasting frontal precipitation, and the lowering of ceilings during precipitation. Use of FPS-77 radar and weather satellite data also discussed.

AWS TR 234 (AD873241) A Model of Ionospheric Total Electron Content, by Maj Allan C. Ramsay, June 1970, 40pp. Presents a method for specifying or predicting the total electron content of an undisturbed mid-latitude ionosphere during the maximum phase of the solar cycle. Report is operationally oriented: procedures are suitable for hand calculations and based on readily-available information. Diurnal, seasonal, and solar activity related variations in total electron content are modeled.


AWS TR 237 (AD716811) The Use of Trajectories in Terminal Forecasting (Second Report), by Capt John W. Diercks, November 1970, 33pp. Trajectory forecasting techniques introduced at 75 AWS forecast units. Trajectory data, in the form of parcel origins and forecast temperatures, dew points, and cloud amounts, transmitted twice daily to these units. Data are by-products of the AFGWC multi-level cloud-forecasting model; used to supplement conventional forecast tools. In addition, 600-meter (AGL) temperature and dew-point forecasts from AFGWC’s Boundary-Layer Model are included in the trajectory bulletin. Trajectory techniques have been integrated subjectively and objectively into forecast procedures with encouraging results. Ceiling and visibility forecasts prepared with trajectory data have verified better than forecasts prepared without. This report discusses past evaluation programs, characteristics of the trajectory model, and procedures for using the data in forecast applications.


- 2WW Sup 1 (AD064353) Weather, General Aspects of Fog and Stratus Forecasting — Objective Visibility Study, Rhein Main Air Base, Germany, 10 March 1954, 32p.


AWS TR 241, VOL II (AD721688) The Practical Aspect of Tropical Meteorology, Notes on the Tropical Pacific and Southeast Asia, edited by C. S. Ramage, 26 January 1961, 184pp. Formerly AWSM 105–48, Volume II. Report designed to supplement other texts on tropical meteorology. Makes use of new observational material and accords synoptic features of monsoons more attention than they have received in the past. Hints on analysis and uses of auxiliary charts and continuity followed by chapter on physical geography of the Pacific and a gazetteer describing the locations and environments of observing stations. Chapter 3 tabulates monthly mean resultant winds, steadiness and other derived data at standard pressure levels for 34 sounding stations. Chapter 4, which broadly considers the climatology of the region, leads to more detailed discussions of the synoptic climatology of the tropospheric field of motion in the central Pacific (Chapter 5) and of the synoptic climatology of the China seas and Southeast Asia.
(Chapter 6). Appendices amplify topics covered in this chapter. Final chapters devoted to tropical cloud physics, local effects, and aerial reconnaissance. Not available in paper—DTIC microfiche copies only.


- “Predictability of Local Weather,” by C.F. Roberts, pp 112-123.
- “Environmental Simulation in Air-Pollution Control,” by G.C. Holtzworth, pp 338-348.


**AWS TR 245 (AD736004) Final Report - Project COLD RAIN, by 1st Lt Robert Sax and Capt Ted S. Cress, December 1971, 51pp.** Describes techniques and results of an AWS weather-modification operation aimed at augmenting rainfall in south-central Texas. The Air Force portion of the project (COLD RAIN) was conducted in June 1971 as part of a large Texas drought-relief program directed by the Bureau of Reclamation. The primary goal of the project was, by seeding super-cooled cumulus clouds with silver-iodide nucleating material, to increase
rainfall (over what would have occurred naturally) in as wide a geographical area as possible. A secondary, but very important, consideration was to learn as much as possible about cloud response to seeding in order to refine and improve present-day rain-augmentation techniques.

AWS TR 246 (AD763098) Point Comparisons of Total Cloud Cover from Satellites and from Surface Observations, by Maj Patrick J. O’Reilly, April 1973, 58pp. Compares cloud-cover observations made by ground observers with relative cloud-cover estimates determined from satellite-measured brightness values. Comparisons made when each type of cloud (9 low type, 9 middle type, and 9 high type) are found alone, and also with various combinations of other clouds. More than 66,000 incidences are compared from observations taken over the China mainland and portions of Southeast Asia. Satellite observations from the ESSA and ITOS series of satellites used. Tabulated and graphical results included, along with author’s comments on investigative procedures and findings.

AWS TR 74-247 (AD781837) A History of Air Weather Service Weather Modification 1965-1973, by Capt Henry A. Chary, June 1974, 31pp. Starting in 1965 with cakes of dry ice suspended from balloons, then testing vented liquid carbon dioxide, vented liquid propane, and silver iodide, AWS gradually developed a ground-based cold fog dissipation system. Three such systems, all using vented propane, are now operational. In 1967, AWS undertook airborne dissipation of cold fog by seeding with crusted dry ice. AWS investigations into warm fog dissipation started in 1968 when jet engines were used to clear warm fog temporarily from the Travis AFB runway. Subsequently, several tests were run using hygroscopics and helicopter downwash. No operational warm fog dissipation system has yet evolved from these early works. Twice AWS has tried to alleviate the ice fog problem, but both tries failed to generate desired clearings. Precipitation augmentation for drought relief is a twice-used AWS capability. AWS has participated in such programs in the Philippines and in Texas. Current operational weather modification capabilities include airborne and ground-based cold fog dissipation and precipitation augmentation.

AWS TR 248 (AD742265) Normalization Procedures for Sudden Phase Anomaly Events, by Capt William A. Wisdom, Jr., April 1972, 25pp. Discusses procedure whereby sudden phase anomalies (SPA) can be classified as Major events, Significant events, or Minor events. Also, by determining the “path responsiveness” of a path at any given time, normalization factors can be applied to an observed event to determine its “absolute” importance, or its relative importance when compared to a standard event. Report contains procedures necessary to determine “path responsiveness” and normalization factors for any given VLF path. Standardized event categories established for operational use, and equations presented to define event categories on any SPA circuit.


AWS TR 74-250 (ADA007678) Defense Meteorological Satellite Program (DMSP) User’s Guide, by Lee Dickinson, Edward S. Besslely, III and Walter S. Burgmann, 1 December 1974, 120pp. Capabilities of the spacecraft, sensors, and data processor for the Defense Meteorological Satellite Program are described. Many meteorological and geophysical uses of these data are examined, and examples used to illustrate system capabilities to tailor imagery for large variety of present and future users.


AWS TR 74-253 (AD781053) Verification of Rainfall Estimates: As Analysis of Activation Patterns of ADSID and ACOUSID Seismic and Acoustic Intrusion Sensors to Determine Rainfall Rates, by Lt Col Donald H. Kampwerth and Capt Richard Rasmussen, February 1974, 41pp. Test conducted at Eglin AFB, Florida, in fall 1972, to verify rainfall rates as determined from activation patterns of seismic and acoustic intrusion sensors. Sensor activations recorded, analyzed, and compared with rainfall rates determined from recording rain gauges collocated with sensor strings. Useful comparison data obtained in nine tests; definite sensor activation patterns correlated with various rainfall rates. Scatter diagrams prepared and analyzed to summarize sensor activation/rainfall rate comparison.

time since AWS entered field of weather modification, no new projects were begun during FY 74. Three cold fog dissipation systems were used operationally (Fairchild, Elmendorf, and Hahn). These activities assisted 169 aircraft movements that would have been canceled, delayed, or diverted. AWS continued active pursuit of a warm fog dissipation system for use at a few fog-plagued, high-traffic bases. Precipitation augmentation and severe storm mitigation received revived interest, but no operations or tests were carried out. Several important meetings of weather modification scientists are noted. **AWS TR 75-255 The AWS Handbook of Ground-Based Cold Fog Dissipation Using Vented Liquid Propane**, in two volumes:

- **Volume II, Hardware** (AD–NONE) by 2d Lt Russell M. Solt, July 1975, 38pp. A brief introduction to the AWS Cold Fog Dissipation program, followed by detailed plans and programs for the liquid propane dispensing systems at Elmendorf AFB and Hahn AB. Description of the automated radio-controlled system at Elmendorf is included. Note: Volume 2 never published; draft manuscript on file at AFWTL.

**AWS TR 75-256** (ADA008278) **Seasonal Effects on Sudden Phase Anomaly Normalization**, by Lt Edward W. Cliver, January 1975, 29pp. The size of a sudden phase anomaly (SPA) corresponding to a given incident x-ray flux depends on the time of day of the event, the season, the length of the path considered, and the radiation spectrum. It is necessary to determine the influence of each factor if the measured phase advance is to serve as an accurate indicator of the size of the ionospheric disturbance or of the magnitude of the responsible solar flare. In this report, the effect of changing season is considered. For a given x-ray flux and solar zenith angle, the D-layer is more responsive in summer than in winter.

**AWS TR 75-257** (ADA013727) **Eighth Annual Survey Report on the Air Weather Service Modification Program (FY 1975)**, by Lt Col Ronald L. Lininger, July 1975, 8pp. AWS performed cold-fog seeding at three bases again during the winter of FY 1975. Results presented in terms of assisted landings or takeoffs. Cost/benefit figures cited, showing a total NET benefit of about $98,000 for the three bases and for the season.

**AWS TR 74-258** (ADA015370) **Effect of Improved Accuracy of Aircraft Reconnaissance Data in the Initialization of a Two-Dimensional Hurricane Model**, 1 November 1974, 49pp. Prepared by Richard A. Anthes and James E. Hoke as final report on USAF Contract F11612-74-90220. On the basis of a limited number of experiments, it appears that a significant improvement in a two-dimensional hurricane model’s behavior results when the small errors associated with the proposed AWRS system are used instead of a system with temperature and wind errors about five times those of AWRS. Smaller errors associated with new AWRS much less damaging; observations appear to be accurate enough to provide reasonably useful numerical forecasts, at least with this model. Greatest effects of dynamic initialization, both positive and negative, occur when observations are added at the middle tropospheric level rather than the boundary layer. When the observations are added in the boundary layer alone, the model storm has not adjusted very closely to the observation after 12 hours of dynamic initialization and little difference between the two sets of observations exists after 24 hours of forecast time. In contrast, when observations are added to the middle tropospheric layer, they affect much more mass of the system and the hurricane adjusts much more rapidly. In this case, there is little imbalance after 12 hours of initialization and the differences in the model prediction persist for the duration of the forecast.

**AWS TR 75-259** (ADA047720) **Transnormalized Regression Probability**, by Capt Albert R. Boehm, December 1976, 54pp. Incorporates July 1984 errata. The transnormalized regression probability (TRP) model uses climatological probabilities and requires only a relatively small database to calculate the probability of occurrence of a future weather event. The three main procedures that comprise this multivariate transnormalized method are: transnormalization, correlation, and regression conditional probability. The transnormalization process, a nonlinear process, transforms the observed or raw data into the standard normal variable with the same cumulative climatological probability as the raw predictor. Transnormalization insures that the predictor is normally distributed. The correlation step involves finding the simple correlation between each pair of transnormalized variables. The regression coefficients are calculated using the same steps involved in ordinary multiple linear regression. Conditional probability is calculated using transnormalized variables in the multivariate normal distribution.

**AWS TR 75-260** (ADA026302) **A Background Report on Total Electron Content Measurement**, by SMSgt Edward D. Beard, December 1975, 30pp. A simple presentation of ionospheric characteristics, including the D-, E-, and F-regions, is followed by a general description of electromagnetic waves. One of the more important
effects of ionospheric interactions with very high frequency (VHF) and ultra high frequency (UHF) radio waves used in modern electronic detection and tracking systems is refraction. Total electron content (TEC) measurements over specific locations are used as data inputs to numerical models of the ionosphere. Included: Basic considerations for measuring TEC of the ionosphere using Faraday technique and group-path-delay technique, along with discussion of TEC variation.

**AWS TR 76-261 (ADA056159) NCAR Sonde Flight Test Report**, by Capt T. Earl Ley and Maj E.J. Heald, January 1976, 34pp. Documents an operational test of the National Center for Atmospheric Research (NCAR) wind-finding dropsonde. Testing, conducted over the Pacific Ocean about 30 miles from Vandenberg AFB, took place on 11-12 December 1974. Object of the test was to determine ability of the dropsonde to measure stable atmospheric pressure, temperature, and humidity.

**AWS TR 76-262 (ADA026303) Development/Decay Potential of Active Solar Regions from a Full-Disk Neutral-Line Analysis**, by TSgt Jerry D. Farley, April 1976, 26pp. Discusses a full-disk neutral-line analysis technique and the relationship of solar active regions to the large-scale magnetic features. A classification of basic configurations and variations on these configurations are developed to aid in prediction of development/decay of active solar regions. Examples of these configurations presented and discussed in terms of evolution of actual disk regions.

**AWS TR 76-263 (ADA036493) Stochastic Models for Deriving Instantaneous Precipitation Rate Distributions**, by Allen R. Davis and Capt Daniel J. McMorrow, July 1976, 25pp. One- and four-minute precipitation rate records are used to develop stochastic model relations between clock hours and 1-minute (or 4-minute) precipitation rate distributions. These models (for 13 locations) can be used to estimate annual and seasonal distributions of instantaneous precipitation rates for places where clock-hour rate distributions are known.

**AWS TR 76-264 (ADA067090) Satellite Meteorology**, by Lt Col Henry W. Brandli, August 1976, 203pp. Describes types of US meteorological satellites in operational use. Using examples of satellite imagery in the visible and infrared spectrums, the report shows how to identify various meteorological phenomena and various cloud types.

**AWS TR 76-265 Not Used.**

**AWS TR 76-266 (ADA048414) Radarscope Interpretation: Severe Thunderstorms and Tornadoes**, by Capt Roger C. Whiton and Maj Robert E. Hamilton, September 1976, 29pp. Contains material taken from the available literature on identifying severe thunderstorms, hail, and tornadoes from radar echoes. Radar echo signatures indicating severe weather are consolidated for geographical areas and weather types to give radar meteorologists easy access to the findings of several investigators in the weather radar field. Information concerning x-band, s-band, and c-band radars included. Supersedes AWS TR 243.


**AWS TR 77-268 Not used.**

**AWS TR 77-269 Not used.**

**AWS TR 77-270 Not used.**

**AWS TR 77-271 (ADA099510) New Severe Thunderstorm Radar Identification Techniques and Warning Criteria**, by Leslie R. Lemon, November 1977, 67pp. Also published as NOAA TM NWS NSSFC-1. Improved understanding of severe thunderstorm structure and evolution is used to develop new radar sampling techniques and warning criteria. The only radar data needed are obtained from conventional National Weather Service radars (WSR-57, WSR-74C and S) when in PPI tilt sequence mode displaying video integrated and processed reflectivities. Actual WSR-57 data for six storms are used to exemplify techniques and criteria.

**AWS TR 77-272 Not used.**


TECHNICAL REPORTS

Conference, held at the USAF Academy, 28 November through 1 December 1978. Contents:

- “Severe Weather Forecasting,” (abstract) by F.C. Ostby, p 46.
- “Probability Forecasting,” (abstract) by A.H. Murphy, p 47.
- “Recent Developments in Automated Weather Observing and Forecasting,” by D.A. Chisholm, pp 62-68.
- “The Automated Meteorological Station. AN/TMQ–30 ( ),” by W.J. Vechione, pp 76-77.
- “Portable Automated Mesonet,” (abstract) by F.V. Brock, p 78.
- “Operating with NEDS,” (abstract) by T.M. Piovowar, p 96.
- “Use of the Nimbus-G Multi-Channel Microwave Radiometer to Deduce Atmospheric Properties,” by R.C. Savage and C.D. Hall, pp 118-122.
- “The Switch to a Climatic Perspective,” by F.K. Hare, pp 127-128.
- “A Comparison of the AFGL FLASH, DRAF DART, and AWS Haze Models with the RAND WETTA Model for Calculating Atmospheric Contrast Reduction,” by Dr P.J. Breitling, pp 154-162.

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AWS/TR--79/002 (ADA075168) Electro-Optical Handbook, Volume I — Weather Support for Precision Guided Munitions, by Maj Kit G. Cottrell, Lt Col Paul D. Try, Lt Col Donald B. Hodges, and Lt Col Ronald F. Wachtman, May 1979, 108pp. A foundation for weather support to precision guided munitions (PGMS) operating at visual through microwave wavelengths, for use by AWS forecasters and staff weather officers. Chapter I describes effects of the atmosphere and the Earth’s surface on electromagnetic energy. PGMS and their sensitivities to the environment discussed in chapter 2. The next two chapters discuss PGM weather support concepts and techniques. Glossary of terms, supplemental radiative transfer theory, and example worksheets illustrating support techniques to TV, infrared, and laser designator systems included in appendices.

AWS/TR--79/003 (ADA099155) Cloud Patterns and the Upper Air Wind Field, by Roger Weldon, October 1979, 102pp. Information in this report derived empirically from study of SMS–GOES satellite imagery and atmospheric data, analyses, and progs distributed by National Weather Service. Text provides simple comparisons of satellite observed cloud patterns and the wind field.

AWS/TR--79/004 (ADA078858) An Investigation of Radar Returns and Their Relationship to Severe Weather Occurrences, by Capt Werner H. Balsterholt, November 1979, 99pp, FPS–77 5.4-cm radar information gathered throughout US, geographically and temporally separated to delineate severe from non-severe thunderstorms. The critical success indicator used to determine relative reliability of various radar signatures investigated. Thunderstorm structure reviewed, and evolution and development of severe storms is discussed. Severe storm environments analyzed, related to well-established severe storm criteria. The 30 dbz heights, when correlated with tropopause height or height of the total storm, are excellent signatures that frequently define thunderstorms likely to be associated with severe weather.

AWS/TR--79/005 (ADA098599) Forecasting Altimeter Settings, December 1979, 39pp. Formerly AWSM 105–54. Discusses four methods for converting a forecast sea-level pressure to a forecast altimeter setting. The first method (shortest and easiest to use) gives acceptable accuracy at most stations below 1,000 feet elevation and at many stations above 1,000 feet. The second method is more general and designed primarily for use at stations above 1,000 feet when large pressure and/or temperature changes are expected during the forecast period. Both methods require concurrent values of sea-level pressure and altimeter setting at the station in question. A third method is useful when concurrent values of sea-level pressure and altimeter setting are not available; it may be used at any elevation. The fourth method lets forecasters convert a forecast altimeter setting at one station to another station. Step-by-step procedures outlined for each method. Nomograms and table (Appendix A) included. Theoretical discussion of basis for all four methods given in appendix B.

AWS/TR--79/006 (ADA221842) (Revised March 1990) The Use of the Skew T, Log P Diagram in Analysis and Forecasting, December 1979 (Revised March 1990), 153pp. Formerly AWSM 105–124 (ATI169015). Describes the DoD Skew T, Log P diagram and provides instructions for its use. Instructions include: How to plot the data on the diagram, how to determine unreported meteorological quantities and atmospheric stability from the data. Further instructions tell how to analyze discontinuities, stable layers, and clouds, and how to use the plotted diagram to help forecast elements such as aircraft icing and severe convective storms. First revised in November 1987 to update references, provide instructions for use of pressure-altitude curve, and stability indices. March 1990 revision adds new stability indices and forecasting techniques displayed on the Satellite Data Handling System (SDHS), the Automated Weather Distribution System (AWDS), and microcomputer Skew T programs. Includes August 1988 and March 1989 errata.


AWS/TR--80/002 (ADA097018) The WC-130 Meteorological System and Its Utilization in Operational Weather Reconnaissance, by Capt Rodney S. Henderson, August 1980, 79pp. Discusses the USAF WC-130 weather reconnaissance system. Starts with a brief history of weather reconnaissance, then describes the WC-130. Includes descriptions of instrumentation used and
discusses data dissemination, quality control, applications of weather reconnaissance to watching tropical cyclones, weather modification.

**AWS/TR–80/003 (ADA221955) Calculating Toxic Corridors**, by Capt Jon P. Kahler, Lt Col Robert G. Curry, and Maj Raymond A. Kandler, November 1980, 103pp. Revised April 1989 to incorporate revised Tables 2, 16, 22, 23, 24, and 32. This report gives methods of defining evacuation areas for accidental spills of toxic chemicals. An empirical diffusion equation is used to calculate the downwind hazard distance. The width of the toxic corridor, specified in angular degrees centered along the mean wind direction, is based on variability or wind direction. Choice of four methods involving tables, nomograms, and a programmable calculator is provided. Appendices give worksheets, example problems, procedures for determining meteorological inputs, a procedure for determining evaporative source strength, and more.

**AWS/TR–81/001 (ADA111876) Forecasting Aircraft Condensation Trails**, September 1981, 25pp. Formerly AWSM 105–100. Aircraft condensation trails (contrails) are caused by aircraft aerodynamics or engine exhaust under proper atmospheric conditions. Engine-exhaust trails are the most common and are discussed in this report. Jet aircraft contrail-formation graphs facilitate yes-or-no Forecasts for any season with forecasts of pressure, temperature, and relative humidity. Contraill probability curves give contrail probabilities with forecast pressure and temperature. Engine power setting does not affect contrail formation, but does affect contrail intensity. The contrail-formation graph for propeller aircraft is similar to the jet graph.

**AWS/TR–83/001 (ADA148894) Equations and Algorithms for Meteorological Applications in Air Weather Service**, by Lt Col George E. Duffield and Maj Gregory D. Nastrom, 30 December 1983, 69pp. This report lists equations or algorithms used in computing common meteorological and geophysical variables. Should serve as a handy reference for BWS computer programmers, promote standardization, and minimize time-consuming literature searches. Equations and algorithms classified in three groups: kinematic properties, thermodynamic properties, and gridded or contoured data fields.

**AWS/TR–83/002 Mean Upper Tropospheric Flow for the Global Tropics**, by James C. Sadler, University of Hawaii, and Maj Thomas Wann, HQ AWS, January 1984. This report is a powerful forecast tool for tropical forecasters in its presentation of key synoptic features, their persistence, and their effects on sensible weather.

- **Volume I (AD141227)**. Provides a brief discussion of how the charts in volume II were developed; also describes significant climatological features.

- **Volume II (AD141484)** 16pp. Contains mean monthly 200 and 300 mb charts discussed in Volume 1. Charts in two colors, oversized (about 17” X 38”). This report is not available from DTIC.

**AWS/TR–89/001 (ADA227122) Climatic Study of the Upper Atmosphere, Volume 1, January, July 1989, 236pp.** by Michael J. Changery, Claude N. Williams, Michael L. Dickerson and Brian L. Wallace. A study of the upper atmosphere based on 1980-1985 twice-daily gridded analyses produced by the European Centre for Medium Range Weather Forecasters. Included are global analyses of (1) Mean temperature/standard deviation, (2) Mean geopotential height/standard deviation, (3) Mean density standard deviation, (4) Height and vector standard deviation–all for 13 levels: 1,000, 850, 700, 500, 300, 250, 200, 150, 100, 75, 50, and 30 mb. Also included: mean dew point/standard deviation for levels from 1,000 through 300 mb; jet stream (mean scalar speed) for levels from 500 through 300 mb; global 5-degree grid point wind roses for all 13 pressure levels. A joint Navy/USAF document, also published as NAVAIR 50-1C-2.


**AWS/TR–89/004 (ADA227125) Climatic Study of the Upper Atmosphere, Volume 4, April, July 1989, 236pp.** Abstract same Volume 1, Also published as NAVAIR50-1C-4.

**AWS/TR–89/005 (ADA232977) Climatic Study of the Upper Atmosphere, Volume 5, May, July 1989, 236pp.** Abstract same as Volume 1. Also published as NAVAIR50-1C-5.

**AWS/TR–89/006 (ADA232978) Climatic Study of the Upper Atmosphere, Volume 6, June, July 1989, 236pp.** Abstract same as Volume 1. Also published as NAVAIR50-1C-6.


**AWS/TR–89/008 (ADA232979) Climatic Study of the Upper Atmosphere, Volume 8, August, July 1989, 236pp.** Abstract same as Volume 1. Also published as NAVAIR50-1C-8.


AWS/TR--91/001 (ADA254216) Probability Forecasting: A Guide for Forecasters and Staff Weather Officers, December 1991, 124pp. Formerly AWSP 105-51, 31 October 1978--includes Change 1, 16 October 1989. Describes recommended techniques for producing and evaluating probability forecasts. Includes a selected number of applications for optimal decision-making. Chapters 1-4 address specific needs of forecasters and supervisors who make and evaluate subjective probability forecasts. Chapters 5-7 address applications of probabilities in decision-making, primarily for staff weather officers and staff meteorologists.

AWS/TR--93/001 (ADA269686) New Techniques for Contrail Forecasting, by Capt. Jeffrey L. Peters, August 1993, 35pp. Documents the results of a study requested by the Strategic Air Command Deputy Chief of Staff for Operations (SAC/DO) to update previous contrail forecasting research done by Herbert S. Appleman for HQ Air Weather Service in 1953. Advancements in aircraft power plants, especially the development of bypass turbofan engines, made the new study necessary. This report describes the development of new contrail forecast algorithms for several types of engines used in high-flying aircraft. It also provides contrail forecasting rules that correlate synoptic-scale upward vertical motion with contrail formation. The results indicate significant improvement in contrail forecasting accuracy over the Appleman technique now in use at the Air Force Global Weather Central.

AWS/TR--95/001 (ADA302314) Forecasters Guide to Tropical Meteorology--AWS TR 240 Updated, by Dr. Colin Ramage. AWS TR 240, by Maj. Gary D. Atkinson, has served as the reference manual for USAF weather forecasting in the tropics since it was published in 1971. Although TR-240 has endured for the past 25 years, HQ Air Weather Service recognized the need for an update and contracted with tropical forecasting authority Dr. Ramage to produce one. Although a great deal of new material has been added to reflect new techniques and new technology, it still covers the basic facts of climatology, circulation, and synoptic models, with emphasis on analysis and forecasting techniques for the tropics. Physical factors that control tropical circulations are discussed briefly. The climatologies of pressure, winds, temperature, humidity, clouds, rainfall, and disturbances are presented in a form especially suitable for forecasters. Analysis and forecasting of disturbances, cyclones, severe weather, terminal weather, etc., are treated at length. The use of climatology and the interpretation and use of weather satellite imagery are emphasized. Numerous figures, adapted from the literature or prepared by the author, illustrate all the essential facts and principles discussed. A summary of the state of the art and future outlook for tropical meteorology is included, along with an extensive bibliography.

AWS/TR--97/001 (ADA451735) Preparation of Terminal Aerodrome Forecast Worksheets. This report supersedes AWS TR 218, dated October 1969. This technical report discusses how to design both meteorologically sound generic Terminal Aerodrome Forecast (TAF) worksheets and short, concise supplemental regime forms. Information herein describes the characteristics of a good forecast worksheet and outlines steps for designing an effective product.
CROSS-REFERENCE LIST

AWS Manual/Pamphlet to AWS Technical Report

For permanence, a few early AWS manuals and pamphlets were later converted to and republished as AWS technical reports. To facilitate reference, a list of known conversions follows.

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2.2 9th Weather Squadron

Order 9WS publications from the Air Force Weather Technical Library (AFWTL), 151 Patton Ave., Room 120, Asheville NC 28801–5002, DSN 673–9019.

9WSTR-2 (AD–None) *High Altitude Clear Air Turbulence*, by CWO Frederick B. Haymond, November 1967, 20 pp. This study of high altitude clear air turbulence (CAT) began in the summer of 1960. The results have shown, rather conclusively, that wind shear parameters have little effect in producing CAT at stratospheric levels. In over 4,000 sorties analyzed during this period, it was found that CAT can occur with or without strong shears and wind speeds particularly in the area near the tropopause and above.
2.3 88th Weather Squadron


88WS/TR—05/001 (ADB322187) Analysis of Weather Sensitivities and Support Requirements: F/A-22, by Capt. Chad S. Deal and Mary A. Bedrick, 25 May 2005, 18 pp. This document provides an analysis of the weather sensitivities and support requirements for the F/A-22 Raptor. All of the weather sensitivities are extracted from current program engineering documents and other certified sources. The weather support requirements are derived from a DOTMLPF (i.e., doctrine, organization, training, materiel, leadership, personnel, and facilities) analysis of the potential difference between existing and required weather capabilities necessary to support the weapon system. Distribution F: Further dissemination only as directed by the F/A-22 System Program Officer, Wright-Patterson AFB, OH; 25 March 2005.

88WS/TR—05/002 (ADB318273) Analysis of Weather Sensitivities and Support Requirements: Small and Micro Unmanned Aircraft Systems, by Allison G. Schauer, 28 September 2005, 19 pp. This technical report, providing an analysis of the weather sensitivities and support requirements for small and micro unmanned aerial systems is intended to highlight unique issues associated with these systems and open a discussion of ways to capitalize on their use. Distribution authorized to the Department of Defense and US DoD contractors only. This document contains information exempt from mandatory disclosure under the FOIA. Exemption(s) AP3.2.1.1.5 apply.
Chapter 3

TECHNICAL NOTES

3.1 AFWA Technical Notes

The OPR for AWS/AFWA technical notes is AFWA/A3O, 106 Peacekeeper Dr., 2N3, Offutt AFB NE 68113–4039. USAF units order by technical note number, AD number, and title from the Air Force Weather Technical Library (AFWTL), 151 Patton Ave., Room 120, Asheville NC 28801–5002, DSN 673–9019.

AWS/TN--78/001 (ADA175202) Southern Airways Flight 242: The Role of Airborne Weather Radar, by Capt. James I. Metcalf, USAFR, November 1978, 7pp. Meteorological radar data was analyzed to determine the basis of the pilot’s decision to penetrate a severe thunderstorm. The display of 3-cm reflectivity shows a maximum significantly less than that observed by National Weather Service radar but strong enough to have been contoured by airborne radar. The flight path through the storm suggests either a malfunction of the contouring or misinterpretation of the display by the pilots. This case illustrates danger of using 3-cm radar for storm penetration and the value of using current data from longer wavelength radars as aids to interpreting onboard radar displays.

AWS/TN--79/001, Spectral Radiometric Measurement and Analysis Program, by Lawrence G. Christensen, Simmons, R., Schauss, G., Norton, R., and Schoenfeld, G., Eastman Kodak Co., April 1979. A report on a USAF Air Weather Service contract for research in the transfer of atmospheric energy in the visible and near-infrared portions of the electromagnetic spectrum. Objective was to produce a spectral model of path transmittance, radiance, and ground-level irradiance that could be related to weather observations through simultaneous, in-situ data collections. Instrumentation developed under subcontract to Eastman Kodak by Albuquerque Division of EG and G used in a 14-month collection program. A self-sustaining mobile field radiometric laboratory that contained custom-designed spectroradiometers, mechanical/electrical servo controls, and computer interfaces was used. With minicomputers and peripherals, the laboratory produced data processed later on larger systems.

- **Volume I, Description of Mobile Radiometric Laboratory System**, 98pp. (ADA072078) Volume I describes the mobile laboratory, radiometer calibration, and computer software. System documentation listed in appendix A.
- **Volume II, Description of the Data Collection Program**, 164pp. (ADA072079) Volume II describes design of data collection program in the field, ranges of important experimental variables, measurements and supportive observations, and analytical software developed to perform analyses of resulting data.
- **Volume III, Data Analysis and Formulation of the Model**, 224pp. (ADA072080) Volume III describes the analysis used to reduce collected radiometric and meteorological data to a series of equations that became the SCAT3. Model based on physical equations for a homogeneous atmosphere, modified by empirical observations. With the model it is possible to estimate visible and near-infrared spectral absorption and scattering phenomena that result from atmospheric constituents of surface weather observations.
- **Volume IV, SCAT3 Operator's Manual**, 57pp. (ADA072081) The model described in previous volumes was coded into a computer program called SCAT3. Volume IV acquaints the user with proper input sequences and options when SCAT3 is run on an IBM 370 computer.


AWS/TN--79/004 (ADA148050) Results of a Wind-Dew Point Conditional Climatology Table Evaluation, by Capt. M.J. Kelly, August 1979, 9pp. Two types of conditional climatology tables are described. Results show that wind-stratified conditional climatology (WSCC) tables and wind dewpoint conditional climatology (WDCC) tables have nearly equivalent skill.
Author concludes there is insufficient justification for replacing WSCC tables with WDCC tables.


AWS/TN--80/001 (ADA089706) The REFORGER 76 MSI Test, edited by Capt. Gary K. Dotson, June 1980, 83pp. REFORGER is an annual exercise to test US Forces' ability to support NATO commitments. During the 1976 exercise, AWS tested a new way to provide war/contingency support: objectively produced, single-number, Mission Success Indicators (MSIs). During REFORGER 76, AWS provided MSIs for four scenarios or mission types: COBRA/TOW vs. tank, 105mm gun vs tank, close air support, and helicopter assault. For 3 months before exercise, AWS spent nearly 5 man-years in MSI development. Report details events leading to effort, models developed, support provided, forecast verification, customer feedback, and future efforts. Essentially a compilation of reports submitted by AWS units participating in the exercise.


AWS/TN--81/001 (ADA099778) Forecasting Skill, by Col. Kenneth E. German, January 1981, 51pp. Although accuracy of centrally-produced prognoses has improved in the past 20 years, several studies have shown negligible improvement in weather forecasting. More than 100 journal articles were reviewed to independently evaluate weather forecasting improvement. Forecasting skill was improved for most weather elements, but not by all forecasters. This led to a review of other factors (education, experience, interest, and procedures) that might be important in determining forecasting skill. After basic education and experience are achieved (2-3 months), the main factor contributing to forecasting skill was found to be forecaster motivation.

AWS/TN--81/002 (ADA103289) Technical Bible for New Detcos, by Maj. Frank J. Carvell, May 1981, 78pp. The greatest technical challenge for AWS is to improve the basic skill level of a highly intelligent and motivated, but extremely inexperienced, forecasting team. Most of this responsibility falls on already overworked detachment commanders (Detcos). If followed, this guide will help Detcos: organize their technical forecasting program more quickly and effectively, and provide them the tools required to lead, teach, and train their forecasting teams to reach full potential.

AWS/TN--81/003 (ADA113110) East Coast Fog: A Case Study, by Maj. Thomas C. Wann, November 1981, 14p. Study covers 48-hour period (December 27-29, 1980) as an abnormal cold air mass over the eastern seaboard met warm, moist onshore flow. As a result of a strong pressure gradient, brisk onshore flow developed between an intensifying high and deepening low. Study emphasizes the need for a local analysis program that will detect onshore flow and possible extensive fog formation. Note: DTIC copy partially illegible.

AWS/TN--82/001 (ADA113034) Climatology Handbook for VII Corps Forward Areas, January 1982, 140pp. Provides climatology of significant weather that can be expected to affect tactical operations in VII Corps forward areas. Produced by USAFETAC/OL-A.

AWS/TN--82/002 (ADA114728) Climatology Handbook for NORTHAG Forward Areas, January 1982, 140pp. Provides climatology of significant weather that can be expected to affect tactical operations in NORTHAG forward areas. Produced by USAFETAC/OL-A.

AWS/TN--82/003 (ADA119172) The Platteville Radar Profiler as a Meteorological and Communications Engineering Tool, by Capt. Gregory D. Nastrom, January 1982, 16pp. Basic operating principles and capabilities of the VHF pulsed doppler radar at Platteville, Colorado, are discussed. Examples of horizontal and vertical wind speed are discussed. Examples of horizontal and vertical wind speed measurements are given, and meteorological uses for these data are briefly outlined. The radar backscattered power is used to compute the refractivity turbulence structure constant. New results on the variability of the refractivity turbulence structure constant from about 5-15 km are given. Especially interesting is the large diurnal change of the constant in the upper atmosphere.

AWS/TN--82/004 Not used.

AWS/TN--82/005 (ADA141226) Tilted Refractive Surfaces at Eglin Air Force Base, Florida, by Jeffrey S. Schleher, November 1982, 4pp. Radar ducting layers along the Gulf coast of Florida are examined for a 9-day period in May of 1976. Tilted refractive surfaces are shown to exist with enough slope to significantly increase the chance of radar ducting at small look angles. Radiosonde observations agree with average refractometer measurements but do not detect ducting.
layers with small vertical depths. Reprint from Radio Science, Volume 17, Number 5, September-October 1982.

AWS/TN--83/001 (ADA132187) The Operational Meteorology of Convective Weather, Volume I: Operational Mesoanalysis, by Charles A. Doswell III, National Severe Storms Forecast Center, Kansas City, Mo., November 1982, 172pp. A reprint of NOAA Tech Memo NWS NSSFC--5. Addresses operational mesoanalysis associated with convective weather. Discusses physical interpretations of the dynamics that govern the atmosphere and, in particular, convection. Describes upper air data analysis with emphasis on vertical motion, thermodynamic and kinematic considerations and soundings; surface data analysis, including discontinuities, boundaries, pressure and thermal analysis, and terrain features. Objective analysis tools and interpretation of numerical guidance are also discussed. Emphasizes the fact that mesoanalysis must be based on physical understanding. The concept of integrating all available analysis tools into a physically consistent picture, as opposed to basing the analysis on particular weather charts, is heavily stressed.

AWS/TN--85/001 (ADA59919) The Operational Meteorology of Convective Weather, Volume II: Storm Scale Analysis, by Charles A. Doswell III, Environmental Sciences Group, Boulder, Colo., April 1985, 247pp. A reprint of NOAA Tech Memo ERL ESG-15. Deals primarily with fundamental aspects of convective meteorology. To present storm-scale meteorology, a wide range of topics are considered. Certain subjects, such as precipitation physics, are examined at length to provide basic physical understanding of how thunderstorms work. A classification scheme for convective storms is introduced, allowing the reader to make certain physical distinctions in the way storms are organized and how they behave.

AWS/TN--85/002 (ADB099411) Intelligence Preparation of the Battlefield—A Staff Weather Officers Guide, by Maj. Edward J. Eadon, AFCSA/ SAGW, November 1985, 27pp. Introduces Air Weather Service staff weather officers (SWOs) to the U.S. Army's Intelligence Preparation of the Battlefield (IPB) process. Provides step-by-step guidance for SWOs in producing climatology support for IPB. Identifies ways for SWOs to determine weather thresholds that affect Army operations. Describes methods for gathering and analyzing climatology data. Provides tables showing terrain influences on climatology patterns. Discusses forms a SWO may use to provide climatology inputs to IPB. Notice: Distribution authorized to U.S. Government Agencies and their contractors only; Administrative or Operational Use, April 1984. Other requests for this document shall be referred to: AFWA/A5.

AWS/TN--86/001 (ADA172801) AFGWC's Advanced Weather Analysis and Prediction System (AWAPS), by Maj. James G. Stobie, June 1986, 68pp. Describes the three computer models used in the Air Force Global Weather Central's Advanced Weather Analysis and Prediction System (AWAPS) and explains how they interact to form a production cycle. These models are the High Resolution Analysis System (HIRAS), the Global Spectral Model (GSM), and the Relocatable Window Model (RWM). Also gives brief introduction to the basics of numerical weather prediction.

AWS/TN--87/001 (ADB114528) What's Hot and What's Not—A Practical Guide to the Tactical Decision Aid, by Capt. Jason P. Tuell, Det., 2nd WS, July 1987, 157pp. A practical guide for computing and providing Infrared and Television (IR/TV) Tactical Decision Aid (TDA) data, based on Air Weather Service experience in supporting test and development of precision guided munitions at Eglin AFB, Florida, since 1984. The system described here was designed initially for use with the HP–41 calculator, but the reasoning process and adjustments used to modify the calculator TDA output can be used with microcomputer versions, as well. Electrooptical theory is discussed only in as much detail as required for practical use of the TDA. Describes TDA's strengths and weaknesses, along with some operational strategies. Notice: Distribution authorized to the Department of Defense and DoD contractors only, critical technology, 10 July 1987. Other requests shall be referred to AFWA/A5, Offutt AFB NE 68113. WARNING—This document contains technical data whose export is restricted by the Arms Control Act (Title 22, U.S.C., Sec 2751 et seq) or the Export Administration Act of 1979, as amended (Title 50, U.S.C., App. 2401, et seq). Violations of these export laws are subject to severe criminal penalties. Disseminate in accordance with the provisions of AFI 61–204.

AWS/TN--87/002 (ADA207904) Isentropic Analysis and Interpretation: Operational Applications to Synoptic and Mesoscale Forecast Problems, by Dr. James T. Moore, St. Louis University, Department of Earth and Atmospheric Sciences, July 1987, 93pp. Revised May 1989. A basic review of the isentropic coordinate system, including advantages and disadvantages for operational use. Primitive equations in isentropic coordinate form are discussed with emphasis on physical meaning and interpretation. Isentropic analysis techniques for “horizontal” and cross sectional perspectives are described as aids for diagnostic analysis of synoptic scale weather systems. Numerous diagnostic variables are discussed; all tools for identifying synoptic scale features helpful in forecasting cyclogenesis and regions susceptible to strong convection. Final section presents specialized applications of isentropic techniques to weather analysis and forecasting, including trajectory
analysis, tropopause folding process, short-term forecasting of severe weather threat areas, and aviation forecasting.


AWS/TN--88/001 (ADB120515) Satellite Imagery Interpretation for Forecasters, February 1988, 634pp. Originally published as NOAA Weather Service Forecasting Handbook No. 6, May 1986, the result of a joint effort by Air Weather Service, the Naval Oceanography Command, the National Weather Service, and the National Environmental Satellite Data and Information Service. Republished as AWS technical note mainly to effect registration with DTIC. This operational handbook for GOES weather satellite imagery interpretation was designed as a satellite applications guide for the working meteorologist. It updates and replaces several other guides to GOES imagery use and interpretation. Draws on numerous sources, including AWS, Navy, and NOAA technical documents.

AWS/TN--91/001 (ADA247588) Dust and Sand Forecasting in Iraq and Adjoining Countries, by MSgt. Walter F. Wilkerson, November 1991, 72pp. This report, based partly on the author’s recent experience in desert weather forecasting, discusses airborne dust and sand in Iraq, Kuwait, Syria, eastern Jordan, western Iran, and the northern Arabian Peninsula. Describes geography of the region and discusses general types of duststorms and sandstorms. Locates and describes sources of sand and dust in Mesopotamia, Southwest Asia, and the Red Sea area. Provides practical tips and rules of thumb for forecasting airborne sand and dust. Describes methods for enhancing the appearance of airborne dust in satellite imagery and provides example satellite imagery that shows airborne dust produced under several conditions.

AWS/TN--96/001 (ADB207994) Use of Polar-Orbiting Meteorological Satellite Data by Air Force Weather (AFW), by Maj. Michael Bonadonna and Capt. Louis Zuccarello, February 1996, 43pp. Identifies and justifies polar-orbiting meteorological satellite requirements of Air Force Weather. Specific requirements for atmospheric weather parameters and thresholds and space environmental parameters are given. In addition, it contains references to all known studies and documents that justify the requirements. Notice: Distribution authorized to U.S. Government Agencies and their contractors only; Administrative or Operational Use, February 1996. Other requests for this document shall be referred to AFWA/A3O, Offutt AFB NE 68113.

AFWA/TN--98/001 (ADA343975) Freezing Precipitation, by Eugene M. Weber, 31 March 1998. Discusses three advection patterns favorable for freezing precipitation. This technical note is designed to help and train forecasters on various freezing precipitation scenarios.


AFWA/TN--01/001 (ADA403439) Summer Regimes, by Eugene M. Weber, 15 March 2001, 67 pp. This technical note presents a back-to-basics approach to forecasting the weaker, slower moving weather systems of summer. It is especially designed for new and inexperienced forecasters, but it is also an excellent review for all forecasters. As summer approaches, the subtropical ridge begins to drift northward across the southern United States. The increasing insolation, moisture, and weakening pressure and thermal gradients require forecasters to apply different forecasting rules. This technical note presents synoptic patterns and regimes that routinely occur during the summer months. Synoptic pattern recognition is still one of the most important considerations when producing a forecast and will help in determining if model guidance is “on track.”

AFWA/TN--01/002 (ADA403471) Winter Regimes, by Eugene M. Weber, 1 December 2001, 203 pp. This technical note presents a back-to-basics approach to forecasting the stronger, more dynamic weather systems of winter. Although it is especially designed for new and inexperienced forecasters, it is also an excellent review for all forecasters. As winter approaches, the subtropical ridge begins to drift southeastward with its effects lessened. The polar jet shifts southward and results is drastic changes in weather conditions within as little as 24 hours as blast of colder polar air become more frequent. This technical note presents synoptic patterns and regimes
that routinely occur during the winter months. Synoptic pattern recognition remains one of the most important considerations when producing a forecast and will help in determining if forecast model guidance is “on track.”

AFWA/TN--03/001 (ADA415555) *Spring Regimes*, by Eugene M. Weber, 15 April 2003, 157 pp. This technical note presents a back-to-basics approach to forecasting the transitional weather systems of spring. Although it is especially designed for new and inexperienced forecasters, it is an excellent review for all forecasters. As spring approaches, the CONUS becomes a battleground between cold winter-type airmasses and warm summer-type airmasses. This technical note presents synoptic patterns and regimes that routinely occur during the spring months. Synoptic pattern recognition remains one of the most important considerations when producing a forecast and will help in determining if forecast model guidance is “on track.”

AFWA/TN--04/001 (ADA451448) *Autumn Regimes*, by Eugene M. Weber, 13 February 2004, 178 pp. This technical note presents a back-to-basics approach to forecasting the weather in this transition from the weaker, slower moving weather systems of summer to the stronger, more dynamic weather systems of winter. It is especially designed for new and inexperienced forecasters, but it is also an excellent review for all forecasters. As summer ends, the subtropical ridge begins to retreat drift southeastward. The polar jet begins to shift farther southward, and polar air intrusions become more frequent as autumn progresses. By the end of the autumn transition period into winter, drastic changes in weather conditions become more common. This technical note presents synoptic patterns and regimes that routinely occur during the autumn months. Synoptic pattern recognition remains one of the most important considerations when producing a forecast and will help in determining if forecast model guidance is “on track.”

AFWA/TN--05/001 (ADB330301, ADB330302) *Value of Weather Services to the Combatant Commands*, by Paul Demmert, Roger Whiton, Kelly Klein, and Frank Zawada, 30 June 2005, 2 vols., 298 pp. The purpose of this report was to review and assess traditional and innovative ways to identify the value of weather services to the combatant commander. The investigation focused on finding and developing credible evidence that will help convince Air Force and Department of Defense decision-makers that investments in weather service enhancements will improve the combatant commanders’ mission effectiveness and provide a positive return on investment. The study team also looked at how weather support is evaluated in the Air Force Capabilities Review and Risk Assessment (CRRA) process. Using verification statistics produced by the Air Force Weather Agency, this report contains some hard numbers that may be used in the CRRA analysis to more accurately evaluate the overall contribution of weather to the Air Force Concept of Operations. This report highlights some dramatic examples of the value of weather to the combatant commanders and offers recommendations to enhance the use of weather.

AFWA/TN--06/001 (ADA465918) *The Mesoscale Forecasting Process*, by Mr. Calvin C. Naegelin and Mr. Paul J. McCrone, 5 October 2006, 39 pp. The weather forecast effort has progressed a long way past its embryonic stage of the barotropic forecast. Both computer power and our knowledge of atmospheric processes have increased substantially over the years, allowing for the classification of many weather phenomena into scales, including the global/hemispheric scale, the synoptic scale, the mesoscale, and the microscale. These scales represent the cascade of energy that occurs in the atmosphere, with hemispheric features providing energy for the synoptic scale, synoptic features providing energy for the mesoscale, and so forth. Many observation and modeling tools exist to aid the forecaster along the way, including RAOB soundings, satellite imagery, wind profiler data, radar data, lightning data, and model data, and all are useful in mesoscale forecasting. When performing a mesoscale forecast, however, it is prudent to use a mesoscale model, such as the Air Force Weather Agency’s (AFWA) Weather Research and Forecasting (WRF) model.
USAFETAC–TN–68–2 (AD669364) Meteorological Rocket Data and Predicting the Onset of the Southwest Monsoon Over India and Southeast Asia, by Edward V. Von Gohren, May 1968, 16pp. Recent independent results from several sources encourage further consideration of probable correlations between onset time of the southwest monsoon over southern South Vietnam, the advance of the southwest monsoon up the west coast of India, and stratospheric and mesospheric dynamics. This paper shows that there is an interrelationship or correlation between the southwest monsoon and the stratospheric circulation. Presented as example of value of synoptic meteorological rocket network data.

USAFETAC–TN–68–3 (AD672769) Bibliographies of Climatic References and Climatic Maps for Selected Countries, by Vincent J. Creasi, July 1968, 11pp. A list of climatological bibliographies for various countries worldwide. Each bibliography listed with its AD number and weather bureau designation. These publications compiled by the Foreign Area Section, Office of Climatology, U.S. Weather Bureau (now ESSA). Most bibliographies sponsored (contracted) by AWS through its Climatic Center (now AFCCC). Two distinct types of bibliographies included: (1) a listing of climatic references and (2) a listing of climatic maps.


USAFETAC–TN–69–1 (AD685716) A Selected Climatological Bibliography for Thailand, by Alvin L. Smith, Jr., March 1968, 44pp. Contains 105 separate sources of climatological data and text references for Thailand. All entries in alphabetical order by author or originating agency. All items furnished with abstract. Subject index included.


USAFETAC–TN–69–4 (AD688434) Radar-Computed Rainfall Compared With Observations From a Dense Network of Rain Gauges, by Capt. Martin Ross, June 1969, 10pp. Using Wilson's Rainfall Rate - Echo Intensity (RR-EI) Chart, based on the average relationship, radar data collected for 36 hours, using US Weather Bureau WSR–57 at Atlantic City, N.J., is compared with rainfall data from three tipping-bucket rain gauges located within 60 nm of radar over area of 4.8 square miles. Comparisons between radar and tipping-bucket gauges are shown. Radar measurements were within 2 percent of total rain gauge average. Correlation coefficient was .91. Use of Weather Bureau RR-EI chart would have underestimated average areal precipitation. Hourly rainfall amounts of 0.01 inches or more detected in 80 percent of cases. Hourly amounts of 0.02 inches or more detected in 100 percent of cases.


November 1969, 15pp. Models of rain intensity along an aircraft glide slope are derived to compare attenuation losses at various radar frequencies. Models are intended to portray rain intensity over a 10-minute period and 10- or 20-mile ground track. Rain intensities are selected to represent rates that would occur less than one percent or 0.1 percent of the time during the rainy season at the rainiest airfield in the U.S. and the rainiest airfield (with more than 5,000 feet of paved runway) in the world.

**USAFETAC–TN–70–1 (AD700057) A Selected Annotated Bibliography on Clear Air Turbulence (CAT)**, by Dennis L. Boyer and Alvin L. Smith Jr., January 1970, 107pp. Contains 220 references on clear air turbulence, with annotations. References listed alphabetically by author by year. References for the most part refer to turbulence as it appears in the free atmosphere, and represent views from authors/agencies worldwide.


**USAFETAC–TN–70–3 (AD702463) Incorporate in AWS/TI–79/001**.


**USAFETAC–TN–70–5 (AD707120) A Selected Annotated Bibliography of Environmental Studies of Iraq, Jordan, Lebanon, and Syria (1960–1969)**, by Vincent J. Creasi, Dennis L. Boyer, and Alvin L. Smith, Jr., May 1970, 36pp. Contains 112 references to environmental studies for four middle east countries (Iraq, Jordan, Lebanon, and Syria). About 50 items are general references that pertain to one or more of the subject countries. Sixteen additional bibliographies of a meteorological and climatological nature are listed. Entries listed alphabetically by author; subject index included.

**USAFETAC–TN–70–6 (AD709762) A Selected Annotated Bibliography of Environmental Studies of Poland**, by Alvin L. Smith, Jr., June 1970, 52pp. Contains 153 references to environmental studies (1960–1969) on the Polish Peoples Republic. Of these, 43 reference translations of Polish articles are placed separately in text. Five previously published bibliographies are also referenced. Entries are alphabetical by author; subject index included.

**USAFETAC–TN–70–7 (AD691228) Air Force Eastern Test Range Computer “Printed” Rawinsonde (Skew-T) Analysis**, by Irving Kuehnast, June 1969, 23pp. Report intended as a guide to forecasters using Air Force Eastern Test Range computer “printed” rawinsonde (Skew-T) analysis. Each meteorological element on the computer printout is described as to what it is, how it is computed and developed, why it is included in the analysis, and its relationship to a Skew-T analysis.

**USAFETAC–TN–70–8 (AD711794) Hook Echoes on Radar**, by John W. Stryker, August 1970, 17pp. A great amount has been published on tornado activity and hook echoes on radar. This paper discusses one popular tornado theory and explains existence of the hook echo on radar. The tornado model used is that developed by the late Dr. Fred Bales. On the basis of the tornado theory, a steady-state storm develops with a rotating updraft at the center. The potential for tornadic development is on the convergent or windward side of the cell. The hook echo as viewed on radar, while not assumed to be the tornado itself, has an extremely high correlation with tornado occurrence of funnel cloud sighting. The question posed is: What is this hook echo and how is it associated with the tornadic vortex? By using the model in the Bates theory, a satisfactory conclusion can be derived.

**USAFETAC–TN–70–9 (AD714568) The National Air Pollution Potential Forecast Program**, by Edward Gross, May 1970, 33pp. Air pollution potential (APPI) is defined as a measure of the inability of the atmosphere to adequately dilute and disperse pollutants based on values of specific weather elements of the macroscale features. To delineate areas on the macroscale in which high APP has the greatest probability, a stagnation index has been developed independent of mixing height and transport wind speed data. Associated stagnation conditions usually manifested by stable stratification, weak horizontal wind speed components, and little, if any, significant precipitation. Report describes numerical and subjective means by which stagnation areas are delineated, how mixing height and transport wind speed are calculated, and how high APP conditions are transmitted to users.

**USAFETAC–TN–71–1** (AD718966) *Interim Instructions for the Use of the National Meteorological Center Air Pollution Potential (APP) Products*, by Valentine J. Descamps, February 1971, 25pp. Report furnishes interim instructions and guidance for AWS use of NMC air pollution potential products. NMC products are transmitted on COMET III and FOAX to AWS detachments for use in providing guidance to base pollution control officers. Report explains terms, tells how to apply messages to forecast preparation, and gives guidelines for tailoring information furnished by NMC to local requirements.


**USAFETAC–TN–71–3** (AD–721447) Incorporated in AWS/TI–79/001. 29pp. The technical note furnishes a complete listing of the prepared technical seminars at AWS wing headquarters which are available for loan to all AWS units for local presentation. The listing includes the seminar subject, author (where available), number of copies available, period of loan, approximate presentation time, type of illustrative material, and a brief synopsis of the seminar material. The information is based on an annual report from AWS wings.

**USAFETAC–TN–71–4** (AD724645) *Diurnal Variation of Summertime Thunderstorm Activity Over the United States*, by Maj. Eugene M. Rasmusson, USAFR, April 1971, 16pp. Observations from 294 Air Force and National Weather Service stations throughout the United States, were used to study diurnal variation of summertime thunderstorm activity. Results of study summarized in isoline frequency charts giving monthly values of 24-hour mean, variance of mean hourly values, hours of maximum frequency, along with phase, amplitude, and explained variance of diurnal and semidiurnal harmonics.

**USAFETAC–TN–71–5** (AD725738) *Preliminary Verification of AFGWC Boundary-Layer and Macroscale Cloud-Forecasting Models*, by Capt. John W. Diercks, June 1971, 18pp. Report gives results of a limited verification program of temperature and dewpoint forecasts from the AFGWC boundary-layer (BLM) and macroscale cloud-forecasting models using six U.S. locations. Guidance in this report necessarily broad because of problems encountered in gathering and processing large data samples. Improvement over persistence forecasts shows the BLM to have considerable skill east of the Rockies but little or no skill along the western boundary and in mountainous areas.

**USAFETAC–TN–71–6** (AD729022) *Use of Extrapolation in Short-Range Forecasting (Case Study)*, by CMSgt. Robert E. Clark, September 1971, 17pp. Gives step-by-step procedure for extrapolating movement of certain weather phenomena using surface and upper-air analyses. Short-range forecasting (0–4 hours) is emphasized; case study (using technique given here) included for Scott AFB, III.


**USAFETAC–TN–71–8** (AD732765) *A Prediction Method for Blast Focusing*, by Capt. Richard A. Rasmussen, September 1971, 32pp. Discusses an overpressure forecasting technique established by the Ballistic Research Laboratories (BRL) at Aberdeen Proving Ground, MD. Method involves calculating forecast representative value of speed of sound for azimuth angles for layers 1,000 to 10,000 feet. Using graphs, over-pressure intensity and focal points where critical overpressure will occur are pinpointed and semiobjectively forecast. Should help units providing blast damage forecasts. Change, January 1972, 1p.

**USAFETAC–TN–71–9** (AD733505) *Determination of Maximum Emission Rates to Meet Air Quality Standards*, by Lt. A. Roger Greenway and Maj. David S. Lydon, August 1971, 22pp. Explains technique used to calculate allowable stack emissions for certain AF bases within limits of Environmental Protection Agency air quality standards. Examples of calculations for Cape Kennedy AFS, Kelly AFB, and Tinker AFB are given. Graphs of “emission rate vs downwind distances” are furnished to allow downwind ground-concentration of specific pollutants to be readily estimated for effective stack heights of 30, 50, and 70 feet.


**USAFETAC–TN–71–11** (AD732205) *Numerical Preprocessing of Rawinsonde Position Vectors*, by Maj. Thomas E. Stanton, October 1971, 51pp. Martin-Graham filters are used subsequent to correction or erroneous data points to smooth Rawinsonde Set AN/GMD–4 spherical measurements. Smoothing produces not only a corrected wind profile, but allows orderly pressure integration of
the hydrostatic equation. Major data problems besides high frequency elevation-angle noise include range jumps and diffraction phenomena. Range jumps identified and corrected by inspection of first and second differences in range field. Diffraction phenomena adjusted by assuming linear change in balloon ascent-rate field and reconstructing elevation angles. Other erroneous data adjusted by comparing filtered with raw data and imposing limitations on height, wind, and position vector fields.

**USAFETAC–TN–71–12** (AD733586) *Clock-Hour/Instantaneous Rainfall Rate Relationships Applicable to the Eastern United States*, by Capt. Patrick J. O'Reilly, December 1971, 23pp. Describes methodology that provides climatological estimates of frequencies of instantaneous rainfall rates at a point and along a surface horizontal path length as a function of clock-hour rate. Clock-hourly precipitation amounts used since they are available for a period of record for many first-order stations in CONUS and for a selected number of overseas locations. Point instantaneous rainfall rates (measured at Island Beach, New Jersey; Franklin, North Carolina; and Miami, Florida) provided inputs to these clock-hour/instantaneous rate relationships, use is intended primarily for Eastern U.S.

**USAFETAC–TN–72–1** (AD–NONE) Superseded by USAFETAC/TN--86/001. Recommended formats for use in preparing AWS Technical Reports are thoroughly discussed. The suggested format for use by typists in preparing drafts of technical reports is itemized in Chapter 2 and “camera-ready” (final Copy) formats are explained in Chapter 3. Specific instructions on the preparation of figures and tables will aid authors in report arrangement.


**USAFETAC–TN–72–3** (AD–NONE) Incorporated in AWS/TI–79/001.Listing of Seminars Available at AWS Wings, February 1972, 31 pgs. This Technical Note is issued to provide Air Weather Service units with a listing of prepared seminars that are available at AWS wing level.

**USAFETAC–TN–72–4** (AD738594) *A Selected Annotated Bibliography on the Tropopause*, by Sgt. Larry N. Huff, February 1972, 35pp. Contains over 100 items. Entries include brief abstract. Language in which references are available noted, along with library reference or source. Articles published from 1956–1971 are included.


**USAFETAC–TN–72–7** (AD755402) *Random Error Variance and Covariance Estimates from Simultaneous Radar (FPS-16) Measurements*, by Donald R. Johnson and Gary Thompson, September 1972, 17pp. Technique of differences or replication modified so as to estimate pure random error variance and covariance components from simultaneous measurements, either by radar (FPS-16) or direction finding (AN/GMD-1A) observing systems. An example of random error variance estimation in simultaneous FPS-16 observations is presented. Technique applicable to determination of uncertainty of derived estimates from basic data, such as geographical position, wind, wind shear, Richardson number, etc.

**USAFETAC–TN–72–8** (AD755403) *An Operational Decision Model Employing Operational and Environmental Factors*, by Lt. Dana P. Hall, November 1972, 22pp. Model discusses combined conditional climatological probabilities, climatological probabilities, and operational loss values for specified actions in a way that allows for best operational decision. Sample scenario given and demonstrated, using hypothetical problem of airlift supply. Note: Available from DTIC in microfiche only.

**USAFETAC–TN–73–1** (ADA004535) *Interim Instructions for the Use of Air Stagnation Weather Charts and Messages*, by Valentine J. Descamps, revised by Capt. Don W. Janssen, June 1976, 21pp. Instructions and information herein will help forecasters interpret and tailor air stagnation facsimile charts and teletype messages to local requirements. Explains messages and charts available and covers their use. Procedures for overseas and domestic use included. Note: Operationally obsolete; for historical and research use only.
USAFETAC–TN–73–2 (AD768391) The Ocheltree Tornado: A Case Study, by Capt. William E. Finley, 1st Lt. Charles A. Perry, and S/Sgt. Billy W. Brown, March 1973, 35pp. A classic example of a midwestern United States tornado occurred near Richards-Gebaur AFB, Mo., on 1 May 1972 (GMT date) as an associated feature of a steady-state severe thunderstorm. This case study describes synoptic and mesoscale aspects of the situation using meteorological charts and diagrams and includes radar scene photographs from the AN/FPS–77 storm detection radar at Richards-Gebaur AFB. Included in photographs are several highly unusual range height indicator (RHI) sections through the parent thunderstorm and tornado tube. A partial survey of damage caused by the tornado included. Some suggestions to noncentralized weather forecasters for coping with an imminent tornadic thunderstorm presented in final section.

USAFETAC–TN–73–4 (AD762501) USAFETAC Refractive Index Gradient Summaries, by Allen R. Davis and Capt. Richard C. Wagner, April 1973, 15pp. Upper-air soundings are used to compute refractive-index gradients in the lower atmosphere that cause normal and anomalous propagation of radio waves. This note describes the computer-produced summaries of these gradients. Gradients described by height of base in discrete intervals, and give monthly distributions of the minimum gradient for each sounding.


USAFETAC–TN–73–6 (AD767214) A Resume on the State of the Art for Snow Forecasting, by SMSgt. Charles L. Brenton, Jr., July 1973, 28pp. Discusses various predictors and techniques used to forecast snowfall and to make distinction between frozen and liquid precipitation. Techniques applicable to shortrange, midrange, and extended-range forecasts. Includes 53 references on snow forecasting in the U.S.

USAFETAC–TN–74–1 (AD784814) Atmospheric Moisture Parameterization, by Capt. Robert D. Smith, January 1974, 26pp. There are requirements for estimation of the spatial distribution of liquid and solid water in the atmosphere. Evaluation of previous research indicates that the amount of water at a point can be approximated from the temperature and type of cloud at that point, along with the relative position of the point in the cloud. Thermodynamic phase of the water and what portion is liquid or solid can be generalized from the temperature of the point. Drop-size distribution can be determined by assuming that available water is found in distributions typical of various types of clouds.

USAFETAC–TN–74–2 (ADA056234) Development of a Gridded Data Base, by Capt. Robert G. Feddes, April 1974, 83pp. Appendix A, the 3DNEPH data base, Appendix B, analysis data base summary, Appendix C, the usefulness of the gridded conventional data base for climatic application. With the advent of numerical analysis adapted to a large computer system, global automated analysis of a variety of meteorological elements became operational at Air Force Global Weather Central (AFGWC). At USAFETAC, these gridded analyses are maintained as one of the historical data sets used to support a wide variety of data application requests. Gridded analyses now used at USAFETAC are in two distinct forms and include a global analysis of conventional elements and a global analysis of the cloud scene at a variety of standard analysis times. This note describes USAFETAC efforts in development of these historical data bases. Contains an explanatory appendix for each data base, as shown.

USAFETAC–TN–74–3 (ADA002117) A Precipitating Convective Cloud Model, by Capt. Robert D. Smith, May 1974, 51pp. Model presenting a physical depiction of a precipitating convective cloud is explained in detail. Mathematical computations shown, and computer program given. Program uses the primitive equations with initial conditions to compute desired atmospheric elements in two dimensions at some later time. Initial conditions defined by reference temperature, surface temperature, temperature change with height, surface wind, wind shear, and moisture distribution. Model limitations defined by grid interval, grid size, maximum simulated time, and maximum number of iterations.

USAFETAC–TN–74–4 (ADA002118) A Synoptic-Scale Model for Simulating Condensed Atmospheric Moisture, by Capt. Robert G. Feddes, June 1974, 26pp. Determination of a synoptic-scale model for simulating condensed atmospheric moisture by USAFETAC Scientific Services Branch and applications for which model may be used are detailed. Study treats the use of gridded inputs to perform the environmental simulations and explains use of two portions of a data base maintained by USAFETAC. The two data bases are a global cloud analysis (3DNEPH) and a global analysis of conventional elements. Input to the model includes low, middle, high, or convective cloud types (3DNEPH), layered cloud amounts (3DNEPH), present weather conditions (3DNEPH), base, tops and midpoints of layers (AFGWC model terrain), and temperature and D-value profiles (AFGWC gridded hemispheric analyses).
USAFETAC–TN–75–1 (ADA004097) **Estimated Improvement in Forecasts of the SANBAR Hurricane Model Using the Airborne Weather Reconnaissance System (AWRS),** by Capt. Albert R. Boehm, January 1975, 13pp. SANBAR is a one level, barotropic model that forecasts hurricane position. Inputs such as storm movement and maximum winds were selectively varied to measure sensitivity to errors. SANBAR is most sensitive to movement error and somewhat sensitive to errors in maximum wind. Movement error depends primarily on errors in successive storm fixes. Knowing the current aircraft error, forecast error can be split into modeling error and observational error. Using new Airborne Weather Reconnaissance System observations, the SANBAR 24-hour mean vector error is expected to be 60 vs the current 113 NM.


USAFETAC–TN–76–1 Not used.

USAFETAC–TN–76–2 (ADA070154) **Some Aspects of Estimating the Probability of Cloud-Free Lines-of-Sight in Dynamic Situations,** by Ronald J. Nelson and Mead B. Wetherbe, March 1976, 51pp. Dynamic cloudfree line-of-sight (CFLOS) problems involve either moving points between which the line-of-sight is to be assessed or a time during which the line-of-sight between two points, moving or stationary, is to be assessed. There are no adequate assessment techniques available for these kinds of problems. As a preliminary step toward developing required techniques, variables associated with certain types of dynamic CFLOS problems are examined, and a computer program that models space/time aspects of these types is presented.


USAFETAC–TN–77–1 Not used.


USAFETAC–TN–77–3 (ADA321340) **Soil Moisture Agrometeorological Services,** by Maj. William J. Sturm, June 1977, 33pp. Provides a technical synopsis of the automated programs used operationally by USAFETAC to satisfy agrometeorological requirements. Describes the Thomwaite Bookkeeping Method and the Penman Radiation Equations. Either method fully develops all steps used to produce final results used to monitor crop conditions around the world.


USAFETAC–TN–77–5 (AD–NONE) **Computation of Solar Declination, the Solar Azimuth Angle, and the Equation of Time,** by Capt. Richard A. Goldsmith, September 1977, 31pp. Prepared as part of USAFETAC’S WWMCCS support to U.S. European Command. Gives procedures for applying Kepler’s Equation to the earth’s orbit, computing solar declination, with test results. Develops method for evaluating results of standard equation used to compute solar azimuth angle. Updates an equation used previously to compute equation of time. Note: Operationally obsolete; for historical and research use only. Not available from DTIC. Note: Subroutine SSSFTD has changes in lines 1460C, 1470C, 1530C, 1540C, 1550C, and 1790. Subroutine COUNT (page 19) has been excised. Subroutine EQUATI has also been excised. Subroutine Time (page 22) has changes in lines 4560 and 4580. Function DECLIN and Function SPRING (page 24) has also been excised.

USAFETAC/TN--78/002 (ADA059874) A Technique for Estimating Clock Two-Hourly Precipitation Rate Distributions, by Capt. Daniel J. McMorrow, May 1978, 18pp. Clock two-hourly precipitation rate distributions can be derived from distributions of clock-hourly precipitation rate distribution by using negative exponential functions. Analytical conversions are provided for 16 climatic regimes in CONUS and Alaska. Clock-hourly and two-hourly precipitation rate distributions also compared with instantaneous distributions measured over horizontal paths.


USAFETAC/TN--80/001 (ADA085733) Wind Factor Simulation Model; Model Description, by Maj. Roger C. Whiton and Capt. Patrick L. Herod, April 1980, 30pp. A simplified, small and efficient wind factor simulation (WFSM) is developed for inclusion in a Military Airlift Command (MAC) airlift system simulation called Colossus. The WFSM calculates climatological wind factors by Sawyer’s equivalent headwind technique for arbitrary great circle routes at specified altitudes for any of four seasons in any of three wind options. This technique is combined with the mathematics of great circle navigation in a constellation of seven FORTRAN subprograms. In the WFSM, a simulated aircraft is navigated along a great circle route between any two points on the globe. Involved in the mathematics of the navigation is solving the evaluation of a great circle. This equation is sometimes transcendental. In these cases, Newton’s iterative method for the solution of nonlinear algebraic equations is used. The WFSM also calculates the great circle distance in nautical miles and the initial heading in degrees of any two points whose latitude and longitude are known.

USAFETAC/TN--80/002 (ADA085486) Wind Factor Simulation Model: User’s Manual, by Maj. Roger C. Whiton and Capt. Patrick L. Herod, April 1980, 46 pp. User instructions and a concise description are provided for a wind factor simulation model (WFSM). The WFSM is a fast, economical module designed to reside as a collection of subroutines within the user’s larger simulation model. The WFSM, upon call by the user, produces mean overall climatological wind factors for great circle routes between arbitrary points “a” and “b” (specified by latitude and longitude) anywhere on the globe. The WFSM produces wind factors in any of three modes (calm wind case, 90-percent worst case, and mean wind case), for either of two altitudes (25,000 and 35,000 feet) for any of four seasons of the year. In addition, the model can provide great circle distance between points “a” and “b.” From this information and known airspeed, the user can calculate ground speed and adjusted flying time between “a” and “b.” Software solves the equation of a great circle. Program listing and flow chart included.

USAFETAC/TN--80/003 (ADA096796) Bivariate Normal Wind Statistics Model: User’s Manual, by 2nd Lt. Benjamin Novograd, September 1980, 30pp. User instructions, sample input, sample output, and processing times are provided for USAFETAC/DND’s Wind Statistics Model. This model’s basic input consists of five wind statistics: Means and standard deviations of the zonal and meridional wind components, and the correlation coefficient of these components. The model uses a bivariate normal distribution of these wind components to generate its output. The model’s users can interactively select one or several of its output options. Each option generates a different type of output. The available options include: points on an elliptical probability contour, the probability of a range of wind directions, the probability of a range of wind speeds, the joint probability of a range of wind speeds and directions, new basic wind statistics, using a rotated coordinate system, and the conditional probability of a range of wind speeds given a wind direction.

USAFETAC/TN--80/004 (ADA093196) The Rank Input Method and Probability Variation Guides, by Maj. Albert R. Boehm, July 1980, 13pp. The rank input method allows a forecaster’s subjective estimate to be quantified into a probability forecast. The forecaster’s estimate can be a rank input, a probability of a single category, or a categorical forecast. With the rank input, the forecaster ranks the synoptic situation—very bad to very good—in relation to the element to be forecast; e.g., surface visibility. The transnormalized regression probability model is then used to calculate the probability of the specific event. Probability of a single category can be converted to probabilities for one or more different categories. A categorical forecast can be converted to probability forecasts. A validation during REFORGER 78 concluded that the method shows promise and that forecasters were able to produce a large number of probability forecasts with a few simple rankings of the synoptic situation. Probability variation guides are tables giving forecast probability values for various inputs. Plotted on a simple graph, all values for a given skill and climatology fall along a single curve in probability space. These curves make certain decision analysis theorems much simpler in form.

USAFETAC/TN--81/001 (ADA097048) Soil Moisture and Agromet Models, by Capt. Marvin A. Cochrane, Jr., March 1981, 36pp. Two automated models, known as soil moisture and Agromet, used operationally to monitor crop growing conditions, are described. The soil moisture model uses Thornthwaite’s water balance method to
estimate moisture variables from daily temperature and precipitation analyses. The model is relatively simple and has been providing useful information for over 20 years. The newer and more complex Agromet model estimates daily evaporation potential using Penman’s equation. This model also uses a complex cloud analysis to estimate radiation effects. Agromet provides daily grid-point analyses of temperature, precipitation, snow depth, radiation, and evaporation.

USAFETAC/TN--81/002 (ADB066230) Simulated Weather Impact Indicators: A Decision Assistance Technique Applied to Probability Forecasts of Weather Threshold for REFORGER 77 Exercises, by Gary O’Connor, Roger C. Whiton, Albert R. Boehm, and Capt. Emil M. Berecek, June 1981, 39pp. USAFETAC provided tables of Simulated Weather Impact Indicators (SWIIs) in support of REFORGER 77. Report describes development of those tables, and their uses. Tables applicable for four threshold values of weather elements at 111 grid locations. SWIIs produced independent of any weapons system consideration. Weather forecasters could use SWIIs as forecast aids when tailored probability forecasts are required. Planners could use SWIIs along with weighting factors for a particular weapons system. SWIIs helped decision-makers by providing “yes/no” or “go/no go” forecasts based on probability theory. Distribution authorized to U.S. Government Agencies only; Administrative/Operational Use; 13 May 1981.

USAFETAC/TN--81/003 Not used.

USAFETAC/TN--81/004 (ADA113540) Cloud Forecast Simulation Model, by Maj. Roger C. Whiton, Capt. Emil M. Berecek, and 1st Lt. John C. Sladen, October 1981, 134pp. The model generates synthetic worldwide 3-hour total cloud cover forecast fields at 50-nautical mile resolution. Synthetic forecasts are generated stochastically, based on input verifying “observed” total cloud cover fields, in such a manner that the agreement between the synthetic cloud forecast field and its verifying observed field is no better nor worse than the agreement between actual cloud prognoses and their verifying observations. Moreover, a sawtooth wave submodel is used to ensure the synthetic cloud forecast fields have the same spatial correlation as do actual cloud prognoses. Therefore, the cloud forecast simulation model generates synthetic total cloud cover forecast fields that have the same skill and spatial correlation as the operational forecast product. The model is used to generate meteorological input to system planning and optimization simulations and system design studies. The sawtooth wave submodel could also be used to generate synthetic two-dimensional observed weather fields as well as cloud forecasts.

USAFETAC/TN--82/001 (ADA118425) A Comparison of the AFGL FLASH, Draper DART and AWS Haze Models With the RAND WETTA Model for Calculating Atmospheric Contrast Reduction, by Dr. Patrick J. Breitling, March 1982, 55pp. In 1975, USAFETAC was tasked to develop a model to calculate lock-on range for TV-guided precision guided munitions. Investigation revealed availability of several models for calculating contrast reduction by the atmosphere. These models, the Air Force Geophysics Lab (AFGL) FLASH model, the AWS Haze model, the Draper Lab DART model, and the Rand Corporation WETTA model, were compared with one another using the same input data. The FLASH Monte Carlo model was assumed as the standard for the comparison. Visible contrast transmission values were computed for all models for a TV sensor at 12,000 feet AGL, for two mixing depths (200 and 1,500 meters), two visibilities (5 and 23 kilometers), three solar zeniths (20, 60, and 85 degrees), three albedos (.06, .18, and .80), and seven dive angles: (85, 70, 50, 30, 20, 10 and 7 degrees). If one accounts for the difference in optical depths that results from Huschke’s (Rand Corp.) stairstep treatment of vertical extinction coefficients, his model does an acceptable job of approximating flash contrast transmission values for a visibility of 23 kilometers. With 5-km visibility, agreement is not as good due to combination of mathematical and geometrical factors.

USAFETAC/TN--82/002 Not used.

USAFETAC/TN--82/003 (ADA118429) Objective Analysis of Climatological Probability Data, by Maj. Bryan E. Lilius, 1st Lt. Frederick C. Wirsing, and 2nd Lt. Robert M. Cox, July 1982, 105pp. Describes method for compacting, accessing, and analyzing ceiling/visibility probability data. Unconditional cumulative probabilities over the southern half of West Germany are analyzed. Technique used to compact data uses less than 1/8 computer storage normally required. Accuracy of data only slightly impaired. Three objective analysis algorithms were investigated: Barnes, Janola, and nearest neighbor. The Barnes method performed best. Independent data were estimated, using this technique with a mean error of 3.2 percent.

USAFETAC/TN--82/004 (ADA123342) Basic Techniques in Environmental Simulation, by Lt. Col. Roger C. Whiton and Capt. Emil M. Berecek, July 1982, 144pp. Environmental simulation modeling defined as the generation of synthetic weather observations and forecasts by use of mathematical/statistical models. Basic concepts in environmental simulation modeling are described, with emphasis on underlying statistical fundamentals, stochastic processes, and Markov processes. Four principle environmental simulation models and their application described in detail. Treatment begins with the single-variable, single-station model, V1S1, and is extended to the two-variable, singlestation model V2S1. The multivariate triangular matrix model, Multri, is then discussed; that model is capable of generating vectors of a
correlated variables. Case study presented showing application of Multri to modeling point sky cover distributions at station pairs or at a single station for n lag times. Most complex model in the series of four is the 2-dimensional field simulation model, 2DFLD, capable of producing spatially correlated, synthetic, two-dimensional fields or networks or variables. Statistical methods used in developing environmental simulation models are described, with particular emphasis on how to fit probability distribution functions to weather variables.

USAFETAC/TN--82/005 (ADA123280) *The Theory and Use of a Raytracing Model Developed at USAFETAC*, by Capt. Michael D. Abel, Maj. John D. Mill, and Capt. Charles T. Linn, September 1982, 102pp. Describes the theory and use of the USAFETAC ray trace model (RAYTRA). In this model, atmospheric refraction is calculated using geometric optics and a single atmospheric profile. This program allows the user to define an arbitrary path geometry in the atmosphere anywhere from the earth’s surface to space. In its present form ionospheric effects are ignored. Its use is restricted to frequencies between 30khz (wavelength 10 km) and 1,500 hz (wavelength 0.2 m). For frequencies between 115 ghz (wavelength 0.25 cm) and the (wavelength 20m), model results should be accepted with caution. The model itself is unique in its flexibility of application and special numerical techniques which enable it to compute types of ray paths which some models cannot handle. Furthermore, the code is structured in a modular, “top down” fashion to allow for ease in modification and program maintenance. It has the capability to utilize user input atmospheric data or data from USAFETAC archived weather tapes. Actual ray plotting is not provided. Instead, added information on the net atmospheric refractive effect such as range error is included in output along with a summary of input variables.

USAFETAC/TN--82/006 (ADA123352) *Atmospheric Transport and Dispersion Model: User’s Manual*, by 1st Lt. Robert M. Cox, October 1982, 22pp. The atmospheric transport and dispersion model (ATAD) is oriented to transport and dispersion studies. It can calculate trajectories of 5-days’ duration either forward or backward in time at 6-hour intervals during any selected period for any number of requested locations. The individual trajectories are calculated using transport winds averaged in a vertical layer. There are various optional and standard output characteristics. They include tables of transport layer depth, maximum vertical wind shear, trajectory positions, trajectory plots, and surface air concentrations. This program developed for IBM 4341 computer with OS operating system.


USAFETAC/TN--83/001 (ADA132186) *An Aid for Using the Revised Uniform Summary of Surface Weather Observations (RUSSWOs)*, June 1983, 69pp. Note designed to acquaint forecasters, primarily at detachment level, with the use of the RUSSWO prepared by USAFETAC. Includes brief explanation of each part of the RUSSWO, together with reproductions of selected summaries. Exercises that stress procedures for extracting key climatic data included for each reproduced climatological data summary. Some exercises introduce techniques for obtaining data not tabulated directly in the RUSSWO.

USAFETAC/TN--83/002 Not used.

USAFETAC/TN--83/003 (ADA168056) *Ceiling/Visibility Simulation Model, Analysts’s Manual*, by Maj. Emil M. Berecek, December 1983, 120pp. Describes a ceiling/visibility simulation model (WEASIM), designed to be a resident weather simulator within larger host simulation models. The model generates synthetic ceiling and visibility observations at multiple locations. WEASIM preserves the unconditional probabilities of occurrence of ceiling and visibility, as well as the temporal, spatial, and crossvariable correlations. The ceiling/visibility simulation model is “tuned” to a particular geographic area by inputting modeling coefficients and correlation parameters specifically determined from observed weather data from that area.


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**USAFETAC/TN--85/001** (ADA160144) *Low-Level Wind Systems in the Warsaw Pact Countries*, by Wayne E. McCollom, Kenneth R. Walters, Ronald W. Coyle, Capt. Eleanor L. Smith, and TSgt. George E. Elder, March 1985, 56pp. A comprehensive survey of local, low-level wind systems in the Warsaw Pact and adjacent NATO/neutral countries. Region surveyed divided into two geographical areas that cover most of Europe. Local winds named, described, and related to meteorological definitions. Distinctive wind characteristics identified for specific local winds or their locale. Maps showing distribution and locations of local wind systems included. Extensive lists of locally named winds and descriptions. Includes figures, bibliography, and mathematical solution of mountain or standing wave lengths.

**USAFETAC/TN--85/002** (ADA159989) *Central American Climatology*, by T. Jonathan Whiteside, USAFETAC/OL-A, Asheville, N.C., April 1985, 162pp. A presentation of climatological information for the Central American region from Guatemala and Belize southward through Panama. Includes narrative descriptions of Central American climate and weather, to include major synoptic features, precipitation, psychrometric, cloudiness, visibility, surface winds, thunderstorms, fog, and haze. Also includes astronomical, tidal, and seismic data, along with contoured climatological charts and climatological data tables. Primarily addresses surface weather data, but includes some upper atmospheric data.

**USAFETAC/TN--85/003** (ADB099413) *Electro Optical/Meteorological Simulation Model*, by Capt. Jack R. Stickel, Det. 4, 11th WS, August 1985, 173pp. Describes results of a pilot study to simulate electrooptical and meteorological variables; based on the NATO Optical Atmospheric Quantities in Europe (OPAQUE) project. The EO/MET simulator generates simultaneous synthetic measurements of visual attenuation, visual extinction, infrared transmittance, cloud cover, wind speed, relative humidity, temperature, dew point, and aerosol infrared extinction. The study involved two distinct steps: (1) A data study to investigate the underlying probability distributions, serial correlation, and cross-correlations of key weather and electrooptical variables, and (2) Building and testing a simulation model based on the results of the data study. Data analysis includes both raw and derived variables.

**USAFETAC/TN--85/004** (ADB099412) *Central American Flying Weather*, by Kenneth R. Walters, USAF, Air Weather Service (MAC), Environmental Technical Applications Center, Scott AFB, ILL, December 1985, 18pp. A summary of flying weather in Honduras, El Salvador, Nicaragua, and Costa Rica, prepared by a meteorologist from interviews with highly experienced civil and military pilots and meteorologists in Honduras and Costa Rica. Flying weather in defined areas is described for each of the climatological seasons—seasons that do not necessarily match calendar seasons or North American temperate zone seasons. The author drew upon pilot/forecaster interviews, USAFETAC/TN--85/002, and his own 30 years’ experience as an aviation meteorologist in preparing this report. Primary emphasis, however, was on the interviews.


**USAFETAC/TN--86/002** (ADA174247) *Optimum Period of Record*, by Ronald Rodney, USAFETAC, OLA, July 1986, 26pp. Percentage frequency of occurrence of ceilings and visibilities (as well as monthly means of temperature, precipitation, and pressure) is examined for relative and representative application to current climatology. Several U.S. and overseas locations showed climatological changes that rendered normals ineffective as tools for describing or predicting current weather conditions. Monthly values compared to running means for 1 to 31 antecedent years. Mean closest to actual value tallied as “best.” This scoring system applied to periods of record beginning as early as 1700s, usually showed that shorter means (1 to 7 years) were frequently closer to actual values.

**USAFETAC/TN--86/003** (ADB130894) *Directory of Climatic Databases Available from OL-A*, USAFETAC, superceded by AFCCC/TN--96/001, ADA304246, dated January 1996. A directory of climatic databases available from OL-A, AFCCC. Brief descriptions of each database give potential users enough information to determine which database meets their particular application requirements. Explains derivation, elements, geographic area, period of record, data set specifications, file size, update frequency, and quality control for each database.
USAFETAC/TN--88/001 (ADB118951) *A Descriptive Climatology for BaleDogle, Somalia*, by Kenneth R. Walters, Sr., January 1988, 23pp. A descriptive climatology study for the summer season (June, July, August), at BaleDogle (also Ballie Doogle), Somalia, east central Africa. Local forecasting applications and suggestions are included. This study was prepared by combining the resources of the Air Force Weather Technical Library (AFWTL) and the worldwide USAFETAC weather observation database with a limited series of weather observations taken in place. Distribution authorized to DoD Components only, Administrative or Operational use, 2 March 1987. Other request for this document shall be referred to AFCCC/DOR 151 Patton Ave., Room 120, Asheville NC 28801-5002.

USAFETAC/TN--88/002 (ADB124124) *The Persian Gulf Region—A Climatological Study*, by Kenneth R. Walters, Jr, and Capt. William F. Sjoberg, May 1988. A climatological study of the Persian (or Arabian) Gulf, the Strait of Hormuz, the Gulf of Oman, and their adjacent land areas, including Iraq, Iran, Kuwait, Bahrain, the United Arab Emirates, and Oman. Describes general geography of the area. Discusses “semipermanent climatic controls” and “transitory synoptic features” for each of four climatological regimes or seasons: the northeast monsoon (December-March), the spring transition (April-May), the southwest monsoon (June-September), and the fall transition (October- November). Discusses “mesoscale synoptic features,” “typical weather,” and “sea surface conditions” for each of these seasons as they affect each of four climatologically similar subregions of the Persian Gulf. Distribution authorized to U.S. Government Agencies and their contractors; Administrative or Operational use, 7 August 1987. Other request for this document shall be referred to AFCCC/DOR 151 Patton Ave., Rm. 120, Asheville NC 28801-5002.

USAFETAC/TN--88/003 (ADB119239) *Persian Gulf Transmittance Study in the 8–12 Micron Band*, by Capt. Patrick M. Condray and Maj. Roger T. Edson, February 1988, 34pp. LOWTRAN6 was used to compute climatologies of atmospheric transmittance in the 8–12 micron frequency band for 12 stations in the Persian Gulf area over 4- to 10-year periods of record, depending on data availability. A standard geometry of 125 meters (410 feet) AGL sensor height and a 4 km (2.16 mile) slant range was assumed. The 12 stations were combined into four different regions, each with distinct climatological transmittance features. The four regions are: High Desert, Low Desert, Persian Gulf Coast, and Gulf of Oman. Results appeared to be directly related to monthly mean dew points (absolute humidity). There was some diurnal dependence in the data for most regions, with a minimum mean transmittance in the morning; the exception was in the Gulf of Oman region, which showed almost no diurnal change during the southwest monsoon. Unlike similar studies done in the mid-latitudes, where precipitation and fog events are more frequent, the relative frequency of occurrence for bad to good transmittance values was generally unimodal. Distribution authorized to U.S. government agencies and their contractors only, critical technology, January 25, 1988. Other requests for this document shall be referred to AFCCC/DOR, 151 Patton Ave., Room 120, Asheville NC 28801-5002. WARNING—this document contains technical data whose export is restricted by the Arms Control Act (Title 22, U.S.C., Sec 2751 et seq) or the Export Administration Act of 1979, as amended (Title 50, U.S.C., App. 2401, et seq). Violations of these export laws are subject to severe criminal penalties. Disseminate in accordance with the provisions of AFI 61–204.


USAFETAC/TN--88/005 (Revised) (ADA263173) *Seasonal Snowfall Statistics for Selected Stations*, revised by SSgt. Debra L. Runyon in January 1993, 36pp. A convenient reference to snowfall statistics at 63 selected stations worldwide. Revised data is for the 10-year period from 1980 to 1990. Total snowfall amounts for each season (defined as July of one year to June of the next) is provided, along with 24-hour snowfall extremes and dates. Seasonal means and standard deviations also given. All values in inches.

USAFETAC/TN--88/006 (ADA203969) *Global Snow Depth Climatology*, by Dudley J. Foster, Jr., and Robert D. Davy, December 1988, 49pp. Describes the USAF Environmental Technical Applications Center’s (USAFETAC’s) Global Snow Depth Climatic Database; tells how the database was created and how it can be updated. Also tells potential users of the Snow Depth Database how to order data. Contoured charts that show mean mid-month snow depths for September through June in North America, Europe, and Asia are included in an appendix.

Describes USAFETAC’s Modeled Ceiling and Visibility (MODCV) computer program. Explains how cumulative distributions of ceiling and visibility are modeled with Weibull and reverse Weibull curves, which are used to produce unconditional probabilities and, with an Orstein-Uhlenbeck process, conditional climatologies for ceiling, visibility, and joint ceiling and visibility. Output is in tabular format by category and time lag.

**USAFETAC/TN—89/002 (ADB130896) CVOF (Ceiling and Visibility Observation and Forecast) Program Users Guide**, by 1st Lt John A. Rupp, February 1989, 35pp. A users guide for USAFETAC’s Ceiling and Visibility Observation and Forecast (CVOF) simulation model. CVOF was developed (as a weather submodel) for the Air Force Center for Studies and Analysis (AFSCA), which used CVOF in its larger host model, TAC THUNDER. CVOF is an upgrade of an earlier ceiling and visibility simulator called WEASIM I; CVOF produces observations and forecasts, while WEASIM I was only capable of observations. CVOF uses the four-dimensional sawtooth wave model to produce a synthetic observation and forecast of ceiling and visibility at each user-specified time step. Appendices provide examples of the three required input files. Distribution authorized to DoD Components only, critical technology, 17 October 1988. Other request for this document shall be referred to AFCCC/DOO, 151 Patton Ave, Rm-120, Asheville, NC 28801-5002.

**USAFETAC/TN—89/003 (ADA222267) The Caribbean Basin—A Climatological Study**, by Kenneth R. Walters, Sr., 1st Lt. Andrew G. Korik, and 1st Lt. Michael J. Vojtesak, December 1989, 342pp. A climatological study of the Caribbean Basin, an area that includes Central America, the West Indies, and northern South America. After describing the general geography of land areas in the Caribbean Basin, the report discusses major meteorological features of the entire study area. The geography and major climatic controls in each of the three major regions that constitute the Basin are discussed, and each major region is broken into several subregions of “climatic commonality.” Finally, the four so-called “seasons” in each of these subregions are discussed in considerable detail, with sections on “semipermanent climatic controls,” “mesoscale and local effects,” and “typical weather.”

**USAFETAC/TN—89/004 (ADB135616) The Caribbean Basin—An Electrooptical Climatology for the 8–12 Micron Band, Volume I—Central America**, by Capt. Patrick M. Condray and Maj. Roger T. Edson, July 1989, 159pp. A report on a comprehensive electro-optical climatology study for Central America. The study was developed by combining important “conventional” weather elements (clouds, precipitation, and fog) with climatologies of atmospheric transmittance in the 8–12 micron band. The transmittance climatologies were computed by the LOWTRAN6 computer model, using 21 stations with periods of record that varied from 6 to 14 years. A standard geometry of a 12.5-meter (410-foot) AGL sensor height and a 4-km (2.16-NM) slant range with a cloud-free line-of-sight were assumed for the transmittance calculations. The 21 stations used were combined into seven regions, each with its own distinctive electro-optical climatology. The seven regions are the Yucatan Plains, the Western Yucatan, the Central American Mountains, the Caribbean Coastal Plain, the Pacific Coastal Plain, the Nicaraguan Lakes, and Eastern Panama. As noted in earlier transmittance studies, the most important single influence on transmittance is the variation in mean absolute humidity. Local topography is also an important influence, setting up local effects (such as orographic lift and land-sea breezes) that change the diurnal variation of transmittance from region to region. Humid sea breezes, for example, lower afternoon transmittances near seacoasts while inland conditions improve when there is convective mixing with drier air aloft. At times, favorable transmittance conditions are observed with unfavorable low ceilings, and vice-versa. Distribution authorized to U.S. government agencies and their contractors, critical technology, May 1989. Other requests for this document shall be referred to AFCCC/DOO, 151 Patton Ave, Room 120, Asheville NC 28801–5002.

**USAFETAC/TN—89/005 (ADB137470) The Caribbean Basin—An Electrooptical Climatology for the 8–12 Micron Band, Volume II—The West Indies**, by Maj. Roger T. Edson and Capt. Patrick M. Condray, August 1989, 139pp. A report on a comprehensive electro-optical climatology study for the West Indies. The study was developed by combining important “conventional” weather elements (clouds, precipitation, and fog) with climatologies or atmospheric transmittance in the 8–12 micron band. The transmittance climatologies were computed by the LOWTRAN6 computer model, using 21 stations with periods of record that varied from 4 to 14 years. A standard geometry of a 125-meter (410-foot) AGL sensor height and a 4-km (2.16-NM) slant range with a cloud-free line-of-sight were assumed for the transmittance calculations. The 21 stations used were combined into six regions, each with its own distinctive electro-optical climatology. The six regions are: Northwest Cuba, Caribbean Open Waters, Greater Antilles Windward, Greater Antilles Leeward, Lesser Antilles, and Trinidad/Tobago. As noted in earlier transmittance studies, the most important single influence on transmittance is the variation in mean absolute humidity. Local geography is also an important influence, setting up local effects (such as orographic lift and land-sea breezes) that change the diurnal variation of transmittance from region to region. The consistent trade wind now produces windward and leeward effects on
mountainous islands, with more precipitation and slightly higher absolute humidities producing lower transmittances on the windward sides. At times, favorable transmittance conditions are canceled by unfavorable ceilings, and vice-versa. Distribution authorized to U.S. government agencies and their contractors, critical technology, May 1989. Other requests for this document shall be referred to AFCCC/DOO, 151 Patton Ave., Room 120., Asheville NC 28801–5002.

USAFETAC/TN--89/006 (ADA144538) The Caribbean Basin—An Electrooptical Climatology for the 8–12 Micron Band, Volume III—Northern South America, by Maj. Roger T. Edson and Capt. Patrick M. Condray, December 1989, 250pp. A report on a comprehensive electro-optical climatology study for northern South America. The study was developed by combining important “conventional” weather elements (clouds, precipitation, and fog) with climatologies of atmospheric transmittance in the 8–12 micron band. Transmittance climatologies were computed by the LOWTRAN computer model, using 30 stations with periods of record that varied from 4 to 14 years. A standard geometry of a 125-meter (410-foot) AGL sensor height and a 4-km (2.16-NM) slant range with a cloudfree line-of-sight were assumed for transmittance calculations. The 30 stations used were combined into 12 regions, each with its own distinctive electro-optical climatology. The 12 regions are: the Colombian Caribbean Coast, the Venezuelan North Coast, the Lake Maracaibo Basin, the Venezuelan Andes, the Orinoco River Basin, the Guyana Coastal Plain, the Guyana and Colombian Highland, the Andes Mountains, the Colombian Pacific Coast, the Equadorian Pacific Coast, the Eastern Amazon Basin, and the Western Amazon Basin. As noted in earlier transmittance studies, the most important single influence on transmittance is the variation in mean absolute humidity. The seasonal shifting of the mean trough position (monsoon trough west of the Andes, equatorial trough east of the Andes) is an important influence that drives the seasonal wet/dry cycle (which varies from region to region) and brings lower transmittances through enhanced rainfall and higher absolute humidities. At times, favorable transmittance conditions are canceled by unfavorable ceilings, and vice-versa. Distribution authorized to U.S. government agencies and their contractors, critical technology, May 1989. Other requests for this document shall be referred to AFCCC/DOO, 151 Patton Ave., Room 120., Asheville NC 28801–5002.


USAFETAC/TN--90/001 (ADA222574) Conditional Climatology of Ap, The relationship between Solar-Flares and Geomagnetic Storms, by Capt. Donald L. Wilson and Maj. Roger T. Edson, February 1990, 99pp. Documents a study of USAFETAC’s optical solar flare database and its relationship to Göttingen’s planetary geomagnetic index (Ap). The study was based on solar flare data with an 11-year period of record (1975 to 1986—Solar Cycle 21). After solar flares and Ap indices were studied separately, more than 27,000 flare reports were merged with 3-hour Ap values for 7 days after each flare. The resultant dataset was analyzed with respect to certain flare characteristics (such as importance, brightness, duration, solar location, and phase of the solar cycle) to find the best predictor of geomagnetic storming. The results were summarized in contingency tables (provided in Appendix B) for use as solar forecasting aids. Some flares were found to have more of an influence on the earth’s geomagnetic field than others. Of all the features studied, a flare’s importance and location on the disk seemed to be the best predictors of geomagnetic storming.

USAFETAC/TN--90/002 (ADA222094) A LOWTRAN7 Sensitivity Study in the 8–12 and 3-5 Micron Bands, Includes comparison with LOWTRAN6 results. by Capt. Patrick M. Condray, February 1990, 22pp. More than 750 runs of LOWTRAN7 were made to determine how variations in certain weather variables (absolute humidity, relative humidity, wind speed, meteorological range, and precipitation) affect computed atmospheric transmittance in the 8–12 and 3–5 micron bands. This was done by changing the value of each of these weather variables, in turn, and observing the resulting change in transmittance calculations. About 30 LOWTRAN6 runs were made for comparison with the LOWTRAN7 output. Results for the 8–12 micron band showed that absolute humidity and precipitation produce the greatest decreases in transmittance. When the desert aerosol is used in LOWTRAN7, high wind speeds can produce low transmittances due to heavy dust loading. Meteorological range only becomes a strong factor in lowering transmittances when it drops below 2 km. Relative humidity is important when using the maritime aerosol, especially when it exceeds 70 percent.

USAFETAC/TN--90/003 (ADA22266) CLDGEN Users Guide, by Capt. John A. Rupp, April 1990, 17pp. Tells how to use USAFETAC’s Cloud Scene Generator (CLDGEN) computer subroutine. Explains capabilities and limitations of the subroutine, with instructions for installing and running it on the user’s computer system. Output from the subroutine is used by a user-supplied host program to tabulate statistics on cloud effects.
USAFETAC/TN--90/004 (ADA229375) SWANEA (Southwest Asia-Northeast Africa)—A Climatological Study, Volume I—The Horn of Africa, by 1st Lt. Michael J. Vojtesak, 1st Lt. Kevin P. Martin, and TSgt. Gregory Myles, June 1990, 242pp. The first in a four volume series that describes the climatology of a region known as “SWANEA,” an acronym for “Southwest Asia and Northeast Africa.” Volume I describes a subregion of SWANEA known as “the Horn of Africa,” an area that, for this study, has been divided into four other subregions of “climatic commonality.” After describing the general geography of the Horn of Africa, the report discusses major meteorological features, including semipermanent climatic controls, synoptic disturbances, and mesoscale and local features. Finally, the four so-called “seasons” in each of the Horn’s four climatically similar subregions are discussed in detail.

USAFETAC/TN--90/005 (ADA229028) Wet-Bulb Globe Temperature—A Global Climatology, October 1990 23pp. Wet-bulb globe temperature climatology for three major areas of the globe (North and South America, Africa, and Asia) is provided as isolines plotted on four sets of charts for four months that represent the seasons in the northern and southern hemispheres.

USAFETAC/TN--91/001 (ADA233009) Glossary of AWS Acronyms—Acronyms, Initialisms, and Abbreviations Commonly Used in Air Weather Services, January 1991 58pp. by George M. Horn. A collection of acrinabs (acronyms, initialisms, and abbreviations) commonly used in the Air Force Air Weather Service. The acrinabs in this listing have been collected from a number of technical publications, journals, directives, and other glossaries. The collection is intended for use as a decoding device and should not be considered an authoritative source of spelling, exact meaning, or usage.

USAFETAC/TN--91/002 (ADA232776) SWANEA (Southwest Asia-Northeast Africa), A Climatological Study, Volume II The Middle East Peninsula, revised by TSgt. Kenneth R. Gibson in September 1992, 263pp. This report (the second in a four-volume-series) is a climatological study of the Middle East Peninsula, an area that includes the Red Sea Coastal Plains, the Arabian Desert, the Fertile Crescent, and the Persian Gulf Coastal Plains. It was revised to include additional information acquired during the August 1990-March 1991 Persian Gulf War. After describing the general geography of land areas in the Middle East Peninsula, the study discusses major meteorological features of the entire study area. Each major subregion (based on “climatic commonality”) is then broken into its own geography and general weather sections. Finally, each of the four so-called “seasons” in each of these subregions is discussed in detail.

USAFETAC/TN--91/003 (ADA240436) SWANEA (Southwest Asia Northeast Africa), A Climatological Study, Volume III The Near East Mountains, by Kenneth R. Walters, Sr., 1st Lt. Michael J. Vojtesak, Capt. Kevin P. Martin, TSgt. Gregory Myles, Michael T. Gilford, Capt. Kathleen M. Traxler, April 1991, 266pp. The third of four-volume series, this volume is a climatological study of the Near East Mountains: an area that includes Turkey (except for its Mediterranean and Aegean Sea coasts), Northern Iraq, Iran (except for its Persian Gulf and Arabian Sea coasts), Afghanistan, and Pakistan. After describing the general geography of land areas in the Near East Mountains, it discusses major meteorological features of the entire study area. Each major subregion (based on “climatic commonality”) is then broken into its own geography and general weather sections. Finally, the four so-called “seasons” in each of these subregions are discussed in detail.

USAFETAC/TN--91/004 (ADB159251) Wet-Bulb Temperature Computation, by Lt. Col. Roger C. Whiton, May 1991, 18pp. This technical note documents efforts by the USAF Environmental Technical Applications Center (USAFETAC) to develop an algorithm that would compute wet-bulb temperature from input pressure, dry-bulb temperature, and dewpoint temperature. After testing, the algorithm was delivered to USAFETAC’s Data Automation Branch for operational software development. It is recommended as a replacement for USAFETAC’s defective WTUBULB function.

USAFETAC/TN--91/005 (ADA240437) SWANEA (Southwest Asia Northeast Africa), A Climatological Study, Volume IV The Mediterranean Coast and Northeast Africa, by 1st Lt. Michael J. Vojtesak, Capt. Kathleen M. Traxler, Michael T. Gilford, Capt. Kevin P. Martin, and SSgt. Gordon Hepburn, July 1991, 236pp. The fourth in a four-volume series, this volume is a climatological study of the Mediterranean Coast and Northeast Africa, an area that includes the coastlines of western and southern Turkey through Libya, plus the countries of Egypt, Libya, Chad, and Sudan. After describing the general geography of these areas, it discusses the major meteorological features of the entire study region. Each major subregion (based on “climatic commonality”) is then broken into its own geography and general weather sections. Finally, the four so-called “seasons” in each of these subregions are discussed in detail.

a continuation of USAFETAC/TN--90/001, Conditional Climatology of Ap—The Relationship Between Solar Flares and Geomagnetic Storms. Instead of focusing solely on optical flares as in the first study, this report documents the relationship between Göttingen’s planetary geomagnetic index (Ap) and various other solar events, such as surges, prominences, filaments, radio bursts and x-ray events. The study is based on solar and Ap data with an 11-year period of record (1975 to 1986–Solar Cycle 21). Solar reports were merged with 3-hour Ap values for 7 days after each event. The resultant datasets were analyzed with respect to type, position on the sun, and size. Contingency tables of means and percent frequency distribution summarize the results.


USAFETAC/TN--92/004 (ADA259541) South America South of the Amazon River, A Climatological Study, by Michael T. Gilford, 1st Lt. Michael J. Vojtesak, MSgt. Gregory Myles, T Sgt. Richard C. Bonam, and Capt. David L. Martens, August 1992, 715pp. A climatological study of South America south of the Amazon River. The study area includes Brazil south of the Amazon, Peru south of 5 degrees south and south of the Maranon River, and the countries of Argentina, Bolivia, Chile, Paraguay, and Uruguay. It also includes the Falkland (Malvinas) Islands. After describing general geography, the report discusses the major meteorological features of South America. Next, the geography and major climatic controls of each of four major subregions (West Central, Tropical, Subtropical, and Southern South America) are discussed. Finally, each of the four subregions is broken into “zones of climatic commonality.” “Seasons,” which vary in each of these zones, are defined and discussed in considerable detail.

USAFETAC/TN--92/005 (ADA260139) Climatological Probability of Cloud-Free Line-of-Sight, by Capt. Anthony J. Warren, December 1992, 31pp. This report describes how the climatological frequency distribution of cloud-cover is obtained and used to compute the climatological probability of cloud-free line-of-sight, or CFLOS. The probabilities can be estimated for an instantaneous point in time or for a specified time window (i.e., the probability of a continuous CFLOS for a time period of t minutes). The procedures outlined in the report are used by the USAFETAC CPCFLOS computer program. An appendix describes the Burger Aerial Algorithm.


USAFETAC/TN--93/001 (ADA259841) Somalia Upper-Air Climatic Atlas, January 1993, 243pp. An atlas of tabular upper-air statistics for Somalia. Statistics are provided in three regional sets: Northern Somalia, Central Somalia, and Southern Somalia. Tables provide upper-air data (D-value, temperature, dew point, wind speed and direction) at levels from the surface to 10 millibars for specified 2.5 by 2.5 degree latitude/longitude grid points.

USAFETAC/TN--93/002 (ADA263083) Climate and Weather of Yugoslavia — Executive Summary, by Capt. Richard D. Arnold and Kenneth R. Walters, Sr., January 1993, 38pp. Provides a brief executive summary of annual weather and climatology for the region formerly known as Yugoslavia which, in 1992, was restructured politically into the countries of Slovenia, Croatia, Bosnia-Herzegovina, and Serbia.

USAFETAC/TN--93/003 (ADA266850) TAFVER II Users Manual, by Capt. Christopher A. Donahue, May 1993, 31pp. TAFVER II is an automated quality control program designed to provide headquarters staff (at Hq
USAF/XOW, Hq Air Weather Service, and the major command Directorates of Weather) a tool they can use to measure the quality of weather forecasting support provided by the Air Force weather community. The TAFVER II program, run by USAFETAC at Scott AFB, Ill., verifies all terminal aerodrome forecasts (TAFs) issued by Air Force weather forecasters, providing there are corresponding observations against which to verify them. TAFVER II accommodates customer-tailored output by incorporating command-unique category thresholds. This technical note tells users how the TAFVER II program verifies weather forecasts and explains the output statistics. Appendices provide major command verification categories and USAFETAC's weather station information databases.

USAFETAC/TN--93/004 (ADA269511) **Eastern Europe, A Climatological Study**, by Maj. Kathleen M. Traxler, et al., July 1993, 385pp. A climatological study of Eastern Europe, a region that comprises Poland, the Czech Republic, Slovakia, Hungary, Romania, the former Yugoslavia, Albania, Greece, Latvia, Lithuania, Estonia, Belarus, Moldova, Ukraine, Azerbaijan, Armenia, Georgia, and Turkey west of the Sea of Marmara; also Russia, Kazakhstan, Uzbekistan, and Turkmenistan west of 60 degrees east, including Novaya Zemlya. For this study, the entire region is divided into eight “zones of climatic commonality.” Europe, the study discusses major meteorological features of the entire region. Geography and the major climatic controls for each of the eight “climatic commonality zones” are then described. Finally, each season is defined and discussed in considerable detail, to include typical weather, clouds, visibility, winds, precipitation, temperature, and weather hazards.


USAFETAC/TN--94/002 (ADA280923) **USAFETAC Online Climatology Dial-In Service Users Manual**, by MSGt. Robert G. Pena. Users of the USAF Environmental Technical Applications Center (USAFETAC) climatological database are permitted online access to selected portions of that database through a new telephone dial-in service. USAFETAC Dial-In uses a batch-type communication technique called “Advance Program-to-Program Communication (APPC).” Dial-In works cooperatively with Network Software Associates AdaptSNA APPC to allow the flow of information between your computer and the USAFETAC mainframe. User hardware and software requirements include an IBM compatible 286 or better PC with at least 640 K of main memory, 1.5 MB of available hard-disk space, MS-DOS version 3.2 or better, EGA display (256 K) memory, and a Hayes-compatible 2400-baud modem. A Microsoft compatible mouse is highly recommended.

USAFETAC/TN--94/003 (ADA283779) **North Korea — A Climatological Study**, by Kenneth R. Walters, Sr., and Maj. Kathleen M. Traxler, August 1994, 120pp. A climatological study of North Korea, also known as “The Peoples Republic of Korea.” North Korea is separated from South Korea (The Republic of Korea) by the 38th Parallel. After a brief discussion of North Korea’s geography and major meteorological features, the study describes the general and specific weather of North Korea, season by season. An appendix provides summarized climatological data for 17 weather stations in North Korea.

USAFETAC/TN--94/004 (ADA283647) **Climate and Weather of Central Africa — Executive Summary**, by Kenneth R. Walters, Sr., and Maj. Kathleen M. Traxler, August 1994, 114pp. A brief executive summary that describes the weather and climatology of Central Africa, Rwanda, Burundi, and Zaire. For the purpose of this study, Zimbabwe (in southern Africa) has been included. Appendices provide summarized airfield weather data, parachute weather, and cloud ceiling frequencies.

USAFETAC/TN--94/005 (ADA289466) **Southern Africa — A Climatological Study**, by Maj. Kathleen M. Traxler, et al., December 1994, 217pp. A climatological study of Southern Africa, a region that comprises the Republic of South Africa, Zimbabwe, Namibia, Lesotho, Swaziland, Botswana, Madagascar, and the southern parts of Mozambique, Angola, Zaire, and Zambia. After describing the geography and major meteorological features of the entire study area, the study discusses the major climatic controls of each of Southern Africa’s six “zones of climatic commonality” in detail. Each “season” is defined and discussed in considerable detail, to include general weather, clouds, visibility, winds, precipitation, and temperature.

technical notes

general weather, clouds, visibility, winds, precipitation, temperature and other hazards.

USAFETAC/TN--95/002 (ADA302502) Estimating Ice Accumulation on Surface Structures, June 1995, by William R. Schaub, Jr., 33pp. Proposes several methods for estimating ice accretion on surface structures based on estimates of several atmospheric variables. Also provides information on types of structural icing, ice accretion theory, and ice accretion computer models.


AFCCC/TN--95/004 (ADA305466) A Comparison of Aircraft Icing Forecast Models, by Capt. Daniel Cornell, Capt. Christopher A. Donahue, and Capt. Chan Keith, December 1995, 40pp. Describes the results of a study that compared three operational algorithms for forecasting aircraft icing with actual pilot-reported icing. AFGWC’s RAOB software was best, with 67 percent of type forecasts and 42 percent of intensity forecasts agreeing with pilot reports. The greatest degree of error was associated with forecasts of clear and mixed icing, and with moderate icing.


AFCCC/TN--95/006 (ADA305431) Nationwide Lightning Climatology, by William R. Schaub, Jr., February 1996, 31pp. Documents lightning climatology developed by AFCCC for the CONUS. This climatology was developed from a database of cloud-to-ground lightning strikes that occurred from March through October 1986–90. Analysis of the lightning climatology showed that patterns of lightning strikes compared favorably with known preferred locations and times of thunderstorm development.

AFCCC/TN--96/003 (ADA315321) Lightning Climatology for Low-Level Flying Routes in the United States, by William R. Schaub, Jr., March 1996, 35pp. Documents lightning climatologies developed by AFCCC for regions of the central and western CONUS. This climatology was developed from a database of cloud-to-ground lightning strikes that occurred from March through October during 1986–91. Analysis of the lightning climatology showed that patterns of lightning strikes compared favorably with known preferred locations and times of thunderstorm development. It also showed that stratification of the lightning climatologies by 700-mb wind directions is useful in revealing locations of lightning-strike patterns and their movements.


AFCCC/TN--96/006 (ADA315325) Evaluation of the Homogeneity of Cloud Cover Climatology in Large Scale Regions, by Capt. Anthony J. Warren, and Charles R. Coffin, March 1996, 28pp. Documents a study AFCCC completed to evaluate the homogeneity of cloud cover distributions within 19 regions known as Consolidated Evaluation Groupings (CEGs). The sizes of these CEGs vary widely and are composed of a variable number of smaller regions known as Post Mission Evaluation Groupings (PMEs). AFCCC computed the monthly cloud-cover frequency distribution for each of the CEGs and PMEs from the Air Force's Real Time Nephanalysis (RTNEPH) database. In addition, AFCCC conducted a
statistical comparison of the PMEs within each CEG to measure the homogeneity of the cloud climatology.

AFCCC/TN--96/007 (ADA315323) Lightning Climatology for Maxwell AFB, Alabama, by William R. Schaub, Jr., March 1996, 28pp. Documents lightning climatology developed by AFCCC for Maxwell AFB, Ala. This climatology was developed from a database of cloud-to-ground lightning strikes that occurred from March through October 1986–91. Analysis of the lightning climatology showed that patterns of lightning strikes compared favorably with known preferred locations and times of thunderstorm development. It also showed that stratification of the lightning data by 700-mb wind directions and K-index values is useful in revealing locations of lightning-strike patterns and their movement.

AFCCC/TN--96/008 (ADA315322) Lightning Climatology for Nellis AFB, Nevada, by William R. Schaub, Jr., March 1996, 33pp. Documents a lightning climatology developed by AFCCC for Nellis AFB, Nev. This climatology was developed from a database of cloud-to-ground lightning strikes that occurred from March through October during 1986–91. Analysis of the lightning climatology showed that patterns of lightning strikes compared favorably with known preferred locations and times of thunderstorm development. It also showed that stratification of the lightning data by 700-mb wind directions is useful in revealing locations of lightning-strike patterns and their movement.

AFCCC/TN--96/009 (ADA315887) Glossary of German Meteorology, by Robert A. Van Veghel, May 1996, 52pp. Consists of a glossary of German words and terms related to meteorology and climatology. It is designed to assist meteorologists and climatologists in reading German or English bulletins and other weather related text.

AFCCC/TN--96/010 (ADA315336) Maxwell Air Force Base Thunderstorm Study, by Capt. Robert J. Falvey, June 1996, 34pp. Documents a study AFCCC completed to correlate various thunderstorm indices to the occurrence/non-occurrence of thunderstorms at Maxwell AFB, Ala. Eleven thunderstorm indices were used to determine statistically which, if any, of the indices could be used as predictors for occurrence/nonoccurrence of thunderstorms. The discriminate functions were verified against an independent data set consisting of upper-air data from Centerville, Ala., and surface data from both Maxwell AFB, Ala., and Montgomery, Ala. Six different sets of classification tables based on probability thresholds were produced from the output of the discriminate functions. The regression equations developed are useful if they are used as a tool—not as a forecast. The unbinned modified sounding regression has high skill scores, a low false alarm rate, a low percent missed, and a high probability of detection.

AFCCC/TN--96/011 (ADA320831) Consolidated Statistical Background, by Charles R. Coffin, November 1996, 118pp. This technical note is a compilation of several years’ worth of background papers covering a wide range of topics in statistics. Many sample SAS procedures are also included.

AFCCC/TN--96/012 (ADA315337) Northwest Africa, A Climatological Study, by Capt. Christopher A. Donahue, Capt. Luke D. Whitney, Kenneth R. Walters Sr., 2nd Lt. Kenneth P. Cloys, John W. Louter III, and MSGt. Charles D. Surls, August 1996, 126pp. A climatological study of Northwest Africa, including Algeria, Tunisia, Morocco, Western Sahara, and the northern parts of Mauritania, Mali, and Niger. After describing the general geography of land areas in Northwest Africa, the major meteorological features of the entire study area are discussed. The geography and major climatic controls of each of the two “climatic commonality” regions that constitute Northwest Africa are outlined in separate chapters, with a detailed description of each “season,” including typical weather, clouds, visibility, winds, precipitation, temperature, and additional hazards.


AFCCC/TN--97/002 (ADA383778, also ADA286961) East Asia, A Climatological Study Volume I: Continental, by Robert S. Lilianstrom, Melody L. Higdon, MSGt. Charles D. Surls, and MSgt Donald E. Carey, September 1997, 245pp. A climatological study of Tibet, Mongolia, and northwest China. After describing the general geography of land areas, the major meteorological features of the entire study area are discussed. The geography and major climatic controls of each of continental East Asia's three zones of “climatic commonality." Includes a detailed description of each “season,” including typical weather, clouds, visibility, winds, precipitation, temperature, and hazards and trafficability.

AFCCC/TN--97/003 (ADA383777, also ADA286962) East Asia, A Climatological Study Volume II: Maritime,
Capt. Luke D. Whitney, John W. Louer III, Robert S. Lilianstrom, Melody L. Higdon, MSgt. Charles D. Surls, John Freeman, Virgil Killman, and SSgt Gary D. Clinton, December 1997, 268pp. A climatological study of Tibet, Southeast and Northeast China, Taiwan, and Korea. After describing the general geography of land areas, the major meteorological features of the entire study area are discussed. The geography and major climatic controls of each of maritime East Asia's four zones of “climatic commonality.” Includes a detailed description of each “season,” including typical weather, clouds, visibility, winds, precipitation, temperature, and hazards.

AFCCC/TN--00/001 (ADM001217) Eastern Siberia: The Maritime and Near-Maritime Regions, Melody L. Higdon, Robert S. Lilianstrom, Virgil H. Killman, January 2000, 220pp. A climatological study of Eastern Siberia. This study concentrates on the maritime and near-maritime regions of Eastern Siberia. The region includes the continental northeastern coast and islands, the continental southeastern coast and islands, and extends from the Arctic Ocean to northernmost China. After describing the geography and major meteorological features of the entire region, the study discusses in detail the climatic controls of each of Eastern Siberia’s “three zones of climatic commonality.” Each “season” is defined and discussed in considerable detail with emphasis on general weather, clouds, visibility, winds, precipitation, temperature, and hazards.

AFCCC/TN--00/002 (ADM001217) Central Siberia: North Central and South Central Siberia, Melody L. Higdon, Robert S. Lilianstrom, MSgt Don Carey, January 2000, 156pp. A climatological study of Central Siberia. This study concentrates on the North Central and South Central regions of Central Siberia. After describing the geography and major meteorological features of the entire region, the study discusses in detail the climatic controls of each of Eastern Siberia’s “two zones of climatic commonality.” Each “season” is defined and discussed in considerable detail with emphasis on general weather, clouds, visibility, winds, precipitation, temperature, hazards, and trafficability.

AFCCC/TN--00/003 (ADM001217) Western Siberia: The West Siberian Plain and Central Asia, by Melody L. Higdon, Robert S. Lilianstrom, John Freeman, SSgt Gary Clinton, January 2000, 148pp. A climatological study of Western Siberia. This study concentrates on the Western Siberia Plain and Central Asia. After describing the geography and major meteorological features of the entire region, the study discusses in detail the climatic controls of each of Western Siberia’s “two zones of climatic commonality.” Each “season” is defined and discussed in considerable detail with emphasis on general weather, clouds, visibility, winds, precipitation, temperature, hazards, and trafficability.

AFCCC/TN--02/001, (ADA406962) South Asia: A Climatological Study, Volume I, Subtropical South Asia, by Melody Higdon, Robert Lilianstrom, Virgil H. Killman, SSgt Gary Clinton, 1 March 2002, 287 pp. This technical note is a climatological study of Subtropical South Asia. After describing the geography and major meteorological features of the entire region, the study discusses in detail the climatic controls of each of Subtropical South Asia’s “five zones of climatic commonality.” Each “season” is defined and discussed in considerable detail with emphasis on general weather, hazards, clouds, visibility, winds, precipitation, and temperature.

AFCCC/TN--02/002, (ADA406961) South Asia: A Climatological Study, Volume II, Continental South Asia, by Melody L. Higdon, Robert S. Lilianstrom, Virgil H. Killman, MSgt Donald E. Carey, SSgt Gary A. Clinton, 1 May 2002, 288 pp. This technical note is a climatological study of Continental South Asia. After describing the geography and major meteorological features of the entire region, the study discusses in detail the climatic controls of each of Continental South Asia’s “five zones of climatic commonality.” Each “season” is defined and discussed in considerable detail with emphasis on general weather, hazards, clouds, visibility, winds, precipitation, and temperature.

AFCCC/TN--03/001, (ADA418468) Western Pacific Basin: A Climatological Study, by Melody L. Higdon, John W. Louer III, Robert S. Lilianstrom, Virgil H. Killman, MSgt Donald E. Carey, 29 August 2003, 239 pp. This technical note is a climatological study of the Western Pacific Basin. After describing the geography and major meteorological features of the entire region, the study discusses in detail the climatic controls of each of the Western Pacific Basin’s “five zones of climatic commonality.” Each “season” is defined and discussed in considerable detail with emphasis on general weather, hazards, clouds, visibility, winds, precipitation, and temperature.
3.3 AFGWC Technical Notes

The OPR for AFGWC technical notes is AFWA/A3O, 106 Peacekeeper Lane, 2N3, Offutt AFB NE 68113–4039. Order AFGWC publications from the Air Force Weather Technical Library (AFWTI), 151 Patton Ave., Room 120, Asheville NC 28801–5002, DSN 673–9019. Note that some of these documents were designated “technical memos” (TM) through 1978 even though the “TN” sequence began in 1971.

AFGWC–TM–69–1 (AD701374) A Data Selection Procedure for the Rectification and Mapping of Digitized Data, by Maj. Richard C. Roth, December 1969, 18 p. Describes an automated method for rectification and mapping of meteorological satellite images or similar high-resolution data. Purpose of the procedure is to rectify and map satellite photos and spin scan data with the greatest possible accuracy.


AFGWC–TM–69–3 (AD717651) Deviation Analysis, by Maj. Thomas M. Kaneshige and Capt. Philip W. West, 15 December 1969, 26 p. Describes the AFGWC Deviation Analysis Program that provides the mechanism for quality control of meteorological observations and gridded constant pressure analysis and forecast fields. Deviations between observed values and interpolated (in time and space) analysis and/or forecast values are used in the analysis program to detect significant errors in the analysis and forecast fields. Errors are shown to a monitoring analyst with a number of standard AFGWC displays that include window or hemispheric contoured charts and data lists. This procedure lets the monitoring analyst evaluate significant errors rapidly and make timely corrections.


AFGWC–TM–69–5 (AD702449) Tropical Wind and Temperature Analysis, by Maj. August L. Shumbera, Jr., 22 December 1969, 14pp. The AFGWC objective computer tropical wind and temperature analysis program produces gridded wind and temperature analyses from 850 to 50 mb. The analysis technique is the method of successive correction to a first guess field. First guess fields are derived from persistence, climatology and a “blending” of gridded data from the Northern Hemisphere upper air analysis program. Validated wind and temperature observations are used to correct the first-guess fields in the analysis. The correction formula effectively treats all aircraft observations over a small area as one composite observation and all fixed observations as another composite observation which prevents several aircraft observations from masking out an observation from a fixed station. A special technique is used to eliminate spurious divergence in the wind analyses. Errata sheet change, undated.

AFGWC–TM–70–1 (AD709367) AFGWC Meso-Scale Prediction Model, by Capt. James Kerlin, 15 March 1970, 19 p. Describes an upper-air numerical forecast model designed to compute 0-24 hour forecasts for a limited area (window) using a grid spacing. Boundary values are required from a hemispheric mode. This model is designed to obtain higher resolution in the description of atmospheric features smaller than those portrayed by conventional macro-scale numerical forecast models. It is used at the AFGWC to provide forecast data at the top level of the AFGWC boundary layer (1,600 meters above the terrain). The mesoscale prediction model is expandable to hemispheric applications.

AFGWC–TM–70–2 (AD–NONEAD713119) AFGWC Macro-Scale Upper Air Analysis Model, by Maj. August L. Shumbera, Jr., 15 March 1970, 28 p. The AFGWC macroscale numerical upper air analysis program for the Northern Hemisphere is described. The program produces wind, height, and temperature analyses at 14 levels from 850 to 10 mbs, and moisture analyses at four levels, from 850 to 400 mbs. A detailed explanation of the derivation of first-guess fields is presented. The analysis technique is the method of successive corrections to a first-guess field. Constraints are applied to the stability of each layer. Radiation corrections are applied above 100 mb to observations taken in daylight to remove instrumental errors.

vertical velocity, stream function and temperature for up to 72 hours. Installation of a larger computer in 1968–1969 allowed significant changes in the model. Improvements include a refined smoothing technique, use of higher order terms in the calculation of vorticity advection, and the inclusion of a new wind computational technique.

**AFGWC–TM–70–5 (AD713058) AFGWC Boundary Layer Model**, by Lt. Col. Kenneth D. H aden, 1 April 1970, 59pp. Describes a limited area, seven-layer physical-numerical model for the lower tropospheric region. Grid interval is half that of the standard numerical weather prediction grid used in the hemispheric, free atmospheric operational model at AFGWC. This model is an integral part of the complete AFGWC mesoscale (sub-synoptic) numerical analysis and prediction system. It provides greater horizontal and vertical resolution in both the numerical analyses and numerical forecasts. It is used to predict the more detailed smaller scale atmospheric perturbations important in specifying sensible weather elements. Important features of this boundary layer model include the following: a completely automated objective numerical analysis of input data; the transport of heat and moisture by three dimensional wind flow (including terrain and frictionally induced vertical motions); latent heat exchange in water substance phase changes; and eddy flux of heat and water vapor.

**AFGWC–TM–70–6 (AD717652) AFGWC Automated Meteorological Data Processing**, by Richard K. Wilson, 15 September 1970, 84 p. The present “state of art” in automated meteorological data processing as practiced at the AFGWC is discussed. This includes major activities from interface with the DoD operated Automated Weather Network (NWA) to the storage of individual reports into the AFGWC database prior to scientific validation checks. Only the meteorological data processing or decoding of conventional weather reports is discussed.

**AFGWC–TM–70–7 (AD731134) Turbulence Forecasting Procedures**, by Capt. Paul T. Burnett, 15 December 1970, 83 p. Air Force Global Weather Central operational procedures are described for forecasting low-level mechanical, mountain wave-associated, and clear air turbulence significant to aircraft. These procedures involve both annual and automated diagnostic techniques for analyzing individual rawinsonde soundings, data at constant pressure levels, and data from the AFGWC planetary boundary layer model. Brief outlines of computational procedures used in the computer diagnostic and prognostic programs are included. The basic forecast procedure is to associate reported turbulence and potentially turbulent areas with meteorological and orographic features, forecast the future positions of the meteorological features, and reassociate the turbulent areas. Forecasts of low-level mechanical turbulence rely to a considerable extent on prognoses of a numerical turbulence index. Index variables are the gradient level wind, vertical motion, low-level atmospheric stability, 3-hourly sea-level pressure change, and terrain roughness. Formation of mountain waves is forecast using an automated adaptation of the Harrison technique; it considers sea level pressure gradients and wind data above the mountain range. Clear air turbulence (CAT) has been found to be largely associated with shallow baroclinic layers of smaller scale than can be accurately forecast within the present state of the numerical weather prediction art. Consequently, automated forecasts of wind, vertical motion, and temperature distribution and empirical indices incorporating these elements are assimilated by an experienced forecaster into the final prognosis.

**AFGWC–TM–70–8 (AD731138) Validation of Meteorological Data**, by Lt. Col. Thomas Kaneshige and Capt. Bernard C. Diesen, 15 September 1970, 39 p. The AFGWC computer programs for the validation of surface, aircraft and upper-air (RAOB, PIBAL, and ROCOB) reports are described. All reports received in standard codes from the DoD Automated Weather Network are subjected to a number of validation checks: timeliness, gross error, internal consistency, and deviation from a previous analysis or forecast. Failure to pass these checks can result in one of two actions: one or two elements may be discarded, or the entire report may be discarded. Validation of data from atmospheric soundings is discussed in detail. Examples are given to illustrate the methods used to determine whether upper-air height and/or temperature data are in error. Missing or garbled upper-air temperature and height data for mandatory reporting levels are recomputed by solving a system of two simultaneous equations. Procedures to merge newly validated data with similar data validated earlier are briefly described.

**AFGWC–TM–70–9 (AD717653) Three-Dimensional Nephanalysis**, by Maj. Allen R. Coburn, 15 March 1970, 49 p. The AFGWC objective three-dimensional nephanalysis program (3DNEPH) produces high resolution, three-dimensional analyses of clouds. A horizontal grid spacing of about 25 nautical miles is used. Analyses are for 15 layers from surface to 40,000 feet MSL, with higher vertical resolution near the surface (150-feet depth for layer 1) and lower vertical resolution at the top of the model (5,000-feet depth for layer 15). The problem is a stream of individual processors. The active processors are the following: surface data processor, radiosonde data processor, aircraft data processor, satellite video data processor, decision tree processor, final processor, and the special display processor. A description of each processor is given, along with some of the major decisions made within each processor.
AFGWC–TM–70–10 (AD735741) **AFGWC Multilevel Cloud Model**, by Maj. Ralph W. Collins, 15 December 1970, 37 p. Describes the mathematical formulation of the AFGWC cloud forecasting model. Model consists of three modules: macroscale clouds (MSC), five-layer (5LYR), and high-resolution cloud prog (HRCP). Forecasts are based on three-dimensional parcel displacements computed from forecast winds given by dynamic numerical weather prediction models.

AFGWC–TM–71–1 (AD731196) **AFGWC Divergent Mesoscale Prediction Model**, by Capt. James Kerlin, 1 June 1971, 19 p. Describes a follow-on improved mesoscale weather prediction model. Using the previously developed AFGWC mesoscale prediction model as a test-bed, a refined model was developed. Data initialization procedures were modified to separate stream function from the irrotational component of the wind, retaining the divergent portion of the wind field. The resulting field, used as input to the prediction model, more nearly reflects actual atmospheric conditions without introducing spurious noise detrimental to numerical forecasts. Undated change, 17pp.

AFGWC–TM–71–2 (AD–None) **Improved Three Dimensional Nephanalysis Model**, by Maj. Allen R. Coburn, 1 June 1971, 83 pp. The AFGWC objective three-dimensional computer program (3DNEPH) produces high resolution, three-dimensional analyses of clouds in the atmosphere. A horizontal grid spacing of approximately 25 nautical miles is used. Analyses are made for 15 layers from the earth's surface to 55,000 feet MSL, with highest vertical resolution near the surface (150 feet depth for layer 1) and lowest vertical resolution at the top of the model (20,000 feet depth for layer 15). The program is a stream of individual processors. The original program described in AFGWCTM 70-9 contained the following active processors: surface data processor, radiosonde data processor, aircraft data processor, decision tree processor, satellite video data processor, final processor, and display processor. The improved program has added a processor to permit forecaster-prepared data to be used, a satellite infrared data processor, a forecast processor and a verification processor. The improved version also includes improvements to the other processors. A description of each major processor is included. Selected samples of displayed data are shown.

AFGWC–TM–71–3 (AD735742) **AFGWC Macro-Scale Update Forecast Model**, by Capt. James Kerlin, 1 November 1971, 11p. This model specifically designed to be compatible with the macroscale baroclinic prediction model that produces forecasts of height, wind, and temperature at six levels (850, 700, 500, 300, 200, and 100 mb) for an octagonal (hemispheric) grid. The update model produces 6- to 36-hour updated forecasts for window areas of 15x15 to 35x35 grid points (381 km spacing) that may be located anywhere within the octagon. The model is employed whenever required to update areas of the hemispheric forecast that were initially so data-deficient as to significantly degrade the forecast. Stream functions are forecast at six levels and are used as input to solve the diagnostic omega equation, from which vertical velocities are obtained for solution of the vorticity equation for a new stream function tendency. The time step is 45 minutes. Horizontal boundary conditions are determined from the hemispheric forecasts being updated.

AFGWC–TM–71–4 (AD736823) **AFGWC Forward Trajectory Model**, by Capt. Donald S. Thomas, Jr., 1 December 1971, 11 p. Describes the AFGWC Forward Trajectory Model, a customer-oriented global parcel trajectory model. The global capability of this model is a result of the input global wind fields available in the AFGWC data base. The model computes forecast positions out to 72 hours for a parcel of air starting at any predetermined point and follows the parcel for up to 10 days. Each cycle provides the current position and forecast positions at each interval during the 10-day period. The customer has various options available concerning construction and use of the trajectories.

AFGWC–TM–72–1 (AD743302) **A Modified Upstream Differencing Technique for Solving the Advection Equation**, by Maj. Lynn L. LeBlanc, 1 April 1972, 46 p. A scheme for numerical modeling of advection of meteorological elements has been developed and is now used in AFGWC operational models. In this scheme, new values are determined at each time step for each grid point of the prediction matrix by first determining the upstream trajectory position at the previous time step and the corresponding parametric values, then modifying the grid point values. This quasi-Lagrangian advection scheme, which is inherently computationally stable, allows use of any reasonable time step and almost total elimination of artificial smoothing. This technique effects preservation of tight gradients and flow patterns with minimal distortion through the forecast period, as well as more realistic movement and retention of extreme parametric values of analyzed features.

AFGWC–TM–72–2 (AD763102) **The AFGWC Macroscale Tropical Prediction Model**, by Capt. Douglas A. Abbott, 1 December 1972, 27 p. Describes an upper-air numerical forecast model designed to predict tropical macroscale features. Model is based on conservation of potential vorticity as modified by terrain and surface friction. Time-dependent lateral boundary conditions obtained from the AFGWC Northern and Southern Hemispheric macroscale forecasts are incorporated into the model. These boundaries are located at roughly 37 degrees north and 37 degrees south latitude. The quasi-geostrophic equations are used and are found to adequately describe the large scale tropical features. However, the use of these equations does not imply that...
tropical motions are quasi-geostrophic. Numerical integration employs a quasi-Lagrangian technique on a course mesh grid (5° latitude by 5° longitude at the equator) with a 3-hour time step. Numerical correction of planetary wave retrogression is unnecessary with this formulation. Given a reliable initial state, the model predicts wave evolution and phase displacement well. The model contains neither the physics nor the resolution to represent the cooperative interaction between the larger scale motion field and mesoconvective scale phenomena. In addition to predicting the large-scale tropical flow, the model makes available time-dependent boundary condition forecasts for use by limited area mesoscale prediction models and for both Northern and Southern Hemispheric macroscale models.

AFGWC–TM–73–1 (AD774595) AFGWC Macro-Scale Upper Air Analysis Model (Revised), by Capt. Dennis Moreno, 1 October 1973, 30 p. Describes the AFGWC Macroscale Numerical Upper-Air Analysis Program for the Northern and Southern Hemispheres. The program produces wind, D-value, and temperature analyses at 14 levels from 850 mb to 10 mb, and moisture analyses at four levels from 850 mb through 400 mb. A detailed explanation of the derivation or first-guess fields is presented. The analysis technique is the method of successive corrections to a first-guess field. Constraints are applied to the stability of each layer.

AFGWC–TM–73–3 (AD775362) Tropical Analysis Model, by Maj. James F. Brown, 1 November 1973, 20 pp. The AFGWC objective tropical computer analysis programs produce gridded surface pressure and temperature analyses, gridded computed temperature and D-value fields for 1,000 mb, temperature-dew point spread analyses 850–400 mb, and temperature, wind and D-value analyses 850–100 mb. First guess fields are derived from forecast/persistence. Validated observations used to correct first guess fields in the analysis. Special technique are used to insure vertical consistency.

AFGWC–TM–74–1 (AD787210) The Scan Plane Method for Locating and Gridding Scanning Radiometer Satellite Data, by Capt. Terry L. Cherne, 1 January 1974, 80pp. Describes improved techniques for locating and gridding meteorological satellite imagery data by automation. Overall objective is to relate each data sample to a location on a standard map projection so an automated mapping routine can manipulate data to build required product. To achieve objective, either particular data samples or particular map points were selected as bench points; calculations performed for only these points. Remaining points determined by interpolation.

AFGWC–TM–74–2 (ADA005496) Computer Flight Plan System, by Charles W. Cook, 1 January 1974, 57 p. Computer flight planning support for DoD activities provided by AFGWC. Computer flight plans generated from user specifications of flight path and aircraft characteristics. Route selection made by requestor after evaluating both meteorological and non-meteorological variables affecting the flight. Route specifications may be supplied at the time of request or obtained from a library of predefined routes maintained at AFGWC. Flight plan system has two major components: The operational night data component accomplishes the collection, management, and accounting of all data necessary to specify the route, while the flight simulation model component simulates flight of the aircraft through the AFGWC data base.

AFGWC–TM–75–1 (ADA017942) The AFGWC Snow Cover Analysis Model, 1 June 1975, by Saba A. Luces, Samuel J. Hall and James D. Martens is superseded by AFGWC/ TN–86/001 (ADA176202), dated 28 February 1986, by Samuel J. Hall. The AFGWC Snow Analysis Model, which generates daily snow age and depth analyses, has been operational since March 1975 for the Northern Hemisphere and October 1975 for the Southern Hemisphere.


AFGWC–TM–78–001 (ADA057126) High Frequency Radio Users Guide to AFGWC Products, by CMSgt. Edward D. Beard, January 1978, 25pp. High frequency (3–30 Mhz) radio waves used for long range communications networks are at the mercy of natural variations in the earth’s upper atmosphere—more specifically, the ionosphere. This guide explains these variations and describes various products available from AFGWC that can alert system operators to observed or predicted solar and geophysical activity that can affect HF circuit reliability. Guide is basic and designed with the field communicator in mind, but contains information of value to circuit managers and supervisors.
AFGWC–TM–78–001 (ADA057176) The AFGWC Automated Cloud Analysis Model, by Maj. Falko K. Fye, June 1978, 108pp. Supersedes Report No. AFGWC-TM-71-2 dated 1 June 1971, (AD736798). The AFGWC automated cloud analysis program (3DNEPH) produces high resolution, three-dimensional analyses of clouds over the entire globe. Up to eight analyses a day are scheduled, with additional limited area analyses available on request. Horizontal grid spacing is 25 NM and the vertical grid consists of 15 layers of varying thickness from the earth’s surface to 55,000 ft MSL. The program is a string of individual modules that process and integrate meteorological cloud information from surface, pilot, and upper-air reports. An additional capability to interpret and incorporate visual and infrared satellite imagery results in high resolution, worldwide coverage. Recent advances in techniques for interpreting satellite imagery described. A new manual data input processor, quality control procedures, and applications also described. Appendix provides detailed information on the high resolution terrain, geography, temperature, and background brightness (albedo) fields used to support the model. A history of the model and detailed descriptions of the satellite processing algorithms are provided. Samples of displayed data are provided.


AFGWC–TN–71–5 (DOCM) AD730627 Verification Data: AFGWC 1,000-mb Macroscale Prediction Model, by Capt. James Kerlin, 1 September 1971, 13pp. Forecasts produced by the AFGWC 1,000-mb Macroscale Prediction Model are compared with rawinsonde observations; monthly summaries are for March, April,

AFGWC/TN–72–1–3 (AD–NONE) Verification Data
Limited Area Mesoscale Prediction Model (October -

AFGWC/TN–72–1–4 (AD–NONE) Verification Data
Macroscale Cloud Model (October-December 1971), by

AFGWC/TN–72–1–5 (AD–NONE) Verification of
North American Window Boundary Layer Model
(September-December 1971), by Capt. Arnold L. Friend,

AFGWC/TN–72–1–6 (AD–NONE) Verification of
North American Window Boundary Layer Model
(February-March 1972), by Capt. Arnold L. Friend, 1

AFGWC/TN–72–1–7 (AD–NONE) Verification Data
1000 mb Macro Scale prediction Model (January-March
1972), by Sgt. Garry R. Buettner, and Paul T. Burnett, 15
May 1972 , 14pp.

AFGWC/TN–72–1–8 (AD–NONE) Verification Data
Macro Scale Baroclinic Prediction Model (January -
March 1972), by Sgt. Garry R. Butttner, 15 May 1972,
30pp.

AFGWC/TN–72–1–9 (AD–NONE) Verification Data
Macroscale Cloud Model (January-March 1972), by

AFGWC/TN–72–1–10 (AD–NONE) Verification Data
Limited Area Mesoscale Prediction Model (January -
March 1972), by Sgt. Garry R. Buettner, 15 Aug 1972,
32pp.

AFGWC/TN–72–1–11 (AD–NONE) Verification Data
Macroscale Baroclinic Prediction Model (April-May

AFGWC/TN–72–1–12 (AD–NONE) Verification Data
1000 mb Macro Scale Prediction Mode (April-May

AFGWC/TN–72–1–13 (AD–NONE) Verification Data
Limited Area Meso Scale Prediction Model (April-May

AFGWC/TN–72–1–14 (AD–NONE) Verification of
North American Window Boundary Layer Model (April-
June 1972), by Capt. Arnold L. Friend, 15 Oct 1972, 72
pp.

AFGWC/TN–72–1–15 (AD–NONE) Verification Data
Macro-Scale Cloud Model (Apr-May 1972), by Sgt
Garry R. Buettner, 1 Nov 1972, 22 p.

AFGWC/TN–72–2–1 (AD–NONE) Satellite Data
Location Accuracy, by Capt. Gerald J. Dittberner, 11pp.
**AFGWC/TN–72–6–1 (AD743304) AFGWC Air Stagnation Model**, 15 May 1972 by Maj. Richard L. Daye, 18pp. Supersedes AFGWC-TN-73-61, dated 1 Jan 1973. The Air Stagnation Model (ASM) developed at AFGWC is designed to provide air stagnation data to Air Force installations overseas where mesoscale data are available. Variables are derived from the AFGWC Boundary Layer Model data and the AFGWC Mesoscale Prediction Model data. Precipitation forecasts from the Macroscale Cloud Module (MSC) are also used. Since the BLM forecasts are only available through 24 hours, the 36-hour outlook uses data from the AFGWC Macroscale Baroclinic Prediction Model, the MSC, and the 1000-mb Prognostic Model. The techniques used in the ASM are similar to those used by the National Weather Service. The air stagnation data include mixing depth, transport wind in the mixing layer, ventilation value in the mixing layer, meteorological stagnation index (MSI), times of maximum and minimum MSI and the maximum and minimum MSI.

**AFGWC/TN–73–2 (AD–NONE) An Evaluation of the AFGWC Air Stagnation Model Meteorological Parameters**, by Capt. A. Edgar Mitchell, July 1973, 24pp. The AFGWC Air Stagnation Model (ASMI) compares favorably with National Weather Service (NWS) products for air stagnation guidance. Compared were the two meteorological variables of mixing height and transport wind from the ASM and MWS. A statistical analysis was made for 1200Z and 1800Z data from eleven sites throughout the United States. The ASM and MWS forecasts had nearly the same mean mixing height, but ASM heights were slightly lower, as expected. The mean afternoon mixing heights for the ASM and NWS forecasts are approximately equal. Daily errors in ASM mixing heights are for the same magnitude as those made by NWS. Accuracy of ASM forecast elements is roughly equivalent to total of the NWS model.

**AFGWC/TN–73–6–1 (AD–NONE) AFGWC Air Stagnation Model**, by Maj. Richard L. Daye, Capt. A. Edgar Mitchell, and Capt. Saba A. Luces, 1 January 1973. Supersedes AFGWC-TN-72-6-1 (AD743304) by Richard L. Daye 15 May 1972, 15pp. The Air Stagnation Model (ASM) developed at AFGWC provides air stagnation data to Air Force installations overseas where mesoscale data are available. Variables are derived from the AFGWC Boundary Layer Model (BLM) data and the AFGWC Mesoscale Prediction Model data. Precipitation forecasts from the Macroscale Cloud Module (MSC) are also used. Since the BLM forecasts are only available through 24 hours, the 36-hour outlook uses data from AFGWC’s Macroscale Baroclinic Prediction Model, the MSC, and the 1000-mb Prognostic Model. Techniques used in the ASM are similar to those used by the National Weather Service (GROSS). Air stagnation data includes mixing depth, transport wind in the mixing layer, ventilation value in the mixing layer, meteorological stagnation index (MSI), times of maximum and minimum MSI, and the maximum and minimum MSI value.


**AFGWC/TN–79/002 (ADA083125) Training Guide for Severe Weather Forecasters**, by MSgt. Charlie A. Crisp, November 1979, 82pp. A detailed training guide designed for a forecaster’s initial exposure to the AFGWC’s severe weather function; details analysis procedures for all charts and progostic tools available to the severe weather function. Significant severe weather variables are analyzed at the surface, 850 mb, 700 mb, and 500 mb levels. Additionally, the 850/500 mb thickness and maximum wind charts are examined. Also discussed are the severe weather parameters chart and the 12-hour surface pressure change chart. A detailed, step-by-step evaluation of a synoptic situation is presented, along with appropriate forecasts and verification data. Finally, automated progostes available at AFGWC are discussed in relation to severe weather forecasting. Before using this guide, forecasters should become familiar with AWSTR 200 (Rev), Notes on Analysis and Severe Storm Forecasting of the Air Force Global Weather Central. AWSTR 200 (Rev) is referred to briefly when relating analyzed variables to those synoptic patterns producing severe thunderstorms and tornadoes. This TN also familiarizes users with techniques used to produce the Military Weather Advisory (MWA). Multicolor illustrations. Note: Paper copies out of print and out of stock.

**AFGWC/TN–79/003 (REV) (ADA100324) Map Projections and Grid Systems for Meteorological Applications**, by Capt. James E. Hoke, Capt. John L. Hayes, and 2nd Lt. Larry G. Renninger, March 1981 (Revised March 1985), 102pp. Describes maps and grids currently used at AFGWC to provide conventional meteorological support, but not those used for space environmental support. Emphasis is on equations needed for proper earth location of meteorological data on both maps and grids. Intended as a reference for programmers, but also provides information for users of AFGWC products and for the meteorological community at large. Addendum (four page inserts) June 1985.
AFGWC/TN--79/004 (ADA083157) The AFGWC Automated Analysis/Forecast Model System, by Maj. Terry C. Tarbell and Capt. James E. Hoke, December 1979, 59pp. Describes the AFGWC automated analysis/forecast model system. Emphasis is on interrelation of various analysis/forecast models in the production cycle. This description of the automated analysis/forecast system written for managers, programmers, computer operations personnel, product users, and the meteorological community at large. Only discusses analysis/forecast models that are primary meteorological data-base builders; most applications programs that access data bases not included.


AFGWC/TN--80/002 (ADA088234) Geomagnetic Index Calculation and Use at AFGWC, by Capt. Robert D. Prochaska, April 1980, 34pp. AFGWC uses several geomagnetic indices to specify state of the magnetosphere. This paper introduces those indices of geomagnetic activity most commonly used by DoD agencies. Discusses procedures used at AFGWC to compute the indices and briefly describes uses for each.

AFGWC/TN--80/003 (ADA090086) The Use of Satellite-Derived Soundings in the AFGWC Stratospheric Analysis Models, by Capt. Fred P. Lewis, Maj. Terry C. Tarbell, and Capt. James E. Hoke, August, 1980, 55pp. The first successful use of satellite-derived soundings in AFGWC’s stratospheric analysis models was on December 26, 1979. A new procedure for construction of the stratospheric first-guess fields was also instituted on that date. These new first-guess fields are based on satellite soundings. This note describes changes to AFGWC’s stratospheric analysis procedure.

AFGWC/TN--80/004 (ADA093195) Radiation Corrections Used in the AFGWC Stratospheric Analysis Models, by Maj. Terry C. Tarbell and Capt. Francis G. Tower, September 1980, 21pp. At stratospheric levels, radiosonde temperature sensors are affected not only by ambient air temperature but by direct short-wave radiation and long-wave solar radiation. Short-wave radiation makes a radiosonde temperature sensor indicate a temperature warmer than ambient air; long-wave radiation makes the sensor indicate a temperature cooler than ambient air. This note tells how corrections are applied to account for those radiation effects.

AFGWC/TN--81/001 (ADA096833) Short Term HF Forecasting and Analysis, by Capt. James A. Manley, January 1981, 111pp. AFGWC’s Space Forecasting Branch issues short term HF forecasts and analyses to a variety of users. This note gives forecasters some techniques for interpreting data used in preparing those forecasts, and describes forecast limitations.

AFGWC/TN--81/002 (ADA100325) Total Electron Content Forecasting at AFGWC, by Capt. James A. Manley, February 1981, 15pp. The AFGWC Space Forecasting Branch produces TEC forecasts for a variety of users. This note gives a qualitative assessment of TEC forecasts for a 5-year period.


AFGWC/TN--82/003 (ADA135556) Cloud Forecast Fields Comparison Test, by Capt. Kenneth E. Mitchell, May 1982, 68pp. A study of comparative cloud forecast skill of several numerical analysis/forecast systems at AFGWC and National Meteorological Center. Study compares gridded cloud forecasts derived from AFGWC’s trajectory cloud forecast model (5-layer) and NMC’s 7-Layer moist primitive equation model (7LHFM) from August to September 1979. Study also measures sensitivity of 5-layer model to accuracy of input forecast winds (used to compute trajectories). Results
show that 5-layer and 7LHF M-derived cloud forecasts differ appreciably owing to differences in methods used by the two centers to initialize model moisture fields. During first 24-hour forecast period, 5-layer consistently produces more accurate cloud forecasts than 7LHFM because satellite and surface cloud observations used systematically and globally in derivation of 5-layer initial moisture fields.

**AFGWC/TN--86/001** (ADA176202) *AFGWC Snow Analysis Model*, by Capt. Saba A. Luces, Capt. James D. Martens, and Samuel J. Hall, February 1986, 26pp. Supersedes AFGWC–TM–75–1, same title, 1 June 1975. The AFGWC Snow Analysis Model that generates daily snow age and depth analyses has been operational since March 1975 for Northern Hemisphere, since October 1975 for Southern Hemisphere. The snow analysis (SNODEP) model uses the latest surface synoptic observations, snow and ice climatology, time continuity, and manual updates, making it possible to produce very good measures of snow extent and reasonable snow depth values at all grid points over land and ice-covered areas of the earth, regardless of the availability of surface observations. The method of analysis, a technique used to infer snow age, is described, along with some problems associated with input data. Although the model is tailored to satisfy specific AFGWC requirements, other potential applications are discussed.

**AFGWC/TN--86/002** (ADA177931) *TAF Verification*, by Sherwin W. Jamison, November 1986, 32pp. Gives managers the information they need to use the Air Weather Service Terminal Aerodrome Forecast Verification (TAFVER) system effectively. The TAFVER system provides a cost-effective means for monitoring terminal forecast performance reliability by retrieving terminal forecasts and comparing them with corresponding observations. Verification statistics are computed, retained, and periodically provided to management. Steps to help identify apparent and persistent problems are described.

**AFGWC/TN--87/001** (ADB115170) *AFGWC Cloud Forecast Models*, edited by Maj. Timothy D. Crum, April 1987, 78pp. This report describes the Air Force Global Weather Central’s (AFGWC’s) three cloud forecast models: Five layer (5LAYER), High Resolution Cloud Prognosis (HRCP), and Tropical Cloud Forecasting (TRONEW). These models satisfy a wide range of requirements and have been in operation since the early 1970s. Using a quasi-Lagrangian approach, the 5LAYER model makes extratropical forecasts for periods up to 48 hours. It produces forecasts of layer and total cloud, cloud type, layer temperatures, icing, and weather conditions. Trajectories needed for these forecasts are computed from wind forecasts derived from the AWS Global Spectral Model (GSM). The 5LAYER moisture is initialized from the Real-Time Nephanalysis (RTNEPH) model layer cloud amount and the Multilayer Analysis (MULTAM) model layer dewpoint depression. The 5LAYER temperatures are initialized from the High Resolution Analysis System (HIRAS) and GSM-derived temperatures. The High Resolution Cloud Prognosis (HRCP) model combines RTNEPH-analyzed cloud input with 5LAYER trajectories to produce high resolution (25NM) short-range (out to 9-hour) cloud forecasts. The TRONEW model uses the analyzed RTNEPH cloud to make 24-hour persistence cloud forecasts for the tropics.


**AFGWC/TN--90/001** (ADA219309) *AFGWC’s Upper Air Validator System*, by Paul A. Zamiska, February 1990, 25pp. Describes AFGWC’s current Upper Air Validator System. Describes internal error checking and data quality assurance functions in detail. Problems with AFGWC’s previous validator and improvements in the new one are addressed. Reject and suspect limits for temperature, height, wind speed, and density used by the validator are included.

**AFGWC/TN--91/001** (ADA235305) *Improved Point Analysis Model (IPAM) Users Guide*, February 1991, 201pp. The Air Force Global Weather Central (AFGWC) and the USAF Environmental Technical Applications Center (USAFTAC) have provided vertical meteorological profiles to military organizations, government agencies, and DoD contractors for a number of years. These products are called “Point Analyses,” or “PAs.” The contents of a PA let customers use applicable meteorological information to assess and evaluate their own data with respect to the state of the atmosphere at a specific place and time. The capabilities of the PA have recently been improved to accommodate new meteorological databases, new data sources, updated or new climatological data fields and models, and sophisticated mathematical techniques that enhance the accuracy and reliability of the data profile. The improved product is known as the “Improved Point Analysis Model,” or “IPAM.” This users guide describes the IPAM in detail, explaining its capabilities and limitations in sufficient depth to allow customers to use and apply the data to their own purposes.

**AFGWC/TN--92/001** (AD257985) *Computer Models Used by AFGWC and NMC for Weather Analysis and
**Forecasting**, by TSgt. Richard J. Conklin, August 1992, 77pp. Describes the numerical analysis and forecast models most widely used by U.S. Air Force Meteorologists. These models include the following: the Air Force Global Weather Central (AFGWC) Global Spectral Model (GSM), the AFGWC Real-Time Nephanalysis (RTNEPH), the AFGWC High Resolution Analysis (HIRAS) model, the AFGWC Five-Layer cloud forecast model (5-LAYER), the National Meteorological Center (NMC) Nested Grid Model (NGM), and the NMC Aviation/Medium Range Forecast (AVN/MRF) model. Report also describes model grids and tells how the grids are built. Strengths and weaknesses of the models are discussed, along with AFGWC and NMC production cycles.


**AFGWC/TN--95/002** (ADA302303) *AFGWC Dial-In Subsystem (AFDIS) Software Users Manual, Version 3.2*, by Sterling Software, March 1995, 197pp. Describes AFGWC’s Dial-In Subsystem (AFDIS) software (PC-0054; see Section 2.4) that allows remote access to certain applications of AFGWC’s Satellite Data Handling System (SDHS). It provides users step-by-step instructions for installing and using the software required for access to SDHS. AFDIS software is not provided with the users manual; to request software, call or write AFWA/DOO, 106 Peacekeeper Drive, Offutt AFB, NE 68113–4039, DSN 271–5985. Superseded by AFGWC/TN--95/003.


**AFGWC/TN--95/004** (ADA302632, AD-A320832) *The Air Force Global Weather Central Surface Temperature Model*, by Thomas J. Kopp, PhD, December 1995, 30pp. Describes AFGWC’s Surface Temperature Model (SFCTMP) mainframe computer program. Explains how it produces global temperature analyses and forecasts at and near the earth’s surface. Explains the various processors used and the ties to other models, particularly the RTNEPH. Quality control and deficiencies are covered.
3.4 1WW Technical Notes

The 1st Weather Wing no longer exists; however, during its existence a number of technical documents were published. Questions on the following technical notes may be addressed to HQ PACAF/DOW, 25 E. Street, Suite 1232, Hickam AFB HI 96855–5426. Order these technical notes from the AFW Technical Library (AFWTL), 151 Patton Ave., Room 120, Asheville NC 28801–5002, DSN 673–9019.

1WW–TN–78–1 (ADA066839) The Role Of Atmospheric Tidal Winds In The Production Of Ionospheric Sporadic-E, by Capt. Bruce D. Springer, June 1978, 112pp. Summarizes an investigation of interactions among atmospheric tidal winds, the earth’s magnetic field, and metallic ions in the upper atmosphere (90–180 km). Results support theory that upper atmospheric tidal winds play a critical role in formation of ionospheric sporadic-E. The contributions of various tidal wind modes are analyzed with extensive computer simulations. Available in Microfiche only.


1WW–TN–79–2 (ADA069687) A Methodology To Analyse Forecast Problems, by Major Phillip D. Wood, April 1979, 13pp. Describes a problem analysis methodology recommended for use by base weather station managers whenever an adverse trend in forecast or local point warning performance is observed.


1WW–TN–81/002 (ADA118428) Positioning Tropical Cyclones in Satellite Imagery, 1981, 31pp. Describes a three-step operational approach to positioning Pacific based tropical cyclones in satellite imagery. In the preanalysis stage the image is acquired, selectively processed, and correctly gridded. During the analysis stage, the circulation center of the cyclone is fixed based on cloud features in the image. In the third stage, postanalysis, quality control procedures ensure optimum accuracy of the determined position fix.

1WW–TN–81/003 (ADA118427) Sources of Errors in Locating Weather Systems in Imagery from Polar-Orbiting Satellites — A Short Primer in Spacecraft Geometry, by Maj. David C. Danielson, 1981, 14pp. Accurate tracking of meteorological systems in satellite imagery requires recognition and correction of location errors. This note discusses three sources of location errors: satellite altitude, orbital anomalies, and satellite perspective. These errors may be corrected in the gridding process.

1WW–TN–83/001 (ADB080673) METSAT (Meteorological Satellite) User’s Guide, by Gordon R. Hammond, May 1983, 76pp. Describes the four operational meteorological satellite systems that provide METSAT data to Air Force units in the Pacific. Also describes Air Force DMSP direct readout site and mini-SIDS location operations, provides considerable background information on METSAT imagery characteristics. Discusses image accuracy, gridding, imagery types and forms, geographic coverage picture resolutions, data frequency and image identification techniques, and imagery analysis procedures.

1WW–TN–83/002 (ADA138792) A Study of Western North Pacific Tropical Storms and Typhoons that Intensify After Recurvature, by Maj. Charles P. Guard, November 1983, 28pp. Contrary to the findings of several past studies, many tropical cyclones intensify after recurvature, an unexplained behavior that has led to large forecasting errors. This study reveals two seasonal peaks of the behavior separated by a July minima in which intensification after recurvature (IAR) does not occur. A particular synoptic pattern is identified. Monthly characteristics of IAR are explained as functions of physical elements in the tropical cyclone’s oceanic and atmospheric environment. Guidelines provided to help forecasters anticipate and react to IAR.
**TECHNICAL NOTES**

1WW/TN--84/001 (ADB087539) *METSAT Imagery Interpretation Guide*, by Maj. Gordon R. Hammond, August 1984, 118pp. Provides descriptions and photographic examples of cloud and earth phenomena as seen from polar-orbiting and geostationary satellites (METSAT). Begins with look at basic cloud types, then covers comma cloud systems, low- and high-level wind flow cloud patterns. Ends with miscellaneous cloud/earth phenomena. Meant as a quick reference for METSAT imagery interpretation; can serve as part of unit’s METSAT Imagery Reference File (MIRF).

1WW/TN--90/001 (ADA234984) *An Overview of Tropical Circulation*, by Capt. Frank Sornatale, July 1990, 29pp. A discussion of tropical circulation and its role in supporting the larger general circulation system. Also discusses the historical presentation of general circulation theory, the influence of tropical circulation on heat and momentum budgets, and localized circulation patterns. However, tropical cyclones are omitted from the discussion.
3.5 2WW Technical Notes

The 2nd Weather Wing no longer exists; however, during its existence a number of technical notes were published. Questions about the following technical publications may be addressed to USAFE/DOW, Unit 3050, Box 15, APO AE 09094–5015. Order these technical notes from the AFW Technical Library (AFWTL), 151 Patton Ave., Room 120, Asheville NC 28801–5002, DSN 673–9019.

2WW–TN–69–1 (AD–NONE) Developing an Objective Forecast Study, by Capt. Robert E. Black, 1 June 1969, 14pp. Many of the articles written the past few years on objective forecast studies have covered various facets of studies—from how to select parameters to how to write them. This paper will comment on various aspects of objectives forecast studies but will try not to repeat that which is published elsewhere. It will discuss various phases of the study and give pointers and hints that may help you to avoid some of the more common pitfalls of conducting a forecast study.

2WW–TN–69–2 (AD692731) Cyclones and Anticyclones in Europe, by Robert E. Black, 1 September 1969, 72pp. Numerous studies, dating from 1783, have been conducted on cyclone and anticyclone paths. This study discusses movement and generation of pressure centers (cyclones and anticyclones) from a theoretical and climatological point of view. It discusses, by month: pressure system paths over Europe, areas of genesis, and the relationship of paths to 500mb circulation. Cyclogenesis on lee side of a terrain barrier is discussed in light of the conservation of potential vorticity. Pettersen’s development formula is used to show effect of land-locked bodies of water on genesis of pressure systems. Cyclone and anticyclone tracks vary from season to season, month to month. Tracks shown on charts discussed in light of these variations. Areas and factors affecting genesis also discussed.

2WW–TN–69–3 (AD–NONE) European Sun Data Tables 1969–2000, 15 Sep 1969 (formerly 2WWP 105–3), Supersedes 2WWP 105-03 July 1962. This pamphlet provides a standard reference source for light data to be used in military planning. The tables have been designed primarily for use by units of the US Army, but they also provide useful information for weather detachments.


2WW–TN–70–2 (AD708141) Forecasting Reduced Visibilities due To Atmospheric Aerosols, by Richard L. Walterscheid, 1 June 1970, 7pp. The problem of forecasting low visibilities has become less a problem of forecasting restrictions due to condensed water droplets than to forecasting those due to suspended particles. This paper discusses a formula and graph for calculating forecast visibility given initial conditions of visibility and relative humidity.


2WW–TN–71–1 (AD733429) Understanding And Using FPS–77 Radar Data, by Charles J. Melsom, 1 November 1971, 21pp. Discusses AN/FPS–77 weather radar, its scopes, controls, and procedures used at Hahn AB, Germany. RAMET code and scope photography discussed. Purpose is to inform using agencies of uses and limitations of information received from a radar station. Rescinded 880322.

2WW–TN–72–1 (AD–NONE) The Use of Conditional Climatology—Some Second Thoughts, by Capt. Richard L. Walterscheid, 1 April 1972, 9p. The introduction of conditional climatology (CC) tables broken out by ceiling and visibility separately has undermined the ability of these tables to provide the basis for a first guess TAF which supplies a better starting point than persistence. The rationale for using CC tables to provide a first guess TAF is grounded in the premise that one can select a verification category which is at least as likely as the persistence category. To select such a category we must be able to assign verification probabilities to each verification probabilities. A forecast scenario is suggested that takes this into account and exploits the real value of CC tables, namely, their ability to provide the basis for judgment.

2WW–TN–72–2 (AD749493) An Investigation of Thunderstorm Potential In Cold Air Cumulonimbi, by Christopher A. Biltoft, 2 October 1972, 25pp. Introduces method for determining difference between cold air cumulonimbi with thunderstorm potential from those with no such potential for development. Problem frequently occurs in winter over northwestern Europe. Several theories on thunderstorm activity and observational evidence combine a simplified theory of cloud electrification. This theory is applied in a stability index.
similar to the lifted index with the exception that parcels are raised to the –20°C level. The index is useful in cold air for separating areas of thunderstorms from those in which only cumulonimbus clouds occur.

2WW–TN–72–3 (AD–NONE) The Accuracy of Conditional Climatology Tables, by Richard L. Walterscheid, 2 October 1972, 16 p. Air Weather Service Units frequently verify forecast performance against the performance of straight persistence and against the performance of blind forecast based on the conditional climatology (CC). In the process, it is natural to inquire which of the blind forecasts provide a more accurate first-guess forecast.

2WW–TN–72–4 (AD753683) The Value of Our Forecasts, by Richard L. Walterscheid, 24 November 1972, 25pp. Two simple cost-benefit models are presented. One evaluates cost effectiveness of forecast service in terms of the benefit derived by strict adherence to a strategy of acting solely on basis of forecasts in preference to acting solely on basis of existing weather. The other model evaluates marginal cost effectiveness of forecasts in terms of benefit derived by subscribing to AWS service in preference to a service based on persistence forecasts. Two relationships are derived that express savings per forecast and marginal savings per forecast in terms of measures of forecast performance. The study shows that the percentage increase in cost effectiveness and marginal cost effectiveness can be significantly greater than the percentage increase in performance. It also shows that a small increase in forecast performance can result in a significant increase in cost effectiveness.

2WW–TN–72–5 (AD743148) European Climatological Guide, 31 January 1972, (Includes changes1-3) 181pp. This pamphlet provides summarized data of some of the most important meteorological parameters affecting Europe. Both mean and extreme values of temperatures by month are shown in isotherm form. Other factors, as precipitation and thunderstorm activity, are reflected in charts of average values. The pamphlet will be useful in general planning for military operations throughout the year. (formerly 2WW/P–105–13).

2WW–TN–72–6 (AD–NONE) European Mean Pressures, Heights and Freezing Levels, 15 May 1972, 105pp. This pamphlet presents charts for each month showing mean sea level pressures, geopotential heights of six standard upper level surfaces and heights of the freezing level. The main areas of interest are the European land mass and the Northern Atlantic Ocean. Data in these charts are suitable for numerous purposes including climatological and forecaster orientation. (formerly 2WW/P–105–15).

2WW–TN–72–7 (AD–NONE) An Objective Method for Forecasting Afternoon & Evening Thunderstorms, by Jean H. Page, 10 July 1972. Afternoon and evening activity has caused considerable forecasting difficulties at Coleman AAF. An objective method was evolved which successfully forecasts this activity.

2WW–TN–73–1 (AD–NONE) The European Climatological Slide Series, 20 June 1973, 15pp. A description is presented of the development of some 35mm climatology briefing slides for Europe. Advantages are given of using these seasonal slides which show maps overlaid with isopleths of various climatological parameters of importance to the military decision maker. Several recommendations are made to increase the effectiveness and optimize the value of the climatology briefing to the customer.

2WW–TN–73–2 (AD–NONE) An Evaluation of Selected Stability and Moisture Parameters, by Christopher Biltoft, 1 August 1973, 14pp. Stability and moisture parameters often used on composite weather charts are statistically evaluated using data recorded during a specific European airmass thunderstorm situation. The Showalter Stability Index shows the best performance as a thunderstorm indicator, but only with marginal superiority over the Total Totals Index. Dew point is shown to be a significantly better thunderstorm indicator than dew point depression. When used in combination with the Showalter Index, the other stability and combination of stability and moisture parameters shows poorer performance than “no skill” successive day data. To be most effective, a composite chart must include relevant data from independent sources.

2WW–TN–73–3 (AD–NONE) Two Objective Methods of Using Trajectory Data, by Donald J. Varley, 7 September 1973, 19pp. Data from trajectory bulletins for an approximately four month period were correlated in several ways to determine predictors of thunderstorms and ceilings at Wiesbaden AB, Germany. Of the several parameters examined the 12-hour forecast of the total totals index was best correlated with thunderstorm occurrence. A “climatology” of Wiesbaden ceiling conditions at about 22Z was developed as a function of the degree of air saturation and amount of lifting that were inferred in the 00Z 24-hour trajectory data. Higher ceilings were well correlated with forecasts of dry, descending air, while lower ceilings were generally related to trajectories indicated to be rising and moist. Some useful correlations of ceilings with 36-hour trajectory forecasts were also found, though these were not as well related as were the 24-hour forecasts.

2WW–TN–74–1 (AD–NONE) Use of Thickness in Forecasting Rain and Snow in Germany, by Harold C. Walker, 22 February 1974, . Thickness values between 1,000 and 500 mb were compared with observed precipitation types. When thickness values were less than 528 geopotential decameters (gpdm), only snow occurred;
with values greater than 535 gpdm, only rain was observed. Varying combination of precipitation forms occurred with thickness values between 528 and 534 gpdm. Forecasters at the European Tactical Forecast Unit routinely use thickness analyses and forecasts received via facsimile from the British Meteorological Office in preparation of Planning Guidance and Operational forecasts.

2WW–TN–74–2 (AD–NONE) The Application of Systematic Procedures to Visibility Forecasting in the Federal Republic of Germany, by Donald C. Hansen and Emidie J. Mazzella, 28 June 1974. This note is concerned with the development and implementation of procedures relating standard real-time synoptic-scale parameters to the prediction of visibilities. Procedures used by the authors when preparing studies for selected bases in Germany are illustrated. Gradient-level winds, as determined from nearby mountain station observations, are shown to have a strong influence on the visibility at airfields in Germany. Refinements of these forecasts involve the application of low-level stability and moisture relationships.

2WW–TN–74–3 (ADB000416) Weather Service Support to the 50th Tactical Fighter Wing, Hahn AB, Germany, 28 January 1974–22 February 1974, by John M. Huck and Larry J. Mayou, 1 October 1974. The impact of weather service on an F–4 tactical fighter wing’s peacetime training activities was determined and evaluated. Major operational decision points where weather could have an impact were determined, improvements to weather services suggested.


2WW–TN–75–1 (AD–NONE) Forecasting the Occurrence of Thunderstorms Using Echo Tops and Equivalent Radar Reflectivity Factors Ze) as Measured on the AN/FPS–77 at Hahn AB, by I. P. Shulhan, 15 September 1975, 6p. The development of a method to determine if thunderstorms are occurring from indicators observed by the AN/FPS–77 weather radar was accomplished for Hahn Air Base, Germany.


2WW–TN–76–1 (AD–NONE) Trajectory Bulletin Uses for Forecasting the Occurrences of Precipitation and for Forecasting Passage of Weather Systems at Hahn AB, Germany, by I.P. Shulhan, 1 March 1976, 12pp. The development of objective methods to use the trajectory bulletin forecast tool to improve local forecasting.

2WW–TN–77–1 (ADA104219) Report on the Results of the Probability of Lightning Condition Forecasting Test Conducted in 2WW During March, April, and May 1977, by R.G. Bachman, 31 July 1977, 31pp. Aircraft lightning strikes are a significant and previously unforecasted hazard to aircrews in Europe. A logic-diagram technique was developed to forecast probability of occurrence of all known weather conditions that relate to such strikes. Logic was developed by meteorological reasoning and modified on the basis of questionnaire feedback from aircrews. Though results contained some pessimistic bias, indications from more than 100 responses showed that a significant number of crews wanted the service, and that increasing probability values in the issued forecasts were associated with increasing likelihood of crews encountering lightning.

2WW–TN–78–1 (AD–NONE) Results of a Set of Subjective, Probability Forecasts Prepared From Very Limited Weather Data, by Ronald L. Lininger, 1 February 1978, 13pp. In April 1977, the Aerospace Sciences Division of 2WW began a program of technique development in terminal forecasting from limited data. The major problem under investigation has been to find ways to forecast when communications are cut off and
available weather data are nearly nil; i.e., limited to maps on hand and a current observation.

**2WW–TN–78–2** (AD–NONE) *2–3 November 1977 Wind Storm (A Review and Some Thoughts)*, by E. J. Gibeau, 31 January 1978, 18 pp. A wind storm of moderate intensity moved through Western Europe on 2–3 November 1977. The sequence of events (surface and upper air); a summary of how well 2WW units reacted to these events; and a post analysis are provided. Readers are encouraged to review the 22 charts and information provided and provide their own post analysis.

**2WW–TN–78–3** (AD–NONE) *The Parameter Utilization Program (PUP)*, by Robert F. Fischer and John S. Bohlson, 30 April 1978, 64pp. This report describes a systematic method of three dimensional weather analysis and forecasting. The significance of changes in atmospheric parameters; such as moisture, temperature, wind shear, diffuence, confluence, etc.; are illustrated by case studies.

**2WW–TN–78–4** (AD–NONE) *Some Further Results of Subject Probability Forecasts Prepared from Very Limited Data During a Winter Period*, by Ronald L. Lininger, 20 April 1978, 12pp. This report is another interim report on the results of technique development in terminal forecasting from limited data. The results from the first 125 of these forecasts were reported in 2WW Technical Note 78–1, to which this article will frequently refer. Currently we are describing the results of a set of 58 new forecasts, prepared during Winter Season weather, from 9 January 1978 to 31 March 1978.

**2WW–TN–78–5** (AD–NONE) *Selected Case Studies and Synoptic Patterns Bringing Significant Weather to Europe*, by Hanry A. Chary and Charles V. Fields, 15 July 1978, 130pp. A series of case studies and examples of significant European weather events is provided. Surface winds, thunderstorms, rain and snow are treated separately.

**2WW–TN–78–6** (AD–NONE) *Still Further Results of Subjective, Probability Forecasts Prepared from Very Limited Weather Data During a Fair Weather Period*, by Ronald L. Lininger, 1 November 1978, 10pp. The results of a third sequential set of consensus and individual forecasts made under conditions of weather-data denial are given for a fair-weather period. Forecasts, made in probability form for 3-hour and 24-hour ceiling/visibility, are scored by the Brier Score and made in probability form for 3-hour and 24-hour data denial are given for a fair-weather period. Forecasts, individual forecasts made under conditions of weather—results of a third sequential set of consensus and by Ronald L. Lininger, 18 January 1978, 55pp. Second Weather Wind conducted a test of making probability forecasts for ceiling and visibility category at three of its forecast units. Results are presented showing that forecasters could demonstrate skill early in the test and continued to do so throughout the test. Best results were obtained for short range forecasts. Verification efforts, as opposed to training and forecasting, comprised the bulk of the extra workload.

**2WW–TN–79–002** (AD–NONE) *On the Occurrence of Unusual Weather in Parts of Western and Central Europe from 19–25 May 1978*, February 1979, by Harald Strauss and Henry A. Chary, 1 Feb 1979, 27pp. A seven-day period of unseasonably poor weather during May 1978 is examined. The synoptic, dynamic, and climatological aspects of this occurrence are discussed. Forecasting difficulties are considered with suggestions being offered for future similar occurrences.

**2WW–TN–79–003** (AD–NONE) *Daily Climatology, A Look at the Ramstein Year*, by Henry A. Chary, 1 March 1979, 83pp. Ramstein AB observations for 6–7 years are examined to determine if there are unique sub-month scale periods of unique weather which would be hidden in the monthly summaries of the RUSSWO. European weather singularities are also discussed and are compared to the running three- and five- day means of the Ramstein daily climatology. The periods and trends discovered agree nicely with the European weather singularities and with one’s subjective concept of the Ramstein year. The separate periods identified are not, however, significantly different in the statistical sense. Typical values of selected meteorological elements are also provided.


**2WW–TN–79–005** (AD–NONE) *Probability of Lightning Conditions—Updated*, by Robert G. Bachman, 23 March 1979, 4pp. The goals and limitations of the probability of lightning condition (PLOC) program are discussed. Introductory background material is presented for the forecaster preparing to make PLOC forecasts.

**2WW–TN–79–006** (AD–NONE) *Final Report on Subjective, Probability Forecasts Prepared from Very Limited Weather Data*, by Ronald L. Lininger, 1 April 1979, 13pp. This report is the fourth and last of a series covering technique development in forecasting with very
limited weather data. The forecasts were made each working day between October 1978 and March 1979, in probability form, prepared subjectively by individuals and by consensus. The forecast elements were ceiling and visibility category, verified at the 3-hour and 24-hour points, using the Brier Score compared to a standard score which takes weather variability into account.


2WW–TN–79–008 (AD–NONE) A New Technique for Forecasting the Occurrence of Fog and Low Stratus Ceilings by Use of Chart, by Harald Strauss, 17 September 1975, 35pp. A new technique for forecasting fog and low stratus ceilings in Europe is presented. This method consists of a flow chart or fog logic diagram leading through various meteorological parameters from which the most essential turned out to be the 850-mb wind speed and the temperature-dewpoint spread at the surface. Its principle item is a stability index for the layer between the surface and the 850-mb level. The stability index alone and the entire flow chart were tested against dependent and independent data, the latter leading to the expectation that a fog forecast can be improved by using this method. The main drawback of this method is that it requires forecasted parameters as data input and that it probably suppresses local effects too much. The advantage is its objective nature and its centralized use.

2WW–TN–80/001 (AD–NONE) Examples of Forecast Detachment Operating Instructions (DOIs) and Standing Operating Procedures (SOPs), Compiled by Victor K. Krzymowski, 1 August 1980, 98pp. The purpose of this technical note (TN) is to crossfeed some of the better forecast related DOIs and SOPs in the wing. Also included, for your consideration, are some example TAF worksheets and an excellent statewide unit LAFP that the MAC/IG rated as laudatory. Our thanks to the units who made contributions to this TN.

2WW–TN–83/001 (ADB076159) A Guide For Meteorological Briefing For VFR And Low-Level Flying In Critical Weather Conditions (Hinweise für die Wetterberatung von Sicht-und Tiefflügen bei Kritischen Wetterlagen), by Dr. R. Trappenberg of the German Military Geophysical Office, Edited by Herr Harald Strauss and Jean-Lorraine Smith 15 February 1983, 10pp. Examines how reports of adverse weather conditions correlate to topography and pilot reports in Germany. Demonstrates that specified routes or areas are accessible to low-level flight when heights of cloud bases at selected reference stations reach specified values. Certain routes and/or meteorological conditions impose special problems and are discussed. Text keyed to three color maps that show restricting terrain features.


first in a series of European weather map type catalogs, designed and published by Second Weather Wing Aerospace Sciences. Based on the work of F. Baur in the 1940s, this effort expands European map typing and brings the focus of Baur’s original use as a long-range forecast tool to the near-time scale. These catalogs are designed to help weather forecasters who, under conditions of severe data denial (e.g., during extended communications outages), are provided possible synoptic situation maps with associated weather discussions. Charts in this document are selected excerpts from the European Meteorological Bulletin produced by Deutsches Wetterdienst.

2WW/TN--88/001 (ADB119840) Second Weather Wing’s Europe Map Type Catalog, Volume II, Southwesterly Flow Over Central Europe, by Herr Harald Strauss, January 1988, 105pp. The second in a series of documents depicting a subset of weather types over Europe. Based on the work of F. Baur in the 1940s, this effort expands European map typing and brings the focus of Baur’s original use as a long-range forecast tool to the near-time scale. These catalogs are designed to help weather forecasters who, under conditions of severe data denial (e.g., during extended communications outages), are provided possible synoptic situation maps with associated weather discussions. Charts in this document are selected excerpts from the European Meteorological Bulletin produced by Deutsches Wetterdienst.


2WW/TN--88/003 Not used.

2WW/TN--88/004 (ADB124026) Second Weather Wing’s Europe Map Type Catalog, Volume III, Low Over Scandinavia, by Herr Harald Strauss, April 1988, 88pp. The third in a series of documents depicting a subset of weather types over Europe. Based on the work of F. Baur in the 1940s, this effort expands European map typing and brings the focus of Baur’s original use as a long-range forecast tool to the near-time scale. These catalogs are designed to help weather forecasters who, under conditions of severe data denial (e.g., during extended communications outages), are provided possible synoptic situation maps with associated weather discussions. Charts in this document are selected excerpts from the European Meteorological Bulletin produced by Deutsches Wetterdienst.

2WW/TN--88/005 (ADB124416) Second Weather Wing’s Europe Map Type Catalog, Volume IV, High Close to the British Isles, by Herr Harald Strauss, April 1988, 111pp. The fourth in a series of documents depicting a subset of weather types over Europe. Based on the work of F. Baur in the 1940s, this effort expands European map typing and brings the focus of Baur’s original use as a long-range forecast tool to the near-time scale. These catalogs are designed to help weather forecasters who, under conditions of severe data denial (e.g., during extended communications outages), are provided possible synoptic situation maps with associated weather discussions. Charts in this document are selected excerpts from the European Meteorological Bulletin produced by Deutsches Wetterdienst.

2WW/TN--88/006 (ADB128947) Second Weather Wing’s Europe Map Type Catalog, Volume V, High Over Central Europe, by Herr Harald Strauss, July 1988, 93pp. The fifth in a series of documents depicting a subset of weather types over Europe. Based on the work of F. Baur in the 1940s, this effort expands European map typing and brings the focus of Baur’s original use as a long-range forecast tool to the near-time scale. These catalogs are designed to help weather forecasters who, under conditions of severe data denial (e.g., during extended communications outages), are provided possible synoptic situation maps with associated weather discussions. Charts in this document are selected excerpts from the European Meteorological Bulletin produced by Deutsches Wetterdienst.

2WW/TN--88/007 (ADB129647) Second Weather Wing’s Europe Map Type Catalog, Vol VI, High Over Scandinavia Extending into Central Europe, by Herr Harald Strauss, November 1988, 92pp. The sixth in a series of documents depicting a subset of weather types over Europe. Based on the work of F. Baur in the 1940s, this effort expands European map typing and brings the focus of Baur’s original use as a long-range forecast tool to the near-time scale. These catalogs are designed to help weather forecasters who, under conditions of severe data denial (e.g., during extended communications outages), are provided possible synoptic situation maps with associated weather discussions. Charts in this document are selected excerpts from the European Meteorological Bulletin produced by Deutsches Wetterdienst.

2WW/TN--89/001 (ADB133248) Second Weather Wing’s Europe Map Type Catalog, Vol VII, Low Pressure over Central Europe, by Herr Harald Strauss, March 1989, 193pp. The seventh in a series of documents depicting a subset of weather types over Europe. Based on the work of F. Baur in the 1940s, this effort expands European map typing and brings the focus of Baur’s original use as a long-range forecast tool to the near-time scale. These catalogs are designed to help weather forecasters who, under conditions of severe data denial (e.g., during extended communications outages), are provided possible synoptic situation maps with associated weather discussions. Charts in this document are selected
excerpts from the *European Meteorological Bulletin* produced by Deutsches Wetterdienst.

**2WW/TN--89/002** (ADB143994) *Second Weather Wing’s Europe Map Type Catalog, Volume VIII, Southerly Flow over Central Europe*, by Herr Harald Strauss, May 1989, 87pp. The eighth in a series of documents depicting a subset of weather types over Europe. Based on the work of F. Baur in the 1940s, this effort expands European map typing and brings the focus of Baur’s original use as a long-range forecast tool to the near-time scale. These catalogs are designed to help weather forecasters who, under conditions of severe data denial (e.g., during extended communications outages), are provided possible synoptic situation maps with associated weather discussions. Charts in this document are selected excerpts from the *European Meteorological Bulletin* produced by Deutsches Wetterdienst.

**2WW/TN--89/005** (ADB144491) *European Forecast Unit Backup to Air Force Global Weather Central*, by Capt. William G. Munley, Jr., 2nd Lt. Gerald R. Rugg, and MSgt. Melvin W. Bradley, November 1989, 12pp. Explains European Forecast Unit (EFU) backup products for Category II (long-term) AFGWC outages. Examples of current AFGWC products and EFU backup products are provided for comparison. Although the EFU products differ in appearance, they contain the same information as their AFGWC counterparts. Distribution authorized to U.S. government agencies only, proprietary information, November 1990.

**2WW/TN--90/001** (ADB149907) *The Boundary Layer Model (BLM): A Users Guide*, compiled by Capt. William G. Munley, Jr., with translations by 1st Lt. Peter A. Engelmann, May 1990, 43pp. The BLM used by the German Military Geophysical Office (GMGO) is made available to the European Forecast Unit (EFU) for retransmission on the EURDIGS circuit. This tech note explains the model and the transmitted output available to EURDIGS subscribers. Distribution authorized to U.S. government agencies only, proprietary information, 19 March 1990.

**2WW/TN--90/002** (ADB152837) *2nd Weather Wing’s Europe Map Type Catalog, Volume X, How to Use the 2WW European Map-Types Series*, by Herr Harald Strauss, December 1990, 86pp. Tenth, and final, in a series of volumes depicting a subset of weather types over Europe. Based on the work of F. Baur in the 1940s, this effort expands European map typing and brings the focus of Baur’s original use as a long-range forecast tool to the near-time scale. These catalogs are designed to help weather forecasters who, under conditions of severe data denial (e.g., during extended communications outages), are provided possible synoptic situation maps with associated weather discussions. Charts in this document are selected excerpts from the *European Meteorological Bulletin* produced by Deutsches Wetterdienst.
3.6 3WW Technical Notes

The 3rd Weather Wing no longer exists; however, during its existence a number of technical documents were published. Order these technical notes from the AFW Technical Library (AFWTL), 151 Patton Ave., Room 120, Asheville NC 28801–5002, DSN 673–9019. (SSTN = Scientific Services Technical Note.)


3WW SSTN 3 (AD–NONE) The Forecasting of Clouds and Airframe Icing, by Lt. Col. Clayton E. Jensen, May 1962, 25pp. Adiabatic vertical velocities are computed for atmospheric layers and used to modify dewpoint-depression fields in twelve-hourly steps. Assuming a certain correspondence between dewpoint-depression and amount of cloudiness, cloud forecasts can be made for specific atmospheric layers; for example, 850–700, 700–500, 500–300, and 300–200 millibars. For the lower two layers, airframe icing forecasts are produced on the basis of predicted conditions of cloudiness, temperature, and lapse rate.


3WW SSTN 8 (AD–NONE) On Computation of Pitch, Roll, Yaw, and Geographical Coordinates of Any Point on a Meteorological Satellite Photograph, by Maj. Edwin E. Brown, March 1964, 13pp. Pitch, roll, and yaw of a meteorological satellite, such as TIROS, is computed from the geographical coordinates of two points that are identified on a satellite photograph, the location of the satellite subpoint at the time the photograph was taken, the height of the satellite, and the inclination angle of the equatorial and orbital planes. An initial three dimensional coordinate system with the origin at the satellite and the z axis coincident with the camera’s optical axis is rotated through five angles so that the resultant z axis passes through the subpoint. Deviations of the initial x and y axes (photographic plane) from the resultant, horizontal xy plane are termed roll and pitch respectively. The angle between the y axis and the subpoint track is termed yaw. A technique to compute the geographical coordinates of any point on the photograph is described. Matrix algebra is employed to perform the rotations. Rotation angles are computed from plane and spherical trigonometric relationships.


3WW SSTN 13 (AD–NONE) Numerical Cloud and Icing Forecasts, by Maj. Herbert Edson, September 1965, 61pp. The 3rd Weather Wing (Air Weather Service) automated Cloud and Icing Forecast Program produces hemispheric moisture and temperature forecasts at four levels of the atmosphere (850-, 700-, 500-, and 300-mb), which are converted to layered cloud and icing forecasts as well as total cloud forecasts. The program employs synoptic cloud data to modify and initialize moisture analysis. These moisture values are then advected with three-dimensional trajectories using two-hourly forecasts of horizontal and vertical winds. A forecast moisture field is thus established and converted to cloud amount through use of a Condensation Pressure Spread (CPS) to Cloud Correspondence Table and certain discriminating vertical motion and temperature considerations. The trajectory advection technique requires an input from a six-level height model which produces stream functions at fixed levels and vertical velocities within layers at 2-hour time intervals. Forecast horizontal winds are computed directly from stream functions while vertical motions at the levels are taken from a vertical profile which is fitted to the layer values. Low, middle, high, and total cloud forecast are obtained from the model on a global basis out to 48 hours. These forecasts have been used as an operational tool at the Global Weather Central (GWC) for over a year.


**3WW TN 19 (AD–NONE) Statistical Aids to Terminal Forecasting**, by Maj. Hugh E. Hanna, Jr. and Maj. Frank G. Johnson, September 1968, 20pp. Describes existing and programmed computerized aids to terminal weather forecasting. Discusses application of conditional climatology with respect to the forecast. Several special application tables are provided: wind stratified persistence probability, onset duration, diurnal heating curves, and others. Thumb rules for application of statistical data of format described to the terminal problems in 3WW are presented. Differences between various forms of conditional probability are discussed.

**3WW TN 21 (AD–NONE) A Technique for Applying Trajectory Forecasts from the Trajectory Computer Program to Offutt AFB, (24 October 1968 - 30 November 1968), by Maj. Hugh E. Hanna, Jr., December 1968, 14pp.** Test application of computerized trajectory forecasts to the Offutt terminal aerodrome forecast began on 24 October 1948. After several days of testing on a real-time basis, it became apparent that AWSTR 210, “The Use of Trajectories in Terminal Forecasting,” August 1968, was not explicit enough for literal application to the base TAF. A program was then created to correlate forecast elements with observed weather for different wind directions to evaluate local influences, primarily down-slope, on the utility of trajectory information. This was required due to the apparent tendency of the trajectory program to amplify subsidence and associated drying. Application of revised criteria for Offutt resulted in a 4 percent overall improvement in the percent correct hour-forecasts prepared. The increase was considered significant since trajectory data were helpful in identifying many deteriorating trends.


**3WW–TN–69–2 (AD683762) An Investigation of Winter Fog and Stratus at McCoy AFB, Florida**, by Maj. Frank G. Johnson, February 1969, 31pp. This report correlates wind, temperature, and dew point at 1700L with various categories of fog or stratus occurring during the morning hours at McCoy AFB, Fla.


**3WW–TN–69–4 (AD690174) An Experiment in Utilization of Relative Probabilities of Weather Conditions When Deteriorations Occur**, by Maj. Hugh E. Hanna, Jr. and David L. Nelson, July 1969, 20pp Conditional climatology tables for 3-hour initial time blocks rerun from hourly surface data tapes from 3WW library. Initial program modified to exclude considerations of all 24-hour succeeding time-periods unless at least one observation in that 24-hour period deteriorated to lower category. Effects of the ever-present diurnal cycle and relative timing which may be deduced are studied in detail.

3WW–TN–70–1 (AD698835) Synoptic Features Associated with Snow at Offutt AFB, Nebraska, by Maj. Frank G. Johnson, January 1970, 14pp. Correlates wind direction to onset of snow at Offutt AFB, Neb. Average 850-mb charts 0 to 11 hours before snow occurrence are included.


3WW–TN–71–2 (AD729868) An Objective Technique for Forecasting Wintertime Radiation Fog at Fairchild AFB, WA, by Dwayne N. Burgess and Darrell T. Holland, September 1971, 12pp. Presents an objective technique for forecasting wintertime radiation fog at Fairchild AFB, Wash. Using data available by 1500L, a technique is presented to forecast occurrence or nonoccurrence of radiation fog restricting visibility to less than 2 miles between 0000L and 0800L for November through February. Eight predictors examined: five combinations showed promise; three were used in this study. Predictor combinations used are: surface wind speed vs temperature–dew-point temperature; temperature vs temperature–dew-point temperature; and surface wind speed vs dew-point temperature. POR used: 1952–1962. Independent sample used: 1965–1966.

3WW–TN–71–3 (AD735724) Thermal Parameters as a Predictor of Precipitation Type for Loring AFB, Maine, by Limon E. Fortner, Jr. and Dale G. Rogers, September 1971, 21pp. Presents a summary of thermal variables as precipitation type predictors at Loring AFB, Maine. Material may be used to make an objective forecast when input data is extracted from current observations and prognostic facsimile charts. The Caribou, ME, radiosonde data (0000UTC and 1200UTC) is correlated against precipitation type that occurred at Loring AFB, Maine. Thermal variable combinations used were: 1,000–850 mb thickness; 1,000–700 mb thickness; 1,000–500 mb thickness; surface, 950 mb, 850 mb, and 700 mb temperatures.

3WW–TN–71–4 (AD733583) Description and Use of 3rd Weather Wing Onset-Duration Tables, by Maj. David L. Bailey, October 1971, 16pp. This note describes computation and display of hourly onset-duration tables based on long periods of sequential hourly weather observations. Initial data is stratified by weather element, category, and hour of initial occurrence. Typical elements are ceiling or visibility. Categories consist of discrete increments of ceiling height or visibility. The tables for each hour contain the number of times a particular element and category began (onset), the category at the previous hour, how many hours this condition persisted (up to 6 hours), and the category subsequent to the occurrence. An example of the intended use of the tables is presented.

3WW–TN–71–5 (AD734036) An Experiment in Additional Stratification of Conditional Climatology Summaries for Short-Term Forecast Aids, by Dale G. Rogers, November 1971, 13pp. Describes results of an experiment to use two additional elements in stratifying observational data for conditional climatology (CC) summaries. Conventional CC aids used throughout AWS stratify hourly observations by month, hour, initial ceiling/visibility category, and final ceiling/visibility category at some later time. Later versions add surface wind direction sectors as a fifth variable. This note introduces use of present weather and ceiling/visibility trend over previous hour as the sixth and seventh variables in determining the conditional probabilities of five ceiling/visibility categories 4 hours from initial observation. A sample of the output is presented.

3WW–TN–72–1 (AD754927) Thermal Parameters as A Predictor of Precipitation Type for Kincheloe AFB, Michigan, by Limon E. Fortner, Jr., Dale G. Rogers, Michael P. Cianciolo, and Barry W. Satchwell, February 1972. Revised February 1973, 22pp. This paper presents a summary of thermal variables as predictors of precipitation type at Kincheloe AFB, Mich. The material presented here may be used in the preparation of an objective forecast when input data is extracted from current observations and prognostic facsimile charts. The Sault Ste. Marie, Mich., radiosonde data (00UTC and 12UTC) are correlated against precipitation type that occurred at Sault Ste. Marie AFB, Mich. Thermal variable combinations used here were 1,000–850 mb thickness, 1,000–700 mb thickness, 1,000–500 mb thickness, surface, 950 mb, 850 mb, and 700 mb temperatures; 850 mb wind direction.

3WW–TN–72–2 (AD753418) Thermal Parameters As A Predictor Of Precipitation Type For Ellsworth AFB,
**South Dakota**, by Dale G. Rogers, Limon E. Fortner, Jr., William L. Kneas, and Michael P. Ciancolo, April 1972, 19pp. Gives summary of thermal variables as precipitation type predictors at Ellsworth AFB, S.D. Material may be used in preparation of objective forecast when input data extracted from current observations and prognostic facsimile charts. Rapid City, S.D., radiosonde data (0000UTC and 1200UTC) correlated against precipitation type that occurred at Ellsworth AFB, S.D. Thermal element combinations used: 1,000–850 mb thickness; 850–700 mb thickness; 1,000–500 mb thickness: surface, 850 mb and 700 mb temperatures; 850 mb wind direction.

3WW–TN–73–1 (AD756881) **Synoptic Features Associated with Moderate and Heavy Snow for Loring AFB, Maine**, by Limon E. Fortner, Jr., and Paul Mulder, February 1973, 15pp. The table of event frequency for moderate and heavy snow and the charts presented in the note were prepared from data extracted from the Loring AFB, Maine, hourly surface observations tape and the historical map tapes. Average map displays (AVMAPS) were prepared for 1,000 mb, 850 mb, 700 mb and 500 mb for moderate to heavy snow cases associated with an initial surface wind from the northeast quadrant or the southeast quadrant. Note: A February 1989 3WW/DNS review of this TN shows that it has little value in forecasting snow at Loring AFB, Maine. It could, however, be of value at other locations.

3WW–TN–73–2 (AD762289) **Thermal Parameters as a Predictor of Precipitation Type for Carswell AFB, Texas**, by Limon E. Fortner, Jr., and Billie E. Grubbs, April 1973, 15pp. A summary of thermal variables as precipitation type predictors at Carswell AFB, Texas. Material may be used to make an objective forecast when the input data are extracted from current observations and prognostic facsimile charts. The Greater Southwest Airport (GSW), Fort Worth, Texas, radiosonde data (for 0000UTC and 1200UTC) are correlated against precipitation type that occurred at Carswell AFB, Texas, within 3 hours of radiosonde time. Thermal combinations used were: 1,000–850 mb thickness; 1,000–700 mb thickness; surface and 900 mb temperatures; and 1,000–500 mb thickness. Main criterion for selection was availability of forecast values.

3WW–TN–73–3 (AD–NONE) **Use of Forecasting Statistical Aids**, by Capt. Russell W. Reed, September 1973, 13pp. Discusses the nature, advantages, and limitations of statistical aids. Also discusses how the aids should be maintained and how they should be used in the forecasting routine. Several statistical aids provided by 3WW/DN are explained. This note is in outline form to increase its utility as a reference.

3WW–TN–73–4 (AD768717) **Thermal Parameters as Predictors of Precipitation Type for Grand Forks AFB, North Dakota**, by Capt. Russell W. Reed, October 1973, 17pp. Eight individual thermal parameters and five sets of two parameters from Bismarck, ND., radiosonde data tapes are correlated with the type of precipitation that occurred at Grand Forks AFB, ND., within three hours of radiosonde time. Thermal parameters tested were 1,000–850 mb, 1,000–700 mb, 1,000–500 mb, and 850–700 mb thickness, and surface, 950 mb, 850 mb, and 700 mb temperature. The period of record is May 1959 to August 1964.

3WW–TN–73–5 (AD770037) **Selected Thermal Parameters as Predictors of Precipitation Type for Offutt AFB, Nebraska**, by Russell W. Reed, November 1973, 13pp. Four individual thermal elements (and three combinations of two) from Omaha radiosonde data tapes are correlated with the type of precipitation occurring at Offutt AFB, Neb., within 3 hours of radiosonde time. Elements tested were 700 mb temperature, 850 mb temperature, surface temperature, and 1,000–500 mb thickness. Main criterion for selection was availability of forecast values.


3WW–TN–75–2 (AD688845) **Lyle Stratus Dissipation Study --- for Randolph AFB, Texas**, by Richard W. Lyle, January 1969, 20pp. Gulf Stratus in Texas is defined as a stratus cloud layer formed by nocturnally cooled Gulf air flow. Warm moist air from the Texas Gulf coastal area is cooled to saturation by nocturnal radiation and adiabatic cooling as it moves upslope from the coast to the 500- to 900-foot elevations of central Texas. Forecasting methods have concentrated on forecasting low-level moisture and wind flow. Pressure gradient (rather than wind flow) was used for this study because pressures were thought to be more representative and timely than wind. The 00UTC pressure data gave 89 percent accuracy for occurrence and non-occurrence of a stratus ceiling at Randolph AFB, Texas. Formation of stratus ceilings occurred within 1 hour and 15 minutes in 63 percent of cases and formed within 300 feet of forecast height in 62 percent of cases. Minimum ceilings within 300 feet of forecast occurred in about 65 percent of cases.
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3WW–TN–75–3 (AD–NONE) Wind Forecasting — Colorado Springs Area, by Kenneth E. German and Robert C. Miller, December 1975, 25pp. Several rules for forecasting in the Colorado Springs area are reviewed and summarized. The importance of low-level stability is stressed. Two major divisions are made: stable and unstable cases. Stable cases generally involve winds associated with outbreaks or surges of arctic or cold continental air, and are isolated from the winds aloft by the strong frontal inversion. The unstable cases generally involve determining when a mountain wave will appear. The main mechanism is mid-level cooling, but there are others.

3WW–TN–76–1 (ADA029003) Low Level Moisture Advection, by CMSgt. Eugene M. Weber, August 1976, 28pp. Several years of data were reviewed to update and expand on 8th Weather Squadron Technical Note 10–7. This TN was developed by the author for Whiteman AFB, Mo., in 1965. Two main low-level moisture patterns in the central U.S. (residual moisture and gulf moisture) are identified. Advection and contributions of these patterns are discussed. Relationship between the low-level jet and gulf stratus advection is detailed with three distinct tracks/types of moist tongues designated. Includes forecasting techniques for identifying and determining the extent and rate of movement of gulf moisture/stratus.

3WW–TN–76–2 (ADA034656) Major Snowstorm Development Over the Midwest United States, by CMSgt. Eugene M. Weber, December 1976, 94pp. This technical note discusses the atmospheric conditions essential to the development of major wintertime storm systems over the Midwest (Central United States). Primary emphasis is placed on determination of areas favorable for cyclogenesis. Intensification and movement of the 500-mb low as a function of 500-mb height falls tendency is presented. Identification, intensification, and movement of the plain surface system is then introduced. Finally, the related developments at all levels of the atmosphere, as they occurred during the January 1975 blizzard, are shown.

3WW–TN–77–1 (ADA054236) Special Study: An Investigation of Low-Level Winds as Related to Parachute Operations at Dyess Air Force Base, Texas, by Carl A. Johnson, May 1978, 18pp. Dual theodolite pibals taken concurrently with combat control team mean effective wind calculations. Combat control team errors analyzed within selected ranges of mean effective wind: it was found that error increases significantly with increasing wind speed. Errors resulting from mean direction measurement were found to be insignificant. Similarly, aircraft positioning errors resulting from short term temporal variations were found to be insignificant when compared to speed measurement errors. Two methods of approximating mean effective winds introduced to provide a check against the larger CCT errors. Each method tested for accuracy against Dyess wind data. A simple estimation technique derived by the British Meteorological Office fit our data.


3WW–TN–78–1 (ADA048963) Short Wave Fadeout (SWF) Equipment and Operational Procedures, by Kenneth E. Eis, January 1977, 20pp. Explains the new AWS short wave fadeout (SWF) instrumentation, its installation, calibration, and use. Details of SWF observation discussed. Paper can be used by local equipment technicians as a technical order on SWF equipment until there is a formal Technical Order.

3WW–TN–79–1 (ADA073432) Moisture Advection and the Sangster Chart, by Carl A. Johnson, June 1979, 48pp. Discusses clouds, precipitation, and upper low movements as they were observed to occur with certain type boundary layer moisture advection patterns. Moisture advection calculated using Sangster Chart winds and surface mixing ratios.

3WW–TN–79–2 (ADA072746) Major Midwest Snowstorms, by CMSgt. Eugene M. Weber, August 1979, 104pp. Discusses various atmospheric conditions essential to development of major wintertime storm systems over midwest. Primary emphasis is on determination of areas favorable for cyclogenesis. Intensification and movement of 500-mb low as a function of 500-mb height falls tendency is presented. Identification, intensification, and movement of main surface system is then introduced. Finally, related developments of all levels of the atmosphere, as they occurred, are shown in various summary forms.

3WW/TN--80/001 (ADA080069) Index of 3WW Technical Notes and Forecaster Memos, by Capt. James C. St John, January 1980, 6pp. This technical note lists all current technical notes and forecast memos published by 3WW Aerospace Sciences. This TN will be updated annually. Users may update this index when appropriate. Superseded by ADA097281, January 1981.

Satellite Interpretation, by CMSgt. Eugene M. Weber and Steven Wilderotter, December 1981, 109pp. Describes cloud formations as seen on enhanced infrared and visible GOES satellite photographs; attempts to relate the meteorological causes for these formations. Some of the latest techniques developed by NESS are included. Designed to be used as a base reference for comprehensive training in analysis, interpretation, and application of satellite data in making forecasts. Includes more than 350 illustrations, most of them actual satellite photos.
3.7 4WW Technical Notes

The 4th Weather Wing no longer exists, however, during its existence a number of technical documents papers and technical memoranda was published (TPs and TMs—the period equivalents of “technical notes”) between 1963 and the wing deactivation on 30 June 1972. Archival copies of documents dated from 1963 through 1972 are on file at the AFWTL—some are available from DTIC. Refer all requests to the AFWTL, 151 Patton Ave., Room 120, Asheville NC 28801–5002, DSN 673–9019.

4WW TP 63–1 (AD–NONE) A Method of Verifying Short-Period Categorical Change Forecasts (0–3 Hours), by Capt. Herbert A. Million and Joe S. Restivo, January 1963, 29pp. A multitude of forecast verification systems are in existence today that serve economic, administrative and scientific purposes. We are primarily interested in the scientific purpose, in analyzing forecast errors to determine their nature and possible cause. Once the problem areas have been identified, one can concentrate on technical improvement in these weak areas. Certain problem areas can be subjectively identified without the aid of a verification system. An organized verification system, however, will keep the detachment better informed of its technical capability and effectiveness, point out more specifically where technical improvement is needed, and provide useful information on the trend in forecast accuracy over a period of time.

4WW TP 63–2 (AD296944) An Objective Aid for Forecasting Ceilings Less Than 300 Feet and/or Visibilities Less Than 1 Mile at Geiger AFB, Washington, by Thomas H. Simmonds, February 1963, 9pp. Forecasting the occurrence of operationally critical values of ceiling and/or visibilities presents a major problem at Geiger AFB, Wash. This investigation was conducted to develop an objective aid for forecasting such critical values.

4WW TP 63–3 (AD–NONE) The Effects of High Altitude Thermonuclear Explosions on the Weather, by Capt. Herbert A. Million, February 1963, 8pp. This briefing was given to the Commanders and Staffs of NORAD and ADC in response to their questions regarding several newspaper and weekly new magazines articles.

4WW TP 63–4 (AD–NONE) A Pilot Study of an Objective Aid for Forecasting Ceilings Less Than 300 Feet and/or Visibilities Less Than 1 Mile at Paine AFB, Washington, by Thomas H. Simmonds, March 1963, 6pp. Forecasting the occurrence of operationally critical values of ceiling and/or visibilities presents a major problem at Paine AFB, Wash. This study was conducted to develop an aid for forecasting such critical values.

4WW TP 63–5 (AD404502) An Objective Aid for Forecasting Strong and Gusty Surface Winds, by Thomas H. Simmonds, May 1963, 7pp. Forecasting the occurrence of operationally critical values of strong surface winds with accompanying gusts presents a major problem at Grand Forks AFB, N.D. This investigation was conducted to develop an objective aid for forecasting such critical values.

4WW TP 63–6 (AD405683) A Case History Investigation of Wintertime Storms which Produce Sustained Surface Winds 50 Knots or Greater at Texas Tower 2 and Texas Tower 3 — Part 2 (Summary of Results), by Scientific Services Section, May 1963, 10pp. This report supplements our study, “A Case History Investigation of Winter Storms which Produce Sustained Surface Wind Speeds 50 knots or greater at Texas Tower 2 and Texas Tower 3,” and summarizes our forecasting experience on the tower forecasting project using the procedures outlined in the study. The study was published in September 1962. However, the forecasting procedures set forth in the study were completed on 18 December 1961 and were used as forecasting guides from that date.

4WW TP 63–7 (AD406606) An Objective Aid for Forecasting Strong and Gusty Surface Winds at Portland AFB, Oregon, (Revised May 1963), by Thomas H. Simmonds, May 1963, 4pp. Forecasting the occurrence of operationally critical values of strong surface winds with accompanying gusts presents a major problem at Portland AFB, Ore. This investigation was conducted to develop an objective aid for forecasting such critical values.

4WW TP 63–8 (AD408637) An Objective Aid for Forecasting Strong and Gusty Surface Winds at McChord AFB, Washington (Revised May 1963), by Thomas H. Simmonds, May 1963, 4pp. Forecasting the occurrence of operationally critical values of strong surface winds with accompanying gusts presents a major problem at McChord AFB, Wash. This investigation was conducted to develop an objective aid for forecasting such critical values.

4WW TP 63–9 (AD408449) An Objective Aid for Forecasting Strong and Gusty Surface Winds at Paine AFB, Washington, by Thomas H. Simmonds, June 1963, 4pp. Forecasting the occurrence of operationally critical values of strong surface winds with accompanying gusts presents a major problem at Paine AFB, Washington. This investigation was conducted to develop an objective aid for forecasting such critical values.
An Objective Aid for Forecasting Ceilings Less Than 300 Feet and/or Visibilities Less Than 1 Mile and Ceilings Less Than 1,500 Feet and/or Visibilities Less Than 3 Miles at Richards-Gebaur AFB, Missouri, by Thomas H. Simmonds, October 1963, 8pp. Forecasting the occurrence of operationally critical values of ceiling and/or visibilities presents a major problem at Richards-Gebaur AFB, Mo. This investigation was conducted to develop an objective aid for forecasting such critical values.

An Objective Aid for Forecasting Ceilings and Visibility at Sioux City AFS, Iowa, by Thomas H. Simmonds, November 1963, 7pp. Forecasting the occurrence of operationally critical values of ceiling and/or visibilities presents a major problem at Sioux City AFS, Iowa. This investigation was conducted to develop an objective aid for forecasting such critical values.

Verification of NMC/SAGE Wind Forecasts for July 1963, by Joe S. Restivo and Capt. D. Barbarick, January 1964, 22pp. During the past few years, SAGE wind forecasting has undergone many improvements during the process of changing from a time-consuming manual technique at every sector station to the automated procedure used presently by the National Meteorological Center (NMC). Beginning in early 1963, NMC issued seven SAGE wind bulletins daily containing wind forecasts for each grid point from 5,000 to 60,000 feet. The increased frequency of SAGE wind bulletins is one of the major improvements during the past year. Another improvement, probably of equal importance, is the change in the atmospheric model used to produce NMC operational forecasts. The improved 3-level baroclinic model was introduced into the SAGE wind forecasting routine in 1963 and is believed to offer improvement over the former barotropic SAGE wind forecasts, especially at high altitudes. Information on the new NMC model was widely publicized by Air Weather Service in February 1962, and a description of the NMC/SAGE wind bulletins was published by Headquarters, 4th Weather Wing in September 1962.

Verification of NMC/SAGE Wind Forecasts for October 1963, by Joe S. Restivo and Capt. D. Barbarick, February 1964, 20pp. This report is the second of a series of verification studies on SAGE wind forecasts made at the National Meteorological Center (NMC) for use in SAGE sector weather stations. The first report was published as 4th Weather Wing Technical Paper 64–1 and dealt with verification statistics for July 1963. Subsequent studies for January 1964 and April 1964 will be published as Technical Papers 64–3 and 64–4 respectively. Technical Paper 64–1 contains a general discussion on the SAGE wind forecast system and the reasons for initiating the verification studies; therefore the reader is referred to this paper for necessary background information. The general purpose of this investigation is to obtain a quantitative measure of our wind forecast capability throughout the SAGE system which heretofore has not been sufficiently documented.

Verification of NMC/SAGE Wind Forecasts for January 1964, by Joe S. Restivo and Capt. D. Barbarick, April 1964 21pp. This report is the third of a series of verification studies on SAGE wind forecasts made at the National Meteorological Center (NMC) for use in SAGE sector weather stations. The first two reports, published as 4th Weather Wing Technical Paper 64–1 and 64–2, dealt with verification statistics for July and October 1963. The study for April 1964 will be published as Technical Paper 64–4. Technical Paper 64–1 contains a general discussion on the SAGE wind forecast system and the reasons for initiating the verification studies; therefore the reader is referred to this paper for necessary background information. The general purpose of this investigation is to obtain a quantitative measure of our wind forecast capability throughout the SAGE system which heretofore has not been sufficiently documented.
This report reveals results of the investigation into phenomena producing spurious echoes (targets) observed on radar scopes at sites in the southwestern United States. The purpose of this investigation was conducted to develop objective aids for forecasting such critical values. Over Southwestern United States, by Thomas H. Simmonds, March 1964, 11pp. Forecasting the occurrence of operationally critical values of ceilings and visibilities presents a major problem at Sioux Falls (Foss Field). This investigation was conducted to develop objective aids for forecasting such critical values.


4WW TP 64–8 (AD–NONE) Appraisal and Modification of NMC Prognostic Charts, by Joe S. Restivo, July 1964, 16pp. Describes how to effectively utilize National Meteorological Center (NMC) prognostic charts, detachment forecasters should carefully appraise each chart in some organized and systematic manner.

4WW TP 64–9 (AD–NONE) Spurious Radar Echoes Over Southwestern United States, by Lt. Col. Richard C. Burriss and Capt. Eugene T. Gray, June 1964, 14pp. On 10 April 1964, 4th Weather Wing Scientific Services was requested to investigate the possibility of meteorological phenomena producing spurious echoes (targets) observed on radar scopes at sites in the southwestern United States. This report reveals results of the investigation.

4WW TP 64–10 (AD–NONE) Summer Human Comfort, by Maj. Glenn C. Reiter, May 1964, 10pp. Each new summer brings its share of hot, sultry weather and accompanying human discomfort. The purpose of this report is to discuss the effects of heat on the human body, and to show some of the indexes that have been derived to measure or predict human comfort in terms of meteorological parameters.

4WW TP 64–11 (AD–NONE) Radioactivity Fall-Out Plots, by Lt. Col. Anthony L. Merlo, August 1964, 13pp. This report describes the AWS fall-out plot as a time-space plot that delineates the ground areas that might receive fall-out and the time of occurrence.

4WW TP 66–1 (AD640074) Persistence Probability, by Joe S. Restivo, August 1966, 40pp. This paper consolidates many ideas—both published and suggested—concerning the use of persistence as a practical forecast tool. Specific emphasis is placed on the construction of ceiling and visibility persistence probability (or conditional probability) tables and suggested uses as a short-period forecast aid. The paper contains a survey of published literature available in the technical files of Headquarters, 4th Weather Wing and presents many ideas and suggestions for designing improved probability tables.

4WW TP 67–1 (AD658038) Onset-Duration Tables of Specified Ceiling and Visibility Categories, by Joe S. Restivo, August 1967, 17pp. This paper describes a new type of table which shows for each initial ceiling (and visibility) category, frequency distributions of onset times, a duration history based on successive hours of occurrence and a complete history of the type and frequency of subsequent one-hour weather category changes.

4WW TP 67–2 (AD–NONE) A Catalog of Selected Meteorological Studies Available from the Defense Documentation Center, by Joe S. Restivo, October 1967, 11pp. This catalog contains two parts: Part I contains a list of general reference studies extracted from DDC TAB’s and the USGRDR during the period 1 January 1962-1 October 1967; Part II contains a list of specific terminal forecast studies extracted from DDC TAB’s and the USGRDR during the period 15 December 1965–1 October 1967.

4WW TP 68–1 (AD830636) Forecasting Solar Flares Using Calcium Plage History, by Capt John W. Maurin, June 1967, 15pp. The probability of major solar flares (importance class 2 or greater) is compiled based upon the flare history of calcium plages.


4WW TP 68–3 (AD–NONE) An Investigation and Case History of Five Major Solar Flares that Occurred Unexpectedly, by MSgt. Arthur R. Thomas, November 1966, 26pp. The report discusses five major solar flares that occurred unexpectedly. A unique method of plotting observed data and computing a solar region index is presented. The region index seems to be directly proportional to the importance class of these five major flares.

4WW TP 68–4 (AD835210) Solar Flare Prediction Using Calcium Plage Area, Sunspot Area, and Flare History, by Capt. John W. Maurin and TSgt Delos A. DeForest, August 1967, 22pp. The probability occurrence of major solar flares (importance Class 2 or greater) is compiled based upon multiple correlation and regression analysis of calcium plage area, sunspot area, and flare history.
4WW TP 68–5 (AD835750) Solar Forecasting Aid: The Activity Level Designator Chart, by T Sgt. Richard B. Agee, March 1967, 15pp. The Activity Level Designator Chart (ALDC) is designed to give a 24-hour percentage probability forecast of an importance two or greater solar flare from a selected region on the sun. The data used in this report was from September 1965 through January 1967. Updated ALDC’s and techniques for forecasting solar flares can be found in later technical reports or in 4WWM 105–1.

4WW TP 68–6 (AD–NONE) A Catalog of General Meteorological Studies and Local Forecast Studies, by Joe S. Restivo and MSgt. Robert L. Helms, November 1968, 14pp. This catalog contains two parts: Part I contains a list of general reference studies extracted from DDC TAB’s and the USGRDR during the period 1 January 1962–1 November 1968; Part II contains a list of specific terminal forecast studies extracted from DDC TAB’s and the USGRDR during the period 15 December 1965–1 November 1968. This paper supersedes 4WW TP 67–2 dated October 1967.

4WW TP 69–1 (AD685808) Climatic Atlas of North America Mean Winds, by CMSgt. Donald T. Brissett and Clarence E. Everson, March 1969, 87pp. Provides monthly charts of mean winds at 10,000-foot intervals from 10,000 to 70,000 feet.

4WW TP 69–2 (AD–NONE) Climatic Atlas of North American Flying Weather, by CMSgt. Donald T. Brissett and Clarence E. Everson, May 1969, 41pp. Provides monthly percent frequency of three ceiling/visibility categories: less than 500/1, less than 1,000/3, and less than 5,000/5.


4WW TP 69–5 (AD697960) Visibility Improvement Graphs—A Synoptic Climatological Forecast Aid, by Robert C. Sabin, November 1969, 24pp. Describes a new technique for producing a useful synoptic climatological forecast aid that is different from the conventional climatological product. Data is limited to a specific weather element (radiation fog) associated with a specific synoptic weather regime. It is probably the first true synoptic climatological forecast tool. Its superiority over aids that do not take the synoptic pattern into account is clearly evident.

4WW TP 70–1 (AD703305) The Value of Static and Trend Persistence in the One-Hour Prediction of Ceiling and Visibility, by Joe S. Restivo and Capt Franklin R. Hartranft, February 1970, 122pp. Describes some applications of persistence by different weather agencies—identifies certain “areas of confusion” and clarifies the definition of the term. Presents statistical evaluation of static and trend persistence based on period of record (POR) at seven terminals.

4WW TP 70–2 (AD712678) Computerized Map Typing Procedures and their Application to the Development of Forecast Aids, by Franklin R. Hartranft, Joe S. Restivo, and Robert C. Sabin, August 1970, 57pp. This paper describes methods of classifying surfaces and upper air weather maps into map types through computer techniques, and various applications in the development of forecast aids. Specific emphasis is placed on three applications, namely: 1) case studies of special weather phenomenon, 2) objective forecast studies, and 3) synoptic climatological forecast aids. These applications are illustrated using actual results from several 4WW projects.


4WW TP 70–5 (AD718422) Predicting Heavy Snowfall for Colorado Springs Based on Computer Derived Map Types, by Franklin R. Hartranft, Joe S. Restivo, and Robert C. Sabin, December 1970, 211pp. This paper contains the results of applying the weather map typing procedures described in 4 WW Technical Paper 70–2, Computerized Map Typing Procedures and Their Application in the Development of Forecast Aids, to the specific problem of heavy snow forecasting in Colorado Springs, Colorado. The case study technique described in SECTION IIIA of 4WW TP 70–2 was employed to derive sets of surface and 700-mb map forecast study technique described in SECTION IIIB of 4 WW TP 70–2 was used to develop a set of forecast aids (scatter diagrams) for each surface/700-mb map type. The snow study described
in this paper demonstrates a new approach to objective forecast study development. The synoptic situation has been objectively integrated into the initial stratification of climatological data and therefore permits an objective consideration of surface and 700 mb map patterns as the initial step in the forecast procedure. The inclusion of climatologically derived map types in the forecast study also allows an excellent means of incorporating prognostic chart information.


12 WEATHER SQUADRON TECHNICAL PAPERS

After the 4th Weather Wing deactivation on 30 June 1972, the 12th Weather Squadron (Ent AFB) continued publishing this series of technical papers.

12WS TP 72-1 (AD749130) *The Persistence of Map Types*, by Capt Peter R. Scholefield, Aug 72, 35 pp.


12WS TP 72-4 (AD767217) *Map Type Catalog for the Illinois Window*, Nov 72, 169 pp.


12WS TP 73-2 (AD766925) *Map Type Catalog for the Colorado Window*, Apr 73, 169 pp.

12WS TP 73-3 (AD766926) *Map Type Catalog for the Great Lakes Window*, May 73, 169 pp.

12WS TP 73-4 (AD766927) *Map Type Catalog for the Montana Window*, May 73, 169 pp.

12WS TP 73-5 (AD766928) *Map Type Catalog for the Utah Window*.

4WW TP 72–1 (AD743301) *Applying a Window Pane Technique to the Colorado Springs Snow Study*, by Lt. Col. Robert C. Sabin, January 1972, 19pp. This paper describes an attempt to zero-in on the small scale circulation by correlating only one corner of the large window. By typing the corner, or “window pane,” it is possible to refine the snow forecasting technique.

4WW TP 72–2 (AD744102) *A Comparison of Two Techniques Used to Develop a Computer Generated Map Type Catalog*, by Robert C. Sabin and R.L. Nieman, March 1972, 25pp. Tests and reports upon two methods used to develop map types for inclusion in the computerized terminal forecast program; concludes that the two methods are interchangeable.
3.8 5WW Technical Notes

The 5th Weather Wing no longer exists, however, during its existence, several technical notes were published. The AFW Technical Library (AFWTL) has the technical notes listed below. To order a copy, contact the AFWTL, 151 Patton Ave., Room 120, Asheville NC 28801–5002, DSN 673–9019.


5WW–TN–71–4 (AD728627) Henz Lee Slope Thunderstorm Study for Buckley ANG Base Aurora, Colorado, by John F. Henz, August 1971, 18pp. This note concentrates on the deviation of an objective yes/no thunderstorm forecast technique within a 12 mile radius of Buckley ANG Base, Colo.

5WW–TN–71–5 (AD730327) Mesoscale Analysis and Forecasting, by Maurice E. Pautz, September 1971, 42pp. A collection of mesoscale analysis and forecasting techniques to aid the station forecaster in making improved short-range forecasts. These techniques include plotting and analysis of the pressure, temperature, streamline and upper-air fields with methods to use these fields for forecasting. Even though these methods are not new this manuscript brings all the current techniques into one collection.


5WW–TN–72–3 (AD–NONE) Forecasting Gusty Surface Winds at Nellis AFB, Nevada, by Leonard D. McChesney, July 1972, 20pp. This study discusses the measurement of sea level and upper-air gradients to determine the strength of the wind field at Nellis AFB, Nev.


5WW–TN–78–2 (ADA056988) Tailored Climatology of Severe Weather, by Robert P. Wright, June 1978, 16pp. This technical note describes the design and use of computer-produced climatologies of severe weather reports within 50 statute miles of a given location.


5WW/TN–79/002 (ADA070925) Computing Basic Solar and Lunar Data from the Air Almanac, by Capt. John K Sanders, June 1979, 71 pp. This technical note provides programmed instruction on use of The Air Almanac to compute times of sunrise, sunset, moonrise, moonset, and duration of civil twilight at any location between latitudes 60 degrees South and 90 degrees North. Appropriate basic astronomy is included. Superseded by 5WW/TN–87/001, December 1987.

5WW/TN–83/001 (ADA131892) World-Wide Sea-Surface Temperatures, by Capt. John K. Sanders, Ransom R. Traxler, and TSgt. Gerald L. Wheeler, April 1983, 254pp. Contains sea-surface isotherm charts divided into geographical sections for the Atlantic, Pacific, and Indian Oceans as well as North American lakes and Hudson Bay. Each section further divided into 12 monthly sets of charts, each containing a maximum, mean, and minimum temperature chart (except for the Canadian Lakes and Hudson Bay section, which gives only a mean value). Also includes a table of approximate survival times for humans with ordinary clothing immersed in sea.

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for calculating times for sunrise/set, moonrise/set, and
twilights. Requires use of 5WWPs 105–3 and 105–4 as
data sources.

5WW/TN--84/002 (AD–NONE) Forecasting Air Mass
Thunderstorms at Nellis AFB, Nevada, by Leonard D.
McChesney (updated by 5WW/DNS), November
1984, 10pp.

5WW/TN--86/001 (AD175176) Southwest Asia
1986, 95pp. Prepares forecasters for weather to expect
when deployed or assigned to Southwest Asia. Discusses
Syria, Lebanon, Jordan, Israel, Iran, Afghanistan, Iraq,
and the Arabian Peninsula. Divided into seasons for
convenience.

5WW/TN--87/001 (ADA190777) Computing Basic
Solar and Lunar Data from the Air Almanac, by Capt.
John K. Sanders and TSgt. Charles R. Elliott, updated by
MSgt. George T. Gilligan, Jr., December 1987. Provides
programmed instruction on use of Air Almanac to
compute times of sunrise, sunset, moonrise, moonset, and
duration of civil twilight for any location between
latitudes 60 degrees south and 90 degrees north. Errata
(provided in 20 April 1989 5WW/DNC letter) corrects
nautical twilight estimation instructions on Page 15.
3.9 7WW Technical Notes

The 7th Weather Wing no longer exists; however, during its existence, several technical notes were published. The Air Force Weather Technical Library (AFWTL) has the technical notes listed below. To order a copy, contact the AFWTL, 151 Patton Ave Rm 120 Asheville, NC 28801-5002 DSN 673-9019.

**7WW/TN--80/001 (ADA086151) Forecast Worksheet—A New Approach**, by Thomas L. Rish, May 1980, 22pp. Forecasters are given mixtures of centralized forecasting guidance for various models, techniques, and data bases valid for varying times or time intervals and presented in many different ways. To produce an operationally sound forecast, they must logically assemble the various bits and pieces, resolve all inconsistencies, and visualize the interactive changes that will be taking place in the atmosphere. This report describes the results of a study of worksheets normally used by AWS units to prepare forecasts. It identifies weaknesses in many worksheets and describes a new format that provides a more logical step-by-step process for preparing forecasts.


**7WW/TN--82/001 (ADA118432) Ray-Tracing Analysis of a Line-of-Sight Communications Path**, by Maj. James W. Goldey, May 1982, 28pp. Describes a ray tracing technique used to examine causes of problems with a line-of-sight microwave link between Feldberg and Adenau, Germany, during the winters of 1975–76 and 1976–77. Use of the technique with various model atmospheres helped determine the significance of refractive bending and the location of radio holes. Estimates of depth of resulting fades showed that, on the average, fade was not significant. Results showed that fade can be expected whenever surface-based trapping layers extend to 1,800 feet MSL. Antenna decoupling, another possible problem source, was not examined in this study.

**7WW/TN--82/002 (ADA123353) Technical Management Guide for Station Chiefs**, by Werner H. Balsterholt, December 1982, 9 pp. This technical note is intended to provide guidance to Base Weather Station Chiefs to assist them in their responsibilities as the technical leaders of their respective units. Rescinded.

**7WW/TN--82/003 (ADA149714) Ability of the AFGWC Boundary Layer Model to Detect and Predict Anomalous Propagation**, by Maj. James W. Goldey, May 1982, 20pp. Documents results of a study to (1) determine ability of a computer-generated analysis of atmospheric refraction to detect and predict anomalies in performance of tropospheric scatter communications links, and (2) verify skill with which vertical profiles of atmospheric refraction were forecast for 12 hours. Discusses the need for a capability to remotely analyze and forecast refractivity, gives advantages and disadvantages of technique used to satisfy the need.
Chapter 4

FORECASTER MEMOS

The first forecaster memo appeared in mid-1979. The rationale for its creation is best explained by the following note, which appeared in the last (March 1979) issue of the AWS Aerospace Sciences Review, AWSRP 105-2:

“The March 1979 issue of the Aerospace Sciences Review is the last one. Air Weather Service will publish an informal, aperiodic publication entitled “Forecaster Memo” in place of the Aerospace Sciences Review. The revised AWSR 80-2, which you should receive during April 1979, will prescribe the “Forecaster Memo.” This publication will be used to disseminate articles on forecasting as they become available. Our thanks to all of you who supported and contributed to the Aerospace Sciences Review over the past 20 years.”

FMs were used for fast and informal dissemination of analysis and forecasting procedures or other technical information. FMs are not in technical publication format. Most are not registered at DTIC and do not have AD-numbers. Consequently, they are not included in the DTIC database and are not routinely available to other Department of Defense agencies.

4.1 Air Weather Service Forecaster Memos

Order forecaster memos from the Air Force Weather Technical Library (AFWTL), 151 Patton Ave., Rm 120, Asheville NC 28801-5002 DSN 673-9019.

AWS/FM–79/001 30 Rules for Supervisors, July 1979, 5pp. Provides guidelines to detcos, station chiefs, team-chiefs, and anyone who supervises weather observers. The information is provided because good supervision is an essential ingredient to quality weather station operations today and for the foreseeable future.

AWS/FM–79/002 Short Range Forecasting, July 1979, 1p. This memorandum discusses an analysis for the performance of the operational 2-6 hour severe storm probability forecasts conducted on the basis of seven storm outbreak days from the spring season of 1979.

AWS/FM–79/003 Some Management Practices in USAF Weather Stations, by Kenneth E. German, July 1979, 2pp. This paper discusses the goal of every unit to improve forecast performance. Over the past several years, efforts were made to provide comprehensive guidance for new supervisors or commanders. Included were command (supervisory) emphasis, systematic procedures, and technical guidance.

AWS/FM–79/004 On the Relationship of Severe Weather to Radar Tops, by Roy P. Darrah, July 1979, 8pp. A study of the relationship between radar-reported storm tops above 9150 m, tropopause penetration and the type of severe weather is made. It is found that hailstorms generally extend 1000 m further into the stratosphere than windstorms and nearly 800 m further than tornadic storms. Although large variations are noted for different sections of the country, the tops of hailstorms are generally higher than for tornadic storms. Windstorms usually have the lowest tops. In contrast, the tropopause associated with hailstorms is lower than that with windstorms. The tropopause for tornadic storms usually lies between the values for the other types of severe weather. However, only 19% of the thunderstorms with tops of 15,000 m or more with a tropopause penetration of at least 1500 m are associated with severe weather reports.

AWS/FM–79/005 Diurnal Variation of Precipitation, undated, 4pp. This paper discusses the perception of precipitation. It is generally perceived that over land, especially in summertime, precipitation, if any, occurs in the afternoon. Wintertime precipitation over ocean and over land is often thought to occur without regard to time of day. These patterns are not universally true. In fact, there is strong evidence that the organized, deep convection that leads to significant precipitation usually occurs at night.

AWS/FM–79/006 Precipitable Water over the U.S., July 1979, 5pp. The aim of this article is to provide a climatological summary of precipitable water.

AWS/FM–79/007 A Subjective Assessment of Model Initial Conditions Using Satellite Imagery, by John E. Hales, Jr., undated, 8pp. Even though numerical models have made great strides forward in recent years, their accuracy is limited by initialization. The forecaster has available high quality satellite pictures, which enable him to qualitatively evaluate circulation systems. Using satellite imagery makes it frequently possible to recognize regions where there is a model initialization problem. When such an area is identified, the numerical guidance can be modified before being incorporated in the public
forecasts. A detailed analysis of the development of the damaging storm that struck Southern California on 10 February 1978 is presented. With this storm there were serious initialization problems.

AWS/FM–79/008 Training Guide for Severe Weather Forecasters, by Charlie A. Crisp, not dated, 6pp. (Excerpted from AFGWC TN 79-002). A severe weather forecast is the result of a very organized and highly disciplined approach to the analysis of surface and upper air charts. The prognosis of specific parameters found in the analysis of these charts is just as organized and disciplined as the analysis procedure itself. The example forecast will show a simplified evaluation of the major parameters of interest and how their interaction may be compared to the empirically derived severe weather synoptic patterns. Even in the example forecast, emphasis is placed on the proper evaluation of the analyses.

AWS/FM–79/009 Extended Range Temperature Forecasts, by 7WW/DON, September 1979, 2pp. This memo provides information on the availability of NWS FAX/TTY temperature forecasts outlooks, their interpretation and use.

AWS/FM–79/010 Aircraft Icing over Northwest Europe, by Holt Ashley, November 1979, 5pp. Rules summarizing the occurrence of icing over northwest Europe are presented. These rules were derived from an old study using weather reconnaissance data. Detachment forecasters may find the information useful for the European area. In other areas the information may prove helpful. The study is based on data from 1340 flights conducted over a one-year period, and is described in AWS/TR-105-46.

AWS/FM–79/011 Visibility Deterioration Caused by Successive Takeoffs of Jet Aircraft, by Herbert S. Appleman, December 1979, 4pp. A problem of growing concern is the deterioration in runway visibility that occasionally occurs when a number of jet aircraft take off in rapid succession, particularly when water injection is used to increase visibility thrust. The following study investigates whether the visibility restriction is due to fog resulting from saturation of the air by water vapor in the aircraft exhaust (i.e., surface condensation trails), or to a smoke-type contamination. It is shown that at the temperatures where water injection is used, condensation trails cannot form, so the restriction must be due to contamination. A review is then made of the meteorological parameters likely to be related to the problem of contamination visibility deterioration, including the results of a preliminary objective forecast study using certain of these predictors.

AWS/FM–80/001 Frequently Asked Questions about FXUX, by Maj. Frank Globokar, January 1980, 4pp. This Forecaster Memo explains how some of the values in the FXUX Bulletins are derived, and what they mean. FXUX Bulletins are currently prepared for CONUS units.

AWS/FM–80/002 On the Relationship of Severe Weather Types to the Strength of the Tropopause, by Roy P. Darrah, February 1980, 2pp. In order to study thunderstorm penetration of the tropopause certain characteristics of that tropopause must be understood. The National Weather Service (1969) has adopted the following definition: The Tropopause is the lowest level above 500 mb at which the temperature lapse rate decreases to 2 deg. C per km or less and the average lapse rate within the next 2 km does not exceed this rate. This requires the rawinsonde flight to extend at least 2 km above the tropopause level.

AWS/FM–80/003 Mesocyclone and Severe Thunderstorm Structure: A Revised Model, by Leslie R. Lemon and Charles A. Doswell III, February 1980, 6pp. This Forecaster Memo is a reprint of a paper that was presented at the 11th Conference on Severe Local Storms (Kansas City, Missouri, October 2-5 1979). It presents the latest model of the development of the supercell. The reference list will be most helpful for further study.

AWS/FM–80/004 Tornado and Severe Thunderstorm Warning Verification, by Allen Pearson and Clarence L. David, February 1980, 2pp. This Forecaster Memo is a reprint of a paper that was presented at the 11th Conference on Severe Local Storms (Kansas City Missouri, October 2-5 1979). It presents a summary of how NWS verifies warnings.

AWS/FM–80/005 Description of Automated Fog Forecasts, by Capt. David M. Garrison, February 1980. The FXUX MOS Bulletin contains forecasts of haze and smoke (HK), blowing dust (BD), or fog (F) followed by a percent probability. These forecasts appear in the FXUX only in the absence of “higher priority” weather such as precipitation. This article explains the development of obstructions to visibility MOS (Fog MOS) and gives verification of it. The fog, haze, and blowing phenomena forecasts show considerable skill, beating persistence by 10%-30%, even for the 48-hour forecasts.

AWS/FM–80/006 The Thompson Stability Index, by SMSgt. Larry Thompson, February 1980, 2pp. The Showalter (SI), Lifted (LI), and K (KI) indices, while most helpful in the prediction of convective thunderstorm activity all have some limitations. In an attempt to obtain the maximum assistance from these tools, SMSgt Larry Thompson introduced a combined index from the LI and KI. This index, known as the Thompson Index (TI), is simply the LI subtracted algebraically from the KI (KI-LI). In practice at AFGWC, this index works quite well. This technique requires a plotted skew T and a forecast afternoon temperature curve.
AWS/FM–80/007 AWSTR 200 Review, by MSgt. John J. Slaby, Jr., June 1980, 8pp. This forecast memo (FM) is a review of AWSTR 200 (Notes on analysis and severe-storm forecasting procedures of the Air Force Global Weather Central). The review is exercises/questions on each chapter, making it simple to “brush up” those areas where individuals may be somewhat rusty. Suggested uses for this FM include use by individual forecasters, use as part of a training package for new forecasters, or as topic for a forecaster’s meeting. First and Second Wing forecasters may wish to study the FM just prior to returning to the CONUS.

AWS/FM–80/008 Production Unit Quality Control (AWSR 178-1), by CMSgt. Charles Lee, July 1980, 4pp. Quality Control (QC) is a vital and necessary function in each unit. Its purpose is to detect, isolate, and correct any deficiencies in the production of meteorological information, to improve overall quality, and to insure compatibility between data used and the final product. It includes actions both during and after the production process.

AWS/FM–81/001 Mesoscale Surface Analysis of the 10 April 1979 Tornadoes in Texas and Oklahoma, by Allan R. Moller, February 1981, 8pp. This FM is a reprint of a paper that was presented at the 8th Conference on Weather Forecasting and Analysis (Denver, 1980). It presents a good example and discussion of a surface data mesoanalysis in the forecasting of tornadoes.

AWS/FM–81/002 AWS Ceiling and Visibility Verification, by Col. Kenneth E. German, April 1981, 8pp. The Air Weather Service provides observing and forecasting services at most U. S. Air Force and U. S. Army airfields, primarily for aircraft operations. Forecasts are for ceiling, visibility, cloud layer information, surface winds, and significant weather including icing and turbulence. Air Weather Service uses a summary of verification of the ceiling and visibility forecasts as an indicator of overall forecasting performance. Summary data are available for each year from 1968 through 1979 in terms of a skill score.

AWS/FM–81/003 Electrooptical System Performance Programs (TV and Infrared), March 1981, 25pp. This Forecaster Memo (FM) presents calculator programs for determining target-to-sensor range (e.g., maximum lock-on range or maximum target acquisition range). Users of these programs should familiarize themselves with AWS/TR-79/002, “Electro-Optical Handbook, Volume 1, Weather Support for Precision Guided Munitions.” Two IR programs produce lock-on or target acquisition ranges for infrared systems in the 8-12 micrometer region.

AWS/FM–81/004 Attenuation Problems Associated with a 5 cm Radar, by Capt. Robert H. Allen, March 1981, 8pp. Research for the FM was conducted on a 5 cm Doppler radar, and similar attenuation problems can be expected with FPS-77 radars operating in similar environments. Operators should be constantly aware of their radar’s limitations and recognize situations in which attenuation can be a significant operation problem.

AWS/FM–81/005 Data Problems in the LFM, NMC, March 1981, 3pp. This article discusses problems in the LFM Charts and Analysis and how data are modified to improve the analysis.


AWS/FM–81/007 Refresher on Atmospheric Dispersion Fundamentals and Forecasting, by Lt. Col. James L. Dicke and Capt. Jon P. Kahler, December 1981, 23pp. Although most AWS forecaster training has emphasized synoptic scale meteorology, there are several areas where our customers require detailed information on the microscale, i.e., within the lowest few 100 meters vertically and often only within a few kilometers “downwind” of or around a given point. The purpose of this Forecast Memo (FM) is to review important meteorological aspects of atmospheric dispersion with special reference to the recent publication, “Calculating Toxic Corridors”.

AWS/FM–82/001 A Logic Sheet to Assist Forecasting Thunderstorms and Severe Thunderstorms, by J.R. Colquhoun, February 1982, 6pp. This Forecaster Memo is a reprint of a paper presented at the 12th Conference on Severe Local Storms (San Antonio, January 1982) by J. R. Colquhoun, Bureau of Meteorology, Darlinghurst Australia. Although the logic sheet given may not directly apply to a specific location, it nevertheless provides an excellent basis for devising a similar sheet. An appendix to Colquhoun’s earlier paper (A Method of Estimating the Velocity of a Severe Thunderstorm Using the Vertical Wind Profile in the Storm’s Environment, 1980) is attached to facilitate use of the logic sheet which requires referencing to the appendix.

AWS/FM–82/002 Forecasting Severe Thunderstorms: A Brief Evaluation of Accepted Techniques, by Dr. Robert A. Maddox and Charles A. Doswell III, February 1982, 5pp. This Forecaster Memo (FM) is a reprint of a paper presented at the 12th Conference on Severe Local Storms (San Antonio, January 1982) by Robert A. Maddox and Charles A. Doswell. The strength and location of parameters and features usually considered favorable for severe storms and tornadoes as presented in AWSTR-200 (Rev) are evaluated using three cases of recent outbreaks of significant severe thunderstorms.

AWS/FM–82/003 Hurricane-Induced Tornadoes, by David J. Smalley, February 1982, 5pp. This Forecaster
Memo (FM) is a reprint of a paper presented at the 12th Conference on Severe Local Storms (San Antonio, January 1982) by David J. Smalley. The most common regions of tornado formation inside hurricanes are discussed. Comparisons with the Great Plains-type tornado and with typhoon-induced tornadoes in Japan are made.


AWS/FM–82/005 Satellite and Surface Observations of Strong Wind Zones Accompanying Thunderstorms, by James J. Gurka, March 1982, 4pp. This is an excerpt of the subject paper, which describes the differences in appearance between strong and weak gust fronts on visible and infrared satellite imagery to improve the short-range forecasting of thunderstorm-produced surface winds.

AWS/FM–82/006 Mesoscale Convective Complexes, by Dr. Robert A. Maddox, March 1982. 19pp. This Forecaster Memo contains two articles by Dr. Robert A Maddox on mesoscale convective complexes (MCC). The first one, “Mesoscale Convective Complexes” defines and describes organized mesoscale convective weather systems over the Central U S. heretofore unrecognized in the literature. The second article “Forecasting Mesoscale Convective Complexes Over the Central United States” describes synoptic features conducive to MCC development.

AWS/FM–82/007 Trough Analysis and Depiction on Upper-Air Charts, April 1982, 8pp. From 5WW “Newsletter,” April 1982, 8pp. The purpose of this article is to review methods of upper air trough analysis and to advocate a standard methodology for depiction to keep track of troughs in time and space. The importance of using standardized techniques is that it will provide a station with a coherent and consistent approach to analyzing troughs. All forecasters will be making the same interpretations using the same principles. If you use the same language, you communicate to each other; and most importantly, it will help you, as a group, forecast better.


AWS/FM–82/009 Relationship Between Cloud Bands in Satellite Imagery and Severe Weather, by Samuel K. Beckman, April 1982, 5pp. This Forecaster Memo (FM) is a reprint of a paper presented at the 12th Conference on Severe Local Storms (San Antonio, January 1982). The paper describes how low and middle level cloud band patterns as depicted by high resolution GOES satellite imagery, can be used to refine an expected severe weather area.

AWS/FM–82/010 Comparisons of Heat Stress Indexes, by Robert Quayle and Fred Doehring, April 1982, 5pp. Four heat-related comfort indexes are compared. Temperature and relative humidity (RH) are the primary variables considered. The apparent temperature appears to be the most versatile measure. Inspection of apparent temperature in low ranges indicates that comfort can be increased in cool, heated rooms by increasing RH to moderate levels.


AWS/FM–82/012 Wave Clouds and Severe Turbulence, by Samuel K. Beckman, June 1982, 9pp. This article was extracted from the August 1981 issue of the “National Weather Digest”. It presents an excellent case of moderate and severe turbulence occurrences related to wave clouds as depicted on satellite imagery. It demonstrates how one can track mesoscale phenomena by keeping a close watch on changes noted in the 30-minute geostationary satellite imagery sequence.


AWS/FM–82/014 Verification of MOS Guidance for Cloud Amount, Ceiling, and Visibility, by Maj. Kenneth A. Peterson, August 1982, 9pp. This Forecaster Memo (FM) is a reprint of a paper presented at the Ninth Conference on Weather Forecasting and Analysis (Seattle, June 1982). The paper describes briefly the history of MOS and its development, and verification measures and results. It compares the performances of the old versus the new MOS equations.
AWS/FM–82/015 Water Vapor Depiction—A Minimum Temperature Aid, by John A. Jannuzzi, October 1982, 4pp. This Forecaster Memo (FM) is a reprint of a paper presented originally by the NWS Western Region Headquarters as Western Region Technical Attachment No. 82-19, 27 April 1982. It describes a technique for forecasting minimum temperatures using the satellite water vapor chart. Although the method is subjective, the water vapor imagery appears to be a good tool in evaluating the extent of nocturnal radiation.

AWS/FM–83/001 The Year of the Tornado, by Edward W. Ferguson, Joseph T. Schaefer, Steven J. Weiss, and Larry F. Wilson, March 1983, 11pp. This Forecaster Memo (FM) is a reprint of a paper published in the February 1983 issue of Weatherwise. This paper discusses the tornado statistics on a month-to-month basis for 1982.

AWS/FM–83/002 Thunderstorms, by the Federal Aviation Administration, April 1983, 8pp. This Memo contains a brief description on thunderstorm hazards (squall lines, tornadoes, turbulence, icing, hail, lightning) and weather radar. It also discusses do's and don'ts of thunderstorm flying for the pilots which the weather forecaster should also be aware of.

AWS/FM–83/003 The Icelandic Low and an Effect on Aviation, by Maj. Ed Jenkins, undated, 4pp. Military transport aircraft routinely fly the North Atlantic airway tracks and are therefore susceptible to weather features in this data sparse region. Aircrews who fly this route have reported sharp temperature gradients especially noticeable when flights depart European locations flying in a westerly direction.

AWS/FM–83/004 Mesoscale Convective Complexes and General Aviation, by R.A. Maddox and J.M. Firtsch, May 1983, 7pp. This FM is a reprint of a paper published by the American Meteorological Society in the proceedings of the First International Conference on Aviation Weather System, May 4-6, 1981. The paper discusses the impact of MCCs on general aviation.

AWS/FM–83/005 Mesoscale Convective Complexes over the United States During 1981—Annual Summary, by R.A. Maddox, D.M. Rogers, and K.W. Howard, June 1983, 15pp. Satellite images are used to document the life cycles of Mesoscale Convective Complexes (MCCs) which occurred over the United States during the warm season months of 1981. These systems were found to exhibit characteristics similar to aspects of MCC’s discussed recently in the literature; however, the behavior of several of the convective systems poses questions that can only be answered through detailed studies. The systems did produce a variety of significant weather events ranging from severe thunderstorms to locally heavy rains and flooding. Information is also provided for a number of other significant mesoscale convective systems that although they did not meet the stringent MCC definition criteria, caught the investigators’ attention. This documentation should provide a useful starting point for scientists who might wish to pursue studies of mesoscale convective weather systems.

AWS/FM–83/006 Satellite Depiction of the Life Cycle of a Mesoscale Convective Complex, by Robert A. Maddox, June 1983, 5pp. This article describes a situation where severe thunderstorms producing heavy rains, high winds and tornadoes developed within a seemingly benign largescale weather system over eastern Nebraska.

AWS/FM–83/007 El Niño, July 1983, 4pp. The purpose of this forecaster memo is to provide information to Staff Weather Officers on the climatic effect of the El Nino.

AWS/FM–83/008 Summary of Some Recent Lightning Phenomena Research Investigations, by Lt Col. James L. Dicke, August 1983, 24pp. This FM contains a summary of selected information on lightning phenomena presented in June 1983 during the 8th International Aerospace and Ground Conference on Lightning and Static Electricity. In general, the information selected for highlighting deals with meteorological factors of lightning and the relationships to strikes on aircraft. Among significant items of interest, several investigators have found a bimodal distribution of lightning activity between about 4-6 km and 11-13 km, based on studying several small severe storms in Oklahoma and Virginia. In addition, during NASA F-106 penetrations of the upper portions of the Virginia storms, the number of lightning strikes to the aircraft were a maximum at the height of the upper maximum in lightning activity. Forecasters and staffmets should begin to factor the information from the conference into their pilot briefings and other environmental support products, especially when covering the possibility of encountering lightning during flight operations.

AWS/FM–83/009 Operational Infrared Weather Forecasting Support—Lessons Learned During the IR Maverick IOT & E, by Lt. Col. Robert P. Wright, September 1983, 21pp. This forecaster memo summarizes operational lessons learned in providing weather support to the infrared (IR) Maverick Initial Operational Test and Evaluation (IOT&E) from February 1981 to August 1982. A prototype IR weather support methodology was constructed for the IOT&E using off-the-shelf resources. Despite known limitations of this support mode, the benefit of real-time participation in an operational test far out weighed the risk of failure. The multitude of lessons learned with the prototype IOT&E weather support should serve as a guide for training, forecast technique development, and future planning. Distribution authorized to DoD components only; Premature Dissemination; 1 September 1983. Other requests for this document must be referred to Hq AFWA/A5. WARNING:
FORECASTER MEMOS

This document contains information for manufacturing or using weapons of war. Export of the information contained herein, or release to foreign nationals within the United States without first obtaining an export license is a violation of the International Traffic-in-Arms Regulation. Such violation is subject to a penalty of up to 2 years imprisonment and a fine of $100,000 under 22 USC 2778.

AWS/FM–83/010 The Reliability of the Bow Echo as an Important Severe Weather Signature, by Ron W. Przybylinski and William J. Gery, November 1983, 7pp. This paper presents preliminary statistical results of a continuing study, which evaluates the effectiveness of the bow echo as a severe weather indicator. In this study, the authors introduce two new radar echo characteristics associated with the bow echo. These echo characteristics, along with the signatures documented by Fujita (1980), are combined in the preliminary statistical results.

AWS/FM–84/001 Defense Meteorological Satellite Program (DMSP), by Maj. Gerard D. Wittman, June 1984, 25pp. This memo is designed to provide Air Weather Service personnel a quick reference of DMSP and NOAA satellites. It includes the operation and capabilities of the Operational Linescan System <OLS>; brief descriptions of the other DMSP mission sensors; DMSP launch operations; descriptions of the TIROS-N, Advanced TIROS-N, and GOES spacecraft; and interagency coordination of meteorological satellite programs.

AWS/FM–84/002 Microburst Wind Shear, by John McCarty and Tetsuya T. Fujita, May 1984, 35pp. This FM contains information about the microburst low altitude wind shear hazard to aviation. The first article by McCarthy discusses the structure of microburst and the resulting wind shear as studied in the Joint Airport Weather Study (JAWS). Fujita discusses the Andrews AFB microburst in the second article. The third, excerpts from the Airman’s Information Manual, gives the procedures for wind shear PIREPS.

AWS/FM–85/001 The Forecast Sounding, by MSGt. Fred Gesser and MSgt. Dave Wallace, January 1985, 13pp. This forecaster memo, although only a small part of severe weather forecasting, provides a quick technique to help forecasters assess the potential for severe weather. It also presents a review of stability indices; hail potential, maximum gust potential, and the Severe Weather Threat Index (SWEAT). Forecasters who are knowledgeable of severe weather potential are better prepared to react quickly and, therefore, save lives and minimize damage to valuable military resources.

AWS/FM–85/002 Severe Weather Test...Part 1: Theory, by MSgt. Fred Gesser, April 1985, 10pp. This forecaster memo and a series of four others have been written to specifically help commanders and detachment chiefs carry out this responsibility. The tests cover a broad range of severe weather topics theory, analysis, METSTAT, radar, and use of the skew-T, log-P. Use them in your units to assess technical strength and areas where improvement is needed. Training programs, monthly seminars, and seasonal reviews can be then tailored to individual and group needs.

AWS/FM–85/003 Severe Weather Test...Part 2: Analysis, by MSgt. Fred Gesser, April 1985, 8pp. This forecaster memo and a series of four others have been written to specifically help commanders and detachment chiefs carry out this responsibility. The tests cover a broad range of severe weather topics-- theory, analysis, METSTAT, radar, and use of the skew-T, log-P. Use them in your units to assess technical strength and areas where improvement is needed. Training programs, monthly seminars, and seasonal reviews can then be tailored to individual and group needs.

AWS/FM–85/004 Severe Weather Test...Part 3: METSTAT, by MSgt. Fred Gesser, April 1985, 8pp. This forecaster memo and a series of four others have been written to specifically help commanders and detachment chiefs carry out this responsibility. The tests cover a broad range of severe weather topics-- theory, analysis, METSTAT, radar, and use of the skew-T, log-P. Use them in your units to assess technical strength and areas where improvement is needed. Training programs, monthly seminars, and seasonal reviews can then be tailored to individual and group needs.

AWS/FM–85/005 Severe Weather Test...Part 4: Radar, by MSgt. Fred Gesser, May 1985, 8pp. This forecaster memo and a series of four others have been written to specifically help commanders and detachment chiefs carry out this responsibility. The tests cover a broad range of severe weather topics-- theory, analysis, METSTAT, radar, and use of the skew-T, log-P. Use them in your units to assess technical strength and areas where improvement is needed. Training programs, monthly seminars, and seasonal reviews can then be tailored to individual and group needs.

AWS/FM–85/006 Not used.

AWS/FM–85/007 NWP Models at a Glance, by Maj. Gregory D. Nastrom, December 1985, 17pp Modern analysis and forecasting procedures include products from Numerical Weather Prediction Models (NWP) and their output. In an effort to help forecasters make better use of NWP products, this memo has three purposes: first, to point out the benefits that can be gained by knowing something about common models and properly applying their output; second, to review the four basic components of a model; and third, to provide a thumbnail sketch of the main features of the NWP models used or planned at Air Force Global Weather Central (AFGWC), and National
AWS/FM–85/008 Calendar of the Nighttime Global Illuminance for the Prediction of Nighttime Intensity of Light, by the Office for Armed Forces Geophysics, Traben-Trarbach, Germany, translated by Capt. Dennis Frill, 7th WS, December 1985, 10pp. Distribution authorized to DoD components only; foreign government information, 1 August 1985. Other requests for this document must be referred to AFWA/A3O, Offutt AFB, NE.


AWS/FM–86/002 Local and Regional Influences on the Meteorology of Central America, by Lt Col. Charles P. Guard, September 1986, 27pp. This Forecaster Memo applies tropical meteorological principles to Central America, stressing physical rationale for sensible weather and discussing effects of Central American geography on weather and climate.

AWS/FM–87/001 Forecasting the Atemporalado in Honduras, by MSgt. Bruce Brooks, February 1987, 9pp. In the dry winter season of Central America, the occasional southward penetration of cold fronts or shear zones create significant problems for aviation because of strong and gusty surface winds. This Forecaster Memo presents a simple index to aid forecasters in predicting the onset of this inclement weather in Honduras. It also helps identify the sensible weather expected with the mid-latitude intrusions known in Central America as the “Atemporalado”.

AWS/FM–87/002 The NGM Numerical Output, by 1st Lt Jeffrey Tongue, July 1987, 8pp. Output from the Nested Grid Model (NGM) is the primary numerical guidance used in the CONUS. This FM explains information provided in the NGM output. Explains “sigma” level, provides plotting worksheet.


AWS/FM–92/001 A New Severe Thunderstorm Identification Technique, by Capt. David I. Knapp, February 1992, 7pp. Describes, a new method (developed by AFGWC with data from the spring 1991 thunderstorm season) for identifying severe thunderstorms. The technique uses lightning strike data from the National Lightning Detection Network. The memo describes AFGWC’s success with identifying severe thunderstorms. It also provides a rule of thumb for determining tornado potential from lightning flash data.

AWS/FM–92/002 Using Hodographs in Thunderstorm Forecasting, by Lt. Col. Gregory D. Nastrom, September 1992, 20pp. Describes a method (called a “hodograph”) for displaying vertical wind profiles and using those profiles to forecast severe storms. Vertical wind profiles can help identify conditions that indicate the likelihood of severe storms. They can even identify the type of storm anticipated; for example, supercell, multicell, and splitting storms.

AWS/FM–92/003 Verification of a Severe Thunderstorm Identification Technique, by Capt. David I. Knapp, October 1992, 5pp. Provides verification data for Rule of Thumb #1 given in AWS/ FM-92/001, above. The author verified the rule using late spring data (1 June to 10 July 1991). Initial verification included Red, Blue, and Green observations, but to really test the severe weather forecasting accuracy of the technique, statistics were recalculated using only Red and Blue reports; Green reports were considered “non-severe.” Finally, data from
late spring 1991 and early-to-middle spring 1992 was combined to create a seasonal database from early March to early July. This provided a full season’s statistics with which to validate the technique’s accuracy and determine the geographic distribution of positive strike dominated (PSD) cells.

AWS/FM–92/004 Timing Thunderstorms and Convective Wind Gusts in West Central Florida Based on the Position of the Bermuda High-Pressure Ridge Axis, by 1st Lt. William E. Kirk, October 1992, 5pp. Describes a new method for timing the first occurrence of thunder at MacDill AFB, in west-central Florida. MacDill averages 84 days a year with thunderstorms, more than any other Air Force base in the United States. About 83 percent of these thunderstorms occur during the summer (May to September). The new technique is based on the position (north or south of MacDill) of the 1,560-meter contour line on the 850 hPa 1200 UTC analysis.

AWS/FM–93/001 (ADA290986 and ADA263386) The Basics of Weather Models, by Dr. W. Dale Meyer, March 1993, 15pp. Summarizes the history and fundamentals of modern numerical weather prediction models for operational weather forecasters. The information is intended to help forecasters understand the models’ strengths and weaknesses. It is published with the expectation that an increased understanding of the details of these complex mathematical models will help forecasters make better use of NWP model forecasters. This FM complements information in Chapter 7, AWSP 105-56, “Meteorological Concepts.”

AWS/FM–94/001 (AD-B196769) Estimating IR Visibility from an “Austere” OTDA (Electrooptical Tactical Decision Aid), by Capt. Cliff Dungey, February 1994, 13pp. Tells Air Force weather forecasters how to estimate infrared visibility (IRVIS) that can, in a pinch, be substituted for values calculated by the more sophisticated and more accurate computer-derived electrooptical tactical decision aid (EOTDA). This memo shows how to enter estimated values of target dew point and visibility into graphs prepared for several types of general weather conditions. The “austere” EOTDAs provided by these graphs are based on calculations of atmospheric conditions for an average IR sensor. IRVIS is simply a distance index of IR transmissivity. The results produced by the graphs should be used only to provide very rough estimates of IR visibility when a computer-derived EOTDA is not available. Distribution limited to DoD components only; critical technology, July 1992. Other requests for this document must be forwarded to AFWA STINFO, 151 Patton Ave., Asheville NC 28801-5002. Warning: This document contains technical data whose export is restricted by the Arms Export Control Act (Title 22, U.S.C., Sec 2751, et seq) or the Export Administration Act of 1979 as amended, Title 50, U.S.C., App 2401, et seq. Violations of these export laws are subject to extreme criminal penalties.

AWS/FM–95/001 (AD-A302317) Improved Altimeter Settings for A-10 Aircraft, by Capt. Timothy D. Oram, February 1995, 15pp. Describes a process designed to improve the bombing accuracy of A-10 aircraft equipped with the Low Altitude Safety and Targeting Enhancement (LASTE) system by improving altimeter setting accuracy. After finding unacceptable altitude errors during tests of LASTE Version 3.3, the 57th Test Group (57th TG) at Nellis AFB, Nev., asked the 57th OSS/OSW to develop a method for improving A-10 bombing accuracy by developing improved altimeter setting forecasts. The 57 TG also contracted for General Electric to include software in LASTE Version 4 to correct for these altitude errors automatically. This memo describes a method for improving altimeter setting forecasts in support of LASTE Version 4. It also explains basic altimetry theory and tells how theory relates to the A-10 bombing problem. Finally, the memo provides tips for supporting LASTE Version 4.
The AWS 100- and 200-series forecaster memos were originally intended to familiarize AFW people with the “climate/weather regimes” of selected geographical areas, notably Africa and Asia.

While there are minor variations in format or content between individual publications in this series, each provides climatic controls and climatic anomalies of a particular region. In addition, pertinent climatic summaries and sunrise/sunset data are provided. The series will also include publications on climatic effects on electro-optical weather systems, tropospheric anomalous propagation, and attenuation.

AWS/FM–100/001 Climate and Weather of Africa, March 1980, 6pp. Africa is the second largest continent on earth and occupies a landmass in excess of 11.5 million square miles. This Forecaster Memo describes the geography/topography, pressure patterns, air masses, migratory features, climatic controls, and climatic anomalies of a particular region. In addition, pertinent climatic summaries and sunrise/sunset data are provided.

AWS/FM–100/002 Historical Listing of Country Names, March 1980, 8pp. The purpose of this 100 Series Forecaster Memo is to provide Staff Weather Officers/Noncommissioned Officers with a reference to country names. Most of the available climatology for Africa and Asia has been compiled by various agencies at different times within the last 30 years. Concurrently, the once vast European colonial empires have been dismantled. As many of these former colonies became independent, they adopted new names. This FM is intended solely as a rapid cross-reference between current and obsolete names.

AWS/FM–100/003 Climate and Weather of North Africa, March 1980, 103pp. The purpose of this 100 Series Forecaster Memo is to familiarize Staff Weather Officers/Noncommissioned Officers with the climate/weather regimes of Northern Africa.

AWS/FM–100/004 Climate and Weather of Mali/Niger/Chad/Sudan, March 1980, 30pp. The purpose of this 100 Series Forecaster Memo is to familiarize Staff Weather Officers/Noncommissioned Officers with the climate/weather regimes of the Sudan Region.

AWS/FM–100/005 Climate and Weather of the Guinea Coast, March 1980, 32pp. The purpose of this 100 Series Forecaster Memo is to familiarize Staff Weather Officers/Noncommissioned Officers with the climate/weather regimes of the Guinea Coast.

AWS/FM–100/006 Climate and Weather of Tropical East Africa, March 1980, 36pp. (Change 1, undated) This 100 Series Forecaster Memo was written by Fifth Weather Wing. Its purpose is to familiarize Staff Weather Officers/Noncommissioned Officers with the climate/weather regimes of Tropical East Africa.

AWS/FM–100/007 Climate and Weather of the Congo Basin, March 1980, 20pp. The purpose of this 100 Series Forecaster Memo is to familiarize Staff Weather Officers/Noncommissioned Officers with the climate/weather regimes of The Congo Basin.

AWS/FM–100/008 Climate and Weather of Southern Africa, March 1980, 31pp. The purpose of this 100 Series/Forecaster Memo is to familiarize Staff Weather Officers/Noncommissioned Officers with the climate/weather regimes of Southern Africa.

AWS/FM–100/009 Climate and Weather of the Arabian Peninsula, March 1980, 42pp. The purpose of this 100 Series Forecaster Memo is to familiarize Staff Weather Officers/Noncommissioned Officers with the climate/weather regimes of the Arabian Peninsula.

AWS/FM–100/010 Climate and Weather of South Asia, March 1980, 30pp. The purpose of this 100 Series Forecaster Memo is to familiarize Staff Weather Officers/Noncommissioned Officers with the climate/weather regimes of South Asia.

AWS/FM–100/011 Climate and Weather of the Eastern Mediterranean Countries, March 1980. 58pp (Change 1) the purpose of the 100 Series Forecaster Memo is to familiarize Staff Weather Officers/Noncommissioned Officers with the climate/weather regimes of The Middle East.

AWS/FM–100/012 Climate and Weather of Iraq, Iran, Afghanistan, March 1980, 51pp. The purpose of this 100 Series Forecaster Memo is to familiarize Staff Weather Officers/Noncommissioned Officers with the climate/weather regimes of Southwest Asia.

AWS/FM–100/013 Weather Support to Electro-optical Weapons Systems, March 1980, 5p. The purpose of this 100 series Forecaster Memo is to familiarize Staff Weather Officers/Noncommissioned Officers with the environmental sensitivities of electro-optical (E-O) weapon systems. The significance of the effects of environmental parameters on E-O systems varies from one climatic/weather regime to another. This memo does not attempt to specifically describe the environmental sensitivities for specific regimes. Environmental sensitivities must be inferred from the climatology of
standard meteorological parameters described in other 100 Series Forecaster Memos on specific climatic weather regimes. This memo’s table of Environmental Sensitivities of E-O Systems provides a convenient means for such inferences. Distribution limited to U.S. Government agencies only: Administrative/Operational Use, 27 March 1984. Other requests for this document must be referred to HQ AFWA/A3. WARNING: Information subject to export control laws. This document may contain information subject to the International Traffic in Arms Regulation (ITAR) or the Export Administration Regulation (EAR) of 1979 which may not be exported, released, or disclosed to a foreign national inside or outside the United States without first obtaining an export license. A violation of the ITAR or EAR may be subject to a penalty of up to 10 years imprisonment and a fine of $100,000 under 22 U.S.C. 2778 or Section 2410 of the Export Administration Act of 1979. Include this notice with any reproduced portion of this document.

AWS/FM–100/014 Propagation Climatology, May 1980, 38pp. The purpose of this 100 series Forecaster Memo is to familiarize Staff Weather Officers/Noncommissioned Officers with the propagation climatology of the Middle East, Africa, Southwest and South Asia. The memo includes a discussion of the theoretical aspects of ionospheric and tropospheric anomalous propagation and attenuation as well as the potential impacts on systems operating in the Very Low Frequency (VLF) to Extremely High Frequency (EHF) range of the electromagnetic spectrum.

AWS/FM–100/015 The Effects of Desert on Man and Machine, August 1980, 8pp. The purpose of this 100 Series Forecaster Memo is to familiarize Staff Weather Officers and Noncommissioned Officers with the environmental conditions that prevail in desert regimes. The effects of heat and sand on man and machine are covered in considerable detail. Recommended maintenance practices of ground equipment are also discussed. Information contained in the Forecaster Memo was reprinted from the 1977 “Desert Environmental Handbook” by Harry A Greveris, US Army Yuma Proving Ground.

AWS/FM–100/016 MEAFSA Forecasting Hints, August 1980, 42pp. (Change 2, 1p.). This Forecaster Memo is an anthology of previously published articles that may be of value in the MEAFSA area. It is designed to be a quick reference for Staff Weather Officers/NCO’s supporting the Rapid Development Joint Task Force (RDJTF). These articles have been reprinted in their original form for ease of publication. A brief explanation of the reason each was included is also given.

Lack of Data, especially in wartime, will not lessen the demands for weather service. This article presents a technique that can be used to deduce the type of system that is influencing the local area. This technique requires only the latest upper air sounding and continuity (to construct an upper air sounding see 8-1.3-1). Knowledge of the type of system present will allow the forecaster to prepare a better forecast.

AWS/FM–100/017 Winter Shamal in the Persian Gulf, August 1980, 58pp. The purpose of this 100 Series Forecaster Memo is to familiarize Staff Weather Officers/Noncommissioned Officers with the winter shamal. The condensed report examines the winter shamal, a subsynoptic scale wind phenomenon, and its effect and frequency in the Persian Gulf Region. This FM is extracted from NAVENVPRDRCSDFAC TR 79-06, authored by Thomas J. Perrone.

AWS/FM–100/018 Western Indian Ocean, August 1980, 30pp. The purpose of the 100 series Forecaster Memo is to familiarize AWS members with the airflow at low levels over the Western Indian Ocean. It was extracted from “Mean Monthly Airflow at Low Levels Over the Western Indian Ocean,” by J. Findlater, Geophysical Memoirs No. 115, Meteorological Office, Great Britain (1971). The analyses are average (mean) monthly charts and do not reflect the diurnal oscillation nor the variations between levels. The respective analyses are the means for the indicated level (e.g., 10,000 ft, 3 km) for the month. The reader must be alert that significant diurnal variations occur over East Africa.

AWS/FM–100/019 The Easterly Jet Stream in the Tropics, September 1980, 7pp. The purpose of this 100 series Forecaster Memo is to familiarize Staff Weather Officers and Noncommissioned Officers with the easterly jet stream found over southern Asia and northern Africa. Summertime temperature and wind patterns are discussed for various levels. Relationships of cloud and precipitation patterns with the tropical easterly jet stream are also discussed.

AWS/FM–100/020 Forecasting Techniques in East Africa, undated, 36pp. The purpose of this 100 series Forecaster Memo is to familiarize staff weather officers and noncommissioned officers with the analysis and forecast techniques used in East Africa. Topics discussed include primary and secondary flow models, weather associated with each model, routine analyses done by the East African Meteorological Department, and some useful forecasting techniques.

AWS/FM–100/021 Conditions for a Severe Duststorm and a Case Study for Iraq, undated, 10pp. The purpose of this 100 series Forecaster Memo is to familiarize Staff Weather Officers/Noncommissioned Officers with the physics of dust raising for the formation of severe dust storms. A case study of dust storms in Iraq is discussed in some detail. It should be noted that even though the case study discusses specific weather patterns over Iraq, the physics of dust raising may apply to other locations as well.
AWS/FM–100/022 *Heavy Rain in the Middle East Related to Unusual Jet Stream Properties*, April 1984, 4pp. This study describes a major flooding event over the Middle East, related to unusual characteristics of the jet stream. A major and fatal flooding event illustrative of rare similar cases in the Middle East was related to unusual characteristics of the jet stream. Contrary to the usual conditions, the jet stream had anticyclonic curvature and sloped northward with increasing altitude.

AWS/FM–200/001 *Climate and Weather of Central America*, March 1981, 27pp. The purpose of the 200 Series Forecaster Memo is to familiarize Staff Weather Officers/Noncommissioned Officers with the climate/weather regimes of Central and South America. While there are minor variations in format or content between individual publications in this series, each provides a basic discussion of geography/topography, pressure patterns, air masses, migratory features, climatic controls, and climatic anomalies of a particular country/region. In addition, pertinent climatic summaries and sunrise/sunset data are provided.
AWS/FM—300/series: Single Station Analysis and Forecasting

This series provides background reference materials for forecasting the weather with only limited observational data.


AWS/FM—600/series. SEVERE CONVECTIVE WEATHER

This series of forecaster memos was inspired by the experiences and recommendations of the Severe Weather Assistance Training (SWAT) teams that visited AWS units from January through April 1984.

AWS/FM–600/001 Introduction to the Air Weather Service Convective Weather Forecaster Series, by 1st Lt. John Pino, February 1987, 3pp. This FM introduces weather forecasters to forecasting severe convective weather forecasting. It also aids them in dealing with severe storm support. The 600 series was built to allow maximum participation in the training process by all forecasters.

AWS/FM–600/002 Upper Air Analysis and Severe Weather Forecasting, by MSgt. Fred Gesser, February 1987, 18pp. This forecaster memo is a review of the synoptic scale upper air analysis methodology associated with severe weather forecasting. To bring across the concepts and analysis techniques as clearly as possible, analyzed upper air data is included. Polychromatic charts are prepared for the forecaster, to see what the finished analysis should look like.

AWS/FM–600/003 Analyzing the Surface Map for Severe Convective Weather, by 1st Lt. John Pino, February 1987, 6pp. This FM discusses four parameters which forecasters should constantly consider while analyzing for severe weather and which can be used to determine potential areas of severe convective weather using a surface chart on the synoptic scale.

AWS/FM–600/004 The Automated Radar Summary—An Aid to Convective Weather Forecasting?, by 1st Lt. John Pino, February 1987, 11pp. This FM discusses the relationship between continuity and the ARS chart. In conjunction with continuity, a forecaster can then estimate duration of severe convective outbreaks by matching radar echoes with features as on the surface and upper air analyses and progs.

AWS/FM–600/005 Synoptic Scale Applications of Satellite Imagery to Severe Convective Weather: Numerical Model Initialization Techniques and Interpretation Guidelines, by 1st Lt. John Pino, February 1987, 21pp. This FM discusses the many applications in weather forecasting pertaining to satellite interpretation. It also refers to other documents about other satellite interpretation. The intention of cross-referencing is twofold. One, the references provide a source of background information for the folks who would like some of the concepts contained in this FM clarified or expanded upon. The other intention is to refamiliarize forecasters with valuable sources of information existing in their own unit’s technical library.


AWS/FM–600/007 Not Used.

AWS/FM–600/008 The Forecast Sounding, by MSgt Fred Gesser and MSgt Dave Wallace, January 1985, 13pp. Note: This FM was created by the addition of a new cover sheet to AWS/FM–85/001. The main objective of this forecaster memo is to provide the detachment forecaster with a few quick techniques, which will help identify the potential for severe weather. It gives the forecaster an important model which can be used to determine today’s potential to support severe weather.

AWS/FM–600/009 The Local Area Work Chart, by 1st Lt. John Pino, July 1987, 14pp. This forecaster memo is an organized “potpourri” of old and new information concerning the mesoscale surface analysis and its relationship to severe convective weather forecasting. For some folks, this FM will serve as a comprehensive review of the techniques familiar to them. For the less experienced, it presents a method for analyzing the LAWC and, more importantly, provides many inferences that can be made about upper level processes by looking at the surface data. The case study used in the FM is taken from a severe weather event which occurred on 29 May 1980.

AWS/FM–600/010 Convection—A Selective Process? One Kilometer Resolution Satellite Interpretation, by 1st Lt. John Pino, June 1987, 23pp. In the first section of this FM, various differential heating mechanisms and their role in the convective development process are studied. This section explains not only why thunderstorms develop where they do, but also why certain individual storms reach severe levels. The second section is, in a sense, a continuation of AWS/FM-600-009 in that it shows how 1 km imagery can help solve some of the complexities that can arise while analyzing an LAWC.
4.2 AFGWC Forecaster Memos

Order forecaster memos from the Air Force Weather Technical Library (AFWTl), 151 Patton Ave. Rm 120, Asheville NC 28801-5002 DSN 673-9019.

AFGWC/FM–81/001 (AD-None) *Meteorological Analysis and the LFM; They Work Together*, by MSgt. William R. Matley, April 1981, 24pp. Provides basic guidelines for use of the LFM in the prognosis of frontal systems, occlusions, etc. Discusses features such as the “exploding triple point,” the Hatteras Low, and Arctic frontal placement.


AFGWC/FM–84/002 (ADA290987) *3DNEPH Chronology*, edited by Charles W. Cook, 31 July 1984, 46pp. A chronology of significant 3DNEPH events from 1 January 1972 to 31 July 1983. Provides insight into which years and geographical areas are most likely to contain good data. Users of historical analysis data sets can determine potential deficiencies. Chronology covers the entire data set archived during the production life of the 3DNEPH model, which was replaced on 1 August 1983 by the Real Time Cloud Analysis (RTNEPH) model..
4.3 1WW Forecaster Memos

The 1st Weather Wing no longer exists. However, the AFWTL has copies of the following forecaster memos. Order forecaster memos from the Air Force Weather Technical Library (AFWTL), 151 Patton Ave. Rm 120, Asheville NC 28801-5002 DSN 673-9019.


1WW/FM–80-2 Interpretation and Use of the AXAS and FXAS 12, 24, 36 KGWC, by CMSgt. Thomas E. White, February 1980, 75pp. This memo attempts to describe the new facsimile received in Korea and Japan, how the charts may be used, and how to interpret them.

1WW/FM–80-3 Cut-Off Low Affecting the Republic of Korea, by CMSgt. Thomas E. White, March 1980, 41pp. These sets of charts, maps and weather satellite photographs are classic examples of the development and life cycle of a cut-off low. The low formed to the West of Changchon, China and then moved southeastward through the Yellow Sea and across Korea.

1WW/FM–80-5 The Case Study, by CMSgt. Thomas E. White, December 1980, 2pp. This memo was prepared to provide guidance on preparation of case studies at a base weather station.

1WW/FM–81/001 Uses, Strengths, and Weaknesses of the More Commonly Used Facsimile Products Received on the PACDIGS in Korea, by CMSgt. Thomas E. White, November 1981, 7pp. This memo is used for briefing aircrews in the normal forecasting process for identifying surface features which could affect the local terminal. Used to establish continuity of these features.

1WW/FM–81/002 Station Forecaster Meetings, by Capt. Kenneth M. Dropco, November 1981, 6pp. Describes a forecaster meeting to discuss the organization and a recommended agenda for a successful meeting.


1WW/FM–81/004 Gridding Images from Polar-Orbiting Meteorological Satellites, 16pp. This paper represents an extensive revision of applicable portions of 1WW Pamphlet 105-10. Major David C. Danielson has rewritten most of the original material, and Major D.R. Cochran of 1st Weather Aerospace Sciences handled the reformatting and editing. Gridding is the process of locating the satellite imagery on a certain geographic reference frame or grid.

1WW/FM–82/001 Suggested Guidelines for Certification and Follow-On Training Programs, by Capt. Kenneth M. Dropco, 11pp. Numerical weather analysis and prediction are explained for the manager/forecaster who doesn’t need equations and infinite details. Five papers are presented on the basics of numerical weather predictions (NWP), its major problems, and operational models and development efforts at the AFGWC, Fleet Numerical Oceanographic Center.

1WW/FM–82/002 METSAT Imagery Interpretation Test, by Maj. Gordon R. Hammond, 28 December 1982, 13pp. This FM provides a comprehensive examination of the material forecasters using METSAT data should be familiar with in their daily operations.

1WW/FM–83/001 Techniques for Forecast Improvements, by Capt. Kenneth M. Dropco, 31 March 1983, 5pp. This FM provides some techniques to improve forecasting skill at Base Weather Stations (BWSs) and some general guidelines for preparing end-of-tour reports, forecast reviews, case studies, and forecast studies.

1WW/FM–85/001 Forecasting Techniques for Bradshaw Army Airfield, Hawaii, by TSgt. Duane C. Parker and SSgt. Billy R. Kitchen, and edited by Norman E. Chaney Jr., 31 March 1985, 26pp. This memo is intended to serve as a focal point for the compilation and presentation of what has been learned about forecasting for Bradshaw AAF and Pohakuloa Training Area (PTA). It can be used by island forecasters to increase their knowledge of the weather on the Big Island (Hawaii).

1WW/FM–85/002 Microbursts, by SMSgt. Roy G. Metcalf, June 1985, 17pp. In the early 1970’s, photographs taken during aerial surveys performed by the University of Chicago revealed divergent patterns of high-wind damage in cornfield and forests after severe storm activity. These pictures suggested that some downdrafts, under certain conditions could produce tornado-like damage at the surface. These violent outflows are called “microbursts” which occurred on a spatial and temporal scale of 1 to 4 kilometers (km) and 2 to 5 minutes, respectively, and which have been a causal factor in a number of aircraft accidents (Fujita & Byers, 1977, Fujita & Caraaccens, 1977, NTSB, 1983).
1WW/FM–85/003 Technical Management Guide for Station Chiefs—Volume 1, Master Training Program, by SMSgt. Roy G. Metcalf, June 1985, 12pp. This memo is the first of a series designed to assist weather station managers, specifically station chiefs, in the management of major weather station programs.


1WW/FM–87/001 Tornadic Activity in Korea: A Case Study, by SSgt. Gordon H. Fesenger, Det. 10, 30th WS, January 1987. At 0658Z, on 30 September 1985, the forecaster at Kunsan Air Base, Republic of Korea (ROK), had the opportunity to experience a very rare occurrence for Korea, tornadic activity. The intent of this study is to present the synoptic situation and to document the series of events that led to the development of numerous waterspouts, funnel clouds, and at least one tornado at Kunsan AB, Korea.


1WW/FM–89/002 NEXRAD—100 Years of Radar Evolution, by Capt. Frank Sornatale, July 1989, 18pp. Describes the evolution of radar meteorology from WWII to the WSR-88D.

1WW/FM–89/003 Streamline-Isotach Analysis, by MSgt. Lee R. Bruce, July 1989, 20pp. Provides the “best of the basics” on the subject, collected from books, journals, and Chanute training guides.


1WW/FM–90/003 Electrooptical (EO) Tactical Decision Aid (TDA) Training Guide, by Capt. Frank Sornatale, August 1990, 103pp. Designed to help units develop or enhance their electro-optical (E-O) weather support.
1WW/FM–200/series. CLIMATE AND WEATHER REGIMES OF...

These FMs (Forecast Memos) contain data extracted and copied from National Intelligence Surveys and the USAFETAC/DS-79 AWS climatic briefs.

1WW/FM–200/001 Climate and Weather Regimes of Korea, by James E. Pettett. This FM covers general weather and climatic information, pressure systems, air masses, fronts, and ocean currents. Special phenomena includes winds, floods and droughts, dust storms, tornadoes and hail. Weather elements are broken down into temperature, humidity, precipitation, cloudiness, aircraft icing, visibility, winds, thunderstorms and turbulence. 56 p., December 1980.

1WW/FM–200/002 Climate and Weather Regimes of Japan, by James E. Pettett. This FM covers general weather and climatic information, air masses, fronts, and ocean currents. 56 p. December 1980. This document is for official use only, limited distribution.

1WW/FM–200/003 Climate and Weather Regimes of the Philippine Islands, by James E. Pettett. This FM covers general weather and climatic information, pressure systems, air masses, fronts, and ocean currents. 23 p., December 1980.

1WW/FM–200/004 Climate and Weather Regimes of Indonesia, by James E. Pettett. This FM covers general weather and climatic information, pressure systems, air masses, fronts, and ocean currents. 23 p. December 1980. This document is for official use only, limited distribution.

1WW/FM–200/005 Climate and Weather Regimes of New Zealand, by James E. Pettett. This FM covers general weather and climatic information, pressure systems, air masses, fronts, and ocean currents. 36 p., September 1981.

1WW/FM–200/006 Climate and Weather Regimes of Australia, by James E. Pettett. This FM covers general weather and climatic information, pressure systems, air masses, fronts, and ocean currents. 52 p., September 1981.

1WW/FM–300/series. BRIEFING CLIMATOLOGIES

These FMs provide a brief climatological description of the location specified, along with a set of briefing slide masters. For the most part, they were prepared from terminal forecast reference notebooks and AWS climatic briefs.


1WW/FM–300/003 Briefing Climatology for Camp Casey, Korea, by Capt. Mike Kapel, 21 p., December 1990.

1WW/FM–300/004 Briefing Climatology for Osan AB, Korea, by Capt. Mike Kapel, 11 p., December 1990.


4.4 2WW Forecaster Memos

The 2nd Weather Wing no longer exists. However, the AFW Technical Library (AFWTL) has copies of the following forecaster memos. Order forecaster memos from the Air Force Weather Technical Library (AFWTL), 151 Patton Ave., Rm 120, Asheville NC 28801-5002 DSN 673-9019.

2WW/FM–81/001 AD-None) Decoding British Met Office Analysis and Forecast Bulletins, The British Met Office (BMO) gives a solution for a teletype bulletin which provides a current analysis and/or a forecast of significant synoptic surface features. 5 p., January 1981.

2WW/FM–81/003 Rescinded.

2WW/FM–81/004 Rescinded.

2WW/FM–81/005 Rescinded; contents incorporated in 2WW/TN-86/002.

2WW/FM–83/001 Rescinded.

2WW/FM–83/002 Rescinded.

2WW/FM–83/003 Rescinded.

2WW/FM–83/004 Rescinded.

2WW/FM–83/005 Rescinded; contents incorporated in 2WW/TN-86/002.


2WW/FM–86/003 Rescinded.

2WW/FM–86/004 Rescinded.

2WW/FM–86/005 Rescinded.

2WW/FM–86/006 Rescinded.


2WW/FM–86/008 The Local Analysis and Forecast Program (LAFP), by SMSgt. Danny G. McGrew, December 1986, 64pp. Provides guidance and examples for how to establish and use an LAFP.

2WW/FM–86/009 Rescinded.

2WW/FM–87/001 Superseded by 89/004.

2WW/FM–88/001 Summary of 2WW Forecaster Hints, 1977-1987, compiled by MSgt. Thomas D. Avery, January 1988, 64pp. A compilation of selected 2WW forecaster hints transmitted over the AWN since 1977. Although the entire USAFE/DOW Staff has contributed to these “hints,” the main author for the past 9 years has been Herr Harald Strauss, 2WW’s Climatologist.

U.S. Government Agencies only, operational use, 15 March 1988. Other requests for this document shall be referred to USAFE/DOW.


**2WW/FM–88/004 METSAT Program Guidance**, by Capt. Jeffrey E. Malan, April 1988, 11pp. Provides information needed to establish or maintain a unit METSAT data acquisition and application program.


**2WW/FM–88/006 Forecasting Ceilings and Visibilities in the Eifel/Hunsrück Area of Germany**, by Herr Harald Strauss, April 1988, 33pp. This study was developed for a briefing during a 17-18 March 1988 joint USAFE/DOW-31WS/DN technical consultant visit to Spangdahlem AB. It is intended to familiarize new forecasters with the central European (especially Eifel) regime of “normal” winter weather.


**2WW/FM–89/001 Forecasting Black Ice in Western and Central Europe**, by Herr Harald Strauss, March 1989, 9pp. Provides meteorological conditions favorable for formation of “black ice.” Based on personal experience of the author in the Eifel-Hunsrück area of Germany. Applies to Germany, eastern Belgium, and possibly the Cotswold Hills region of the western UK.

**2WW/FM–89/002 Forecasting Tips from the Aerospace Sciences Division**, compiled by Anja L. Carr, April 1989, 18pp. European forecasting tips from sources throughout 2WW—not the same as USAFE/DOW hints transmitted on EURMEDS.


**2WW/FM–89/004 Climatological Summaries: Kaiserslautern Military Community**, by Capt. Catherine M. Biddulph, May 1989, 14pp. Inspired by Ann Besson, a reporter for the Kaiserslautern American, a newspaper that uses these summaries in a monthly “Weather Watch” column. Statistics used are from standard AFCCC data for Ramstein and Sembach ABs, supplemented with information from a calendar of European weather “singularities,” i.e., a weather condition that occurs around a specific date more often than would be expected due to chance.


Prepared for RAF and other defense use in the Middle East; reprinted with permission.


**2WW/FM–91/003 Tuning Your LAFP (Local Analysis and Forecast Program)**, by Capt. Paul G. LaPointe, June 1991, 39pp. Describes the techniques that are basic to a European base weather station’s meteorological watch process.
4.5 3WW Forecaster Memos

The 3rd Weather Wing no longer exists; however, the AFWTL has copies of the following documents. Order forecaster memos from the Air Force Weather Technical Library (AFWTL), 151 Patton Ave., Rm 120, Asheville NC 28801-5002 DSN 673-9019.

3WW/FM–80/001 Summary of Rules for Winter Precipitation Forecasting, 18 January 1980, 3pp. Values listed under threshold should be considered a 50 percent probability of either rain or snow. Values listed under snow/rain indicates precipitation is nearly all snow/rain for lower/higher values.

3WW/FM–80/002 Drizzle, 21 January 1980, 3pp. Drizzle commonly occurs with fog and stratus and is defined as fairly uniform precipitation composed exclusively of fine drops of water.

3WW/FM–80/003 Freezing Precipitation, 23 January 1980, 13pp. Freezing rain is produced when super-cooled raindrops strike cold objects on the ground and form on that object as a coating of ice.

3WW/FM–80/004 Snowshower Forecasting, by Maj. Arthur T. Safford III, and Frederick E. Gesser, 30 January 1980, 4pp. This memo suggests rules which were originally derived for use at Kinechloe AFB. However, the method should be applicable to many units.

3WW/FM–80/005 Atmospheric Electricity, by Daniel R. Gornell, 4 March 1980, 9pp. This natural activity is becoming an important phenomenon which can adversely affect today’s more advanced aircraft and weapons systems.

3WW/FM–80/006 Spring Patterns, 10 March 1980, 7 pp. The following synoptic patterns and comments are intended to remind forecasters of changes during the winter-to-spring transitional period. The spring season offers rapid changes in weather from day-to-day.

3WW/FM–80/007 Rescinded.

3WW/FM–80/008 Summer Patterns, by CMSgt. Eugene M. Weber, 3 September, 29 April 1980, 15pp. The following synoptic patterns and comments are intended to remind forecasters of summer month phenomena. By early summer, the fast-moving systems of spring are replaced by sluggish and stagnant weather systems.

3WW/FM–80/009 Mesoscale Surface Analysis of the 10 April 1979 Tornadoes in Texas and Oklahoma, by Allan R. Moller, 20 May 1980, 9pp. This paper deals with another very useful, but unfortunately overlooked tornado forecast tool—surface data mesoanalysis surface analysis in a tornado situation.

3WW/FM–80/010 Autumn Patterns, by CMSgt. Eugene M. Weber, 3 September 1980, 17 pp. The following synoptic patterns and comments are intended to remind forecasters of changes during the summer-to-winter transitional period. The sub-tropical ridge, prevalent across the CONUS during summer, slowly retreats southward during October.

3WW/FM–80/011 Winter Patterns, by CMSgt. Eugene M. Weber, 15 December 1980, 26 pp. The following synoptic patterns and comments are intended to remind forecasters of changes during the fall-winter transitional period. The polar jet gradually sneaks southward and suddenly forecasters find the mild, dry Indian summers of autumn replaced by the frequent passages of storm systems followed by blasts of cold polar air.


3WW/FM–82/003 Summer Patterns, Strategic Training Range Complex (STRC), by CMSgt. Eugene M. Weber, 28 June 1982, 21pp. This is the first of four memos dealing with synoptic discussions of weather events across the STRC routes. Conventional data and satellite photos are included.

3WW/FM–82/004 Autumn Patterns, Strategic Training Range Complex (STRC), by CMSgt. Eugene M. Weber, 3 September 1982, 15pp. This is the second of four memos dealing with synoptic discussions of weather events across the STRC routes. Conventional data and satellite photos are included.

3WW/FM–82/005 Winter Patterns, Strategic Training Range Complex (STRC), by CMSgt. Eugene M. Weber, 12 November 1982, 35pp. This is the third of four memos.
dealing with synoptic discussions of weather events across the STRC routes. Conventional data and satellite photos are included.

**3WW/FM–82/006 Caribbean Weather Familiarity Training–Summer**, by MSgt. Frederick E. Gesser, November 1982, 53pp. The purpose of this document is to provide training materials for personnel who may be required to provide meteorological support to Caribbean operations.

**3WW/FM–83/001 Centralized Product Strengths and Weaknesses**, by Maj. James C. St John, 1 March 1983, 4pp. This memo is helpful in assessing the “goodness” or accuracy of the various centralized products which has been a problem for AWS forecasters who make terminal aerodrome forecasts (TAFs).

**3WW/FM–83/002 Spring Patterns, Strategic Training Range Complex (STRC)**, by CMSgt. Eugene M. Weber, 30 March 1983, 23pp. This is the fourth of four memos dealing with seasonal synoptic discussion of weather events across the STRC routes. Conventional data and satellite photos are included.

**3WW/FM–83/003 Initializing the LFM, A Case of Good Agreement**, by Michael Schwilters, 5 April 1983, 2pp. This memo deals with the validity of centrally produced forecast products, called process initialization.

**3WW/FM–83/004 Use of GOES Data as an Aid in Short Range Stratus Forecasting**, by MSgt. John M. Hahn, 1 September 1983, 5pp. Today most of all 3 WW detachments have direct access to one of the best short-range forecasting tools available; GOES data received every thirty minutes.

**3WW/FM–90/001 METSAT Competency Check**, by Bill Swanson, 33pp. Designed to complement METSAT training programs by emphasizing interpretive skills. Includes review discussion, review questions, references.

**3WW/FM–90/002 Convective Techniques (A Springtime Primer)**, by Bill Swanson, 16pp. A look at new severe weather forecasting techniques and a review of some old ones.

**3WW/FM–90/003 Dynamics and Forecasting**, by Maj. Mike E. DesRosiers, updated, 9pp. This memo is a reprint of 2WW/P-105-10.

**3WW/FM–90/004 Unique Aircraft Icing Event (A Case Study)**, by Capt. Jeffrey L. Peters, updated, 13pp. This memo reviews a severe icing event that occurred on 5 December 1989 over eastern Kentucky. This FM emphasizes the analysis process and introduces a possible reason for the icing event.
4.6 4WW Forecaster Memos

The 4th Weather Wing no longer exists; however, the AFWTL has copies of the following documents. Order forecaster memos from the Air Force Weather Technical Library (AFWTL), 151 Patton Ave., Rm 120, Asheville NC 28801-5002 DSN 673-9019.

4WW TM 70-2 (AD-None) *Relationship Between 10 CM Solar Flux and Sunspot Number*, by MSgt. Terrell S. Birch, July 1970, 8pp. Because final values of the Zurich running average sunspot number (RASSN) are not available for several months, a more timely means of obtaining a value for RASSN is needed. The Ottawa 10 cm flux (F10) is available daily and 27 day predictions are made by the Aerospace Environmental Support Center on a routine basis. A good relationship between RASSN and F10 could improve the ESSA foF2 and M(3000) predictions by using F10 to specify or predict RASSN. Monthly means of F10 were smoothed to arrive at 12 month running averages from December 1957 through May 1969. These were correlated with RASSN for the same period with excellent results. An equation for conversion of F10 to RASSN was then derived.

4WW TM 70-3 (AD-709888) *Ionospheric Electron Density Profile Model*, by Thomas D. Damon and Franklin R. Hartranft, July 1970, 41pp. Describes a 4WW project to produce a realistic electron density profile based on elements that can be forecast with reasonable accuracy. The model presented here consists of the sum of three Chapman layers (E, F1, F2). Electron densities in the topside ionosphere are controlled by complex motions rather than a production-loss balance and cannot be successfully described strictly by a Chapman layer. After some experimentation, a best fit was obtained by simply using the Chapman evaluation for the topside ionosphere, but computing the electron densities by using a variable scale height throughout the region. The interim program was used routinely for 8 months to predict profiles for radar refraction.

4WW TM 70-4 (AD-None) *Relationship Between SPA and X-Ray Bursts*, by Maj. Thomas D. Damon and TSgt. Donald C. Anderson, July 1970, 8pp. The relationship between the phase advance on VLF transmissions monitored at Manila Observatory and X-ray flux observed by Vela and Explorer satellites is investigated. A linear regression equation is derived.

4WW TM 71-1 (AD-None) *Geomagnetic Disturbances*, by 1st Lt. Bernard A. Walter, Jr., March 1971, 19pp. This paper describes the various phases of a geomagnetic storm and the processes taking place in each phase. Also included is a review of the recent literature on various topics such as three-dimensional current system theories, satellite measurements of ring current particles, ground base magnetometer measurements and the relationship of ring current enhancements to auroral zone activity.

4WW TM 71-2 (AD-None) *Atmospheric Density Variations in the Region from 280 km to 500 km and Neutron Monitor Response*, by MSgt. Edward D. Beard, R. F. Morris, April 1971, 9pp. A striking correlation appeared when variations in atmospheric density were compared to variations in Deep River neutron monitor counting rates.

4WW TM 71-3 *The Relationship of 10 cm Flux to Sunspot Number*, by MSgt. Terrell S. Birch, and Lt Col Kenneth E. German, April 1971, 10pp. Several equations relating 10 cm flux to sunspot number were evaluated, and a set of equations is proposed for AESC use.

4WW TM 71-4 (AD-None) *Flare Associated Geomagnetic Disturbances*, by MSgt. Terrell S. Birch, and Lt. Col. Kenneth E. German, April 1971, 7pp. The ratios of power at various frequencies during solar radio bursts were designated to test the usefulness of a forecasting scheme proposal by Hakura in 1958. Hakura’s proposal was validated, but the correlations are not high enough to represent significant improvement over presently used techniques.

4WW TM 71-5 (AD-None) *On the Relationship of Standard MUF with MOF*, by MSgt. W. S. Kuster, Jr., April 1971, 23pp. Deviations of standard MUF from monthly mean values for several vertical incidence ionosonde sites in Japan were compared with deviations of MOF from monthly mean values for several obliquely sounded high frequency paths. The results show that there is good correlation only part of the time. These conditions are identified, and some of the noncorrelated periods are discussed in terms of application to forecasting deviations of the oblique MUF from observed deviations of the standard MUF.

4WW TM 71-7 (AD-None) *Variation of HF Radio Propagation Conditions with the Solar Cycle*, by A1C R. H. Gertken, MSgt. Terrel S. Birch, and Lt Col Kenneth E. German, June 1971, 51pp. Long distance High Frequency (HF) radio communications are expected to be worse during solar minimum than during maximum. The ionosphere, upon which HF (3-30 MHz) radio wave propagation depends, varies in mean electron density as a function of the mean variations in solar electromagnetic and corpuscular flux density throughout the 11-year solar cycle. During solar maximum, the ionosphere can be expected to support HF radio wave propagation nearly
100 percent of the time, despite interruptions of two to three percent caused by Sudden Ionospheric Disturbances (SIDs) and ionospheric storms. The greatly reduced incidence of SIDs and ionospheric storms during solar minimum accounts for communication interruptions of only 0.1 to 0.3 percent. Nevertheless, propagation conditions can be worse during solar minimum because the reduced ionizing solar radiation results in a reduced average range of propagating frequencies (propagation window). A further limiting factor during solar minimum can be the occurrence of the propagation window at the more heavily used lower frequencies. During solar minimum, the day to day variations of the ionosphere are expected to have a greater effect upon propagation conditions than during solar maximum. As a result HF communications during solar minimum will suffer more degradation and be less reliable than during solar maximum.

4WW TM 71-8 (AD-888490) MUF/LUF Forecast Verification, by Kenneth E. German, July 1971, 54pp. The Aerospace Environmental Support Center (AESC) has been forecasting maximum usable frequency (MUF) and lowest usable frequency (LUF) for high frequency (HF) radio communications paths for nearly three years. Oblique soundings were made routinely over some of the paths. For each ionogram maximum observed frequency (MOF) and lowest observed frequency (LOF) were scaled and provided to the AESC. As a result, a large data sample was collected. A forecast verification program has existed for some time, and the results are presented herein in terms of average percent error as a function of time and path. Geomagnetically quiet and disturbed days were compared. Overall, the AESC forecasts were better than the monthly or semimonthly forecast medians, and were comparable to some oblique sounder frequency management techniques. As expected, the AESC (MUF) forecasts during geomagnetically disturbed conditions represented the greatest improvements over monthly and oblique sounder techniques than during geomagnetically quiet conditions.

4WW TM 71-10 (AD-737355) An Operational Approach to Forecasting Solar Cap Absorption (PCA) Events, by SMSgt. J. Krause, December 1971, 57pp. The Aerospace Environmental Support Center (AESC) of the USAF Air Weather Service provides military and civilian agencies with information and forecasts related to the atmospheric and space environments. One aspect of the AESC’s support involves the effect of solar proton events upon transpolar high frequency (HF) radio propagation. This study addresses the problem of predicting the occurrence of Polar Cap Absorption (PCA) events resulting from solar proton enhancements near earth. Various aspects of the energetic solar flare event are reviewed and an attempt is made to assess their relative importance in arriving at a PCA forecast. Data pertinent to the flare event are considered in five general classes: radio burst data, x-ray burst data, optical data, solar region history, and the sector structure of the interplanetary magnetic field. An evaluation checklist is developed for use by the AESC forecaster. The checklist reflects the varying degrees of contributions of information in the five categories toward determining the “Total PCA Factor.”

4WW TM 72-1 (AD-744883) Morphology of a Solar-Terrestrial Event in Late September and Early October 1969, by Maj. Clement J. Thomas, May 1972, 56pp. This report looks at the geomagnetic and ionospheric disturbances that were associated with solar flares on 25 and 27 September 1969. The terrestrial responses to these two solar events were considerably different. To better understand these differences, the events are related to some of the contemporary geophysical theories. The specific results of this study reinforce the general conclusion reached in previous ionospheric morphologies. The reason for the different F-region effects of these events appears to be dependent upon the pre-event magnetospheric conditions.

4WW TM 72-2 (AD-None) Longevity of Active Solar Regions, by CMSgt. Carl K. Clay, June 1972, 8pp. The results of a study performed to help provide some operational rules for the solar forecasters of the Aerospace Environmental Support Center (AESC).

4WW TM 72-3 (AD-745100) Basic Neutral Line Patterns Defining Interplanetary Discontinuities, by MSgt. Arnold U. Starr, June 1972, 7pp. This report briefly describes certain chromospheric patterns which appear to show significant correlation with changes in the interplanetary and geomagnetic fields.


4WW TM 72-5 (AD-None) Solar Activity and Related Effects During the Period 1-12 August 1972, by Lt. Col. Jack L. Buckingham, Maj. Clement J. Thomas, and MSgt. Edward D. Beard, August 1972, 40pp. A tremendous amount of interest was generated within the DoD concerning the unusually high level of solar activity originating in AESU Region 331. This region produced a series of energetic solar events which occurred at a time when the solar activity cycle was a on a declining trend. The impact of the solar-geophysical activity associated with this region on various DoD electronics systems has prompted the Aerospace Environmental Support Unit (AESU) to prepare this morphology of solar activity, including not only the effects, but also the support provided by and to the AESU in fulfilling its space environmental support mission. .
U.S. Air Force Aerospace Environmental Support Center Role in Support to Radar Systems, by Capt. Willis D. Kriese, November 1972, 34pp. This report presents an abbreviated overview of the Aerospace Environmental Support Center (AESC) and describes certain aspects of the AESC’s Space Forecasting Branch (SFB). The AESC is a staff division of the 12th Weather Squadron, 3rd Weather Wing (Air Weather Service), and is located in the NORAD Cheyenne Mountain Complex (NMC), Colorado Springs, Colo. It is the centralized operational support agency for the U.S. Air Force Space Environmental Support System (SESS). The mission of the Space Forecasting Branch includes the responsibility of collecting, analyzing, reporting, and predicting solar-geophysical activity which may have a direct impact on the effectiveness of military operations. Environmental support to radar systems is a major role for the SFB, particularly the support to long-range and over-the-horizon radars. Due to ionospheric retardation and refraction of UHF and VHF, satellite tracking radars encounter errors in range and azimuth. Realistic ionospheric electron density profiles permit operators of long-range radar systems to apply corrections for the errors.
4.7 5WW Forecaster Memos

The 5th Weather Wing no longer exists; however, the AFWTL has copies of the following documents. Order forecaster memos from the Air Force Weather Technical Library (AFWTL), 151 Patton Ave., Rm 120, Asheville NC 28801-5002 DSN 673-9019.

5WW/FM–79/001 Fog and Stratus, by Maj. Michael G. Olivier (edited by Capt. Dale L. Johnson), July 1979, 8pp. This forecaster memo was extracted from an article “Developing Objective Aids and Methods for the Forecasting of Stratus and Fog”. It provides an in-depth discussion of physical processes involved in the formation and dissipation of fog and stratus.

5WW/FM–80/001 Superseded by 5WW/FM–86/005.


5WW/FM–80/003 Rescinded.

5WW/FM–80/004 Rescinded.

5WW/FM–81/001 An “Example” of Local Analysis and Forecast Program (LAFP), by SMSgt. Earl W. Rook (FM preparation by Capt. Gary L. Sickler), February 1981, 12pp. This “Example” LAFP provides a basic outline for consideration when revising or developing a LAFP.

5WW/FM–81/002 Shortcut for Moonrise and Moonset Calculations, by Maj. Dale L. Johnson and TSgt Gerald L. Wheeler, February 1981, 5pp. This (FM) is useful in computing the monthly calculations for lunar data.

5WW/FM–81/003 Rescinded.

5WW/FM–81/004 Topical Breakout of Teletype Bulletins Useful in Forecast Preparation, by Capt. Timothy D. Crum, April 1981, 18pp. Simplifies and expedites the forecaster’s task of finding additional guidance to aid in a CONUS forecast decision-making process.

5WW/FM–81/005 The Damming Effect of the Southern Appalachians, by Barry A. Richwien (FM preparation by Capt. Steven A. Taylor), April 1981, 12pp. This article was written by Mr. Barry A. Richwien and published in the National Weather Digest, V.5 No.1, February 1980. It discusses the effect the Appalachian Mountains have on the movement of cold stable air masses, and also provides some guidelines for the forecasts of ceilings, visibilities, temperature, and rain/snow lines.

5WW/FM–81/006 Rescinded.

5WW/FM–82/001 Fundamental Forecast Concepts for Northeast Africa and the Saudi Arabian Peninsula for the period of November/December, March 1982, 10pp. This FM contains basic concepts to provide an overview of meteorological phenomena that are likely to effect Northeast Africa and the Saudi Arabian Peninsula.


5WW/FM–82/003 Examples of a Wide Variety of Thunderstorm Propagation Mechanisms, by Raymond M. Zehr and James F. W. Purdom (FM preparation by Capt. Edwin S. Arrance), April 1982, 7pp. This article was published in the 12th Conference on Severe Local Storms Preprint (January 12-15, 1982). It provides some ideas on the propagation mechanisms of storms along the Texas Gulf Coast and Fort Collins, Colorado.

5WW/FM–82/004 Nowcasting During the 10 April 1979 Tornado Outbreak: A Satellite Perspective, by James F.W. Purdom and John F. Weaver (FM preparation by Capt. Edwin S. Arrance), April 1982, 11pp. This article was published in the 12th Conference on Severe Local Storms Preprint (January 12-15, 1982). It provides an example of how to use satellite imagery and synoptic surface data to predict storm development and possible movement.

5WW/FM–82/005 Observations and Insights Forecasting at Cairo West and Southwest Asia in Nov-Dec, by Capt. Timothy D. Crum and Capt. Gary L. Sickler, 31pp. This (FM) was written to record observations and insights noted while forecasting weather during November and December 1981 in the Southwest Asia (SWA) theater.

5WW/FM–82/006 An Examination of Jet Stream Configurations, 500 mb Vorticity Advection and Low-Level Thermal Advection Patterns During Extended Periods of Intense Convection, by Robert A. Maddox and Charles A. Doswell III (FM preparation by Capt. Edwin S. Arrance), June 1982, 16pp. This article was published in the March 1982 issue of the Monthly Weather Review. It gives good examples relating the occurrence of severe storms to the position of upper-level jets, lower-level jet streams, and the thermal advection fields.

5WW/FM–83/001 Rescinded.
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5WW/FM–86/003 Weather Staff Officers Guide to Climatology, by Lt. Col. Kenneth W. Hertzler, July 1986, 17pp. Shows weather staff officers how to use climatology in their staff duties. First section covers concepts and procedures for applying climatology to planning. Second section identifies climatological resources and shows how to organize and use them. Appendix gives additional uses for climatology. Distribution authorized to U.S. Government agencies and their contractors, administrative or operational use, July 1986. Other requests for this document shall be referred to 5WW/DNC.

5WW/FM–86/004 Turbulence Forecasting, by C.L. Chandler, Manager of Weather, Delta Airlines, August 1986, 24pp. This article, reprinted with permission, is based on knowledge acquired from thousands of hours of observations during 39 years of night by Delta. 5WW/FM–86/005 Preparing a Forecast Using Centrally Produced Facsimile Products, by Capt. Jeanette M. Baker, USAFR, August 1986, 6pp. Gives a carefully structured procedure for analyzing and using facsimile products to produce better forecasts.

5WW/FM–86/005 Preparing a Forecast Using Centrally Produced Facsimile Products, by Capt. Jeanette M. Baker, USAFR, August 1986, 6 p. This FM gives a carefully structured procedure for analyzing and using facsimile products to produce better forecasts.


5WW/FM–87/001 Use of the 500-mb Hemispheric Heights/Temperatures Chart, by Maj. Richard G. Peer, May 1987, 9pp. Provides techniques for using 500-mb hemispheric analysis chart; these techniques supplement the 5WW “Back to Basics” program and provide an insight into atmospheric motion and dynamics. The 500-mb hemispheric chart can be used to assess computer model prognoses, aid in satellite interpretation, view the “big picture,” and enhance mobility training. With two color plates.


5WW/FM–87/003 Tropical Meteorology in the Western Hemisphere, by Capt. Michael T. Gilford, and Stephen J. Savage, June 1987, 42pp. For forecasters inexperienced in tropical meteorology. Examines tropical weather in western hemisphere, concentrating on Central America. Discusses seasonal changes, reviews synoptic and mesoscale features that affect day-to-day weather. Tropical analysis and forecasting techniques are discussed. Section on streamline analysis.

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headers for major U.S., Canadian, and Alaskan stations. Bulletin breakdown (and brief discussion of use) is provided.

5WW/FM–87/005 Surf Forecasting, by Maj. Richard G. Peer, July 1987, 25pp. An introduction to forecasting surf conditions for amphibious assault operations. Although not intended to produce expert surf forecasters, it provides the basic terminology and elements needed to familiarize those involved in joint assault Operations with the problem.

5WW/FM–87/006 Seasons in Review: GOES Satellite Photos Over Central America, by Maj. Douglas C. Pearson, Capt. Michael Michel-Howell, Capt. Christopher S. Strager, and Capt. Charles H. Larcomb, August 1987, 81pp. AWS forecasters supporting the United States Southern Command from January 1985 to June 1987 viewed thousands of weather satellite photos and saved those that were most representative of central American weather. The photos shown here were selected from that collection. The authors provide a discussion of each photo and the situation it represents, along with an introduction and CFLOS data for three locations.


5WW/FM–88/003 Lightning Detection System Acquisition and Application, by Capt. John D. Murphy, November 1988, 53pp. Discusses the numerous types or Lightning Detection Systems (LDSs) and Lightning Detection Networks (LDNs) currently in use; compares strengths and weaknesses, describes applications.


5WW/FM–90/002 Staff Radar Training Program, by Capt. Terry Given, September 1990, 12pp. Provides a radar training program for staff personnel involved in staff assistance visits and technical consultant visits.

4.8 7WW Forecaster Memos

The 7th Weather Wing no longer exists; however, the AFWTL has copies of the following documents. Order forecaster memos from the Air Force Weather Technical Library (AFWTL), 151 Patton Ave., Rm 120, Asheville NC 28801-5002 DSN 673-9019.

7WW/FM–77/002 Rescinded.

7WW/FM–77/004 Wind Shear is Dangerous, 15 December 1977, 2pp. Discusses types of wind shear and wind shear detection systems.


7WW/FM–78/003 Back to Basics, 1 June 1978, 9pp. (This ASTA was adapted from the 5th Weather Wing Seminar 78-1, which has the same title. Stresses routine synoptic analyses and restates basic analysis rules and procedures.

7WW/FM–78/005 Atmospheric Electricity, 1 July 1978, 13pp. Discusses the impact of atmospheric electricity on aircraft and other weapon systems.

7WW/FM–78/006 Rescinded.


7WW/FM–78/009 Limitations of FAA Radars in Storm Detection, 1 September 1978, 3pp. Discusses limitations of ARTCC radar and compares its capabilities with those of the AN/FPS-77.

7WW/FM–78/010 Rescinded.


7WW/FM–78/012 Rescinded.

7WW/FM–78/013 Lightning Casualties, 1 September 1978, 4pp. Summary of a study that reveals lightning is under-reported as a killer because of its erratic and sporadic nature.

7WW/FM–78/014 SPOT Index Advection - An Indicator of Severe Storm Potential, 1 September 1978, 3pp. Discusses a technique that uses the severe storm potential (SPOT) index to define areas of potential severe weather.

7WW/FM–78/015 Use of Geostrophic Wind and Vorticity Bulletin (ASUS 10 KMKC) in the Local Analysis Program, 1 September 1978, 9pp. Discusses use of this bulletin and streamline analysis to identify synoptic features.

7WW/FM–78/018 Rescinded.


7WW/FM–78/023 The Southwest Low and Henry’s Rule, by Walter K. Henry, Department of Meteorology, Texas A& M University College Station, Texas, 1 December 1978, 7pp. Discusses the two synoptic conditions that precede the eastward movement of the Southwest low.

7WW/FM–78/025 Rain or Snow?, 1 December 1978, 1p. Explains why sometimes snow occurs with temperatures at or above freezing.


7WW/FM–79/001 AWS Technical Library (AWSTL) Services, 1 February 1979, 3pp. Discusses use of the AWSTL as the focal point for furnishing meteorological reference materials.

7WW/FM–79/003 Freezing Precipitation, 1 February 1979, 5pp. Discusses surface and upper-air parameters used for forecasting freezing precipitation.

7WW/FM–79/005 Rescinded.

7WW/FM–79/006 Computation of Crosswinds from RUSSWO Data, 1 April 1979, 5pp. Describes a simple graphical technique for computing crosswind components.

7WW/FM–79/007 Low-Level Wind Shear, 1 May 1979, 17pp. Provides guidance for recognizing the meteorological situations that produce low-level wind shear.

7WW/FM–79/008 Fallout Wind, 1 May 1979, 5pp. Discusses NWS procedures for predicting fallout wind in the CONUS.
7WW/FM–79/009 *Worldwide Climatology of Tropical Cyclones*, 15 July 1979, 93pp. Source of climatological information on hurricanes and typhoons to satisfy local and contingency planning support needs.


7WW/FM–81/002 *Weather Warning Support Index*, 1 June 1981, 5pp. Describes the index, computational procedures, and specific uses as a management indicator.


7WW/FM–81/004 *Reliability Studies*, 15 September 1981, 4pp. Encourages forecasters to perform studies to determine product reliability and provides information on setting up such studies.

7WW/FM–81/005 *Rescinded.*

7WW/FM–82/001 *Rescinded.*


7WW/FM–82/003 *Commonly Used Equations in Meteorology*, 22 March 1982, 9pp. Introduces several reliability equations used in meteorology.


7WW/FM–82/005 *A Logical Approach to Preparing a Weather Forecast*, by J.H. Fenner and M. Geb, 1 June 1982, 2pp. Lists weather parameters in an order of use that leads to a logical approach to preparing a weather forecast.


7WW/FM–83/001 *Lajes Crosswind Data*, 1 February 1983, 55pp. Provides crosswind data to those units that support aircraft which transit Lajes Field, Azores and includes data for an alternate location, Santa Maria.

7WW/FM–83/002 *Rescinded.*


7WW/FM–83/005 *Tornado Climatology*, 15 July 1983, 12pp. Summarizes the results of 29 years of tornado data, provides maps and graphs for tornado safety, and gives the total number of tornados in one degree squares for the period 1955-1967.


7WW/FM–83/009 *Superseded by 7WW/FM–88/001.*

7WW/FM–84/001 *Quality Control Program in the Base Weather Station*, 12 January 1984, 21pp. Articulates 7 WW philosophy concerning quality control programs in the base weather station.

7WW/FM–84/002 *Weather Warning Support Index*, 20 February 1984, 8pp. Discusses this index and its use as a management indicator in 7 WW.


7WW/FM–84/004 *Technical Training Program*, 15 April 1984, 8pp. Designed to assist unit supervisory personnel in managing technical training requirements.

7WW/FM–84/005 *Korean Mobility Training Package*, 20 March 1984, 110pp. A mobility training package and outline for the Asian area, mainly for Korea, but can be used as deployment training anywhere.
7WW/FM–84/006 Use of GOES Data in Forecasting, and Analyzing the Southeast Colorado Low, by Brian E. Heckman, 1 May 1984, 20pp. Discusses repeatable meteorological signatures that might improve confidence in forecasting development of the “Colorado Low.”

7WW/FM–84/007 Severe Weather Case Study, Scott AFB, IL, on 3 April 1984, by Susan Reyes-Sauter, 1 May 1984, 22pp. Summarizes the major features and clues that led to the early detection of a severe weather episode.

7WW/FM–84/008 Rescinded.

7WW/FM–84/009 Forecasting Mesoscale Convective Complexes (A Summary of Case Studies), by Dave Wallace, 29 June 1984, 17pp. Presents empirically designed forecast techniques from observations of life cycles of numerous MCCs.

7WW/FM–84/010 Secondary Trough Triggers Severe Weather- (A Case Study), 15 December 1984, 20pp. On 12 February 1984 several tornadoes touched down in the early morning hours in the San Antonio, Texas area. Discusses how this severe weather system developed and highlights how radar, satellite, and conventional data must be used together to provide adequate leadtime.

7WW/FM–84/011 Summer European Mobility Training Package, 30 November 1984, 80pp. Provides mobility officers and NCOs a package of data for use in developing a training program.

7WW/FM–85/001 Mobility Training Package—Turkey, Fall Season, 15 March 1985, 73pp. Provides mobility officers and NCOs a dataset for use in the unit mobility training program.

7WW/FM–85/002 Geography Quiz for Mobility, 15 April 1985, 41pp. A quiz for mobility officers and NCOs to use in their local training program.

7WW/FM–86/001 Plotting the LFM and NGM Teletype Output, 1 April 1986, 7pp. Explains 3WW method for plotting LFM FOUS 60-78 teletype bulletins, as well as newer Nested Grid Model bulletins.

7WW/FM–86/002 AD-None) Baroclinic Leaf 6-8 November 1984—A Significant Weather Development, by Maj. Brian E. Heckman, USAFR, April 1986, 17pp. The “baroclinic leaf” is a feature often observed in satellite imagery during cool seasons, but often missed by NWP models; sometimes associated with fast-developing surface cyclones and significant weather.


7WW/FM–88/001 Recurring Radar Training, 15 April 1988, 14pp. Provides five tests (including answer sheets and keys) on radar principles, FPS-77/FPQ-21 operations, reporting procedures, and interpretation.

7WW/FM–88/002 Not used.

7WW/FM–88/003 Superseded by 7WW/FM–90/001.


7WW/FM–89/003 Forecaster Knowledge Quiz, by Capt. Craig R. Wilkes, Michael A. Jimenez, and David C. Danielson, 41 p., September 1989. This FM can help forecasters find where they stand in technical proficiency by identifying and correcting—with a little refresher training—their own personal weaknesses.


7WW/FM–90/002 Using Conditional Climatology, May 1990, 10pp. Provides a brief history and description of WS CC (wind stratified conditional climatology) and MODCV (modeled climatology ceiling and visibility). Tells how to use both. Includes examples.


7WW/FM–90/004 Forecasting Techniques Notebook and Forecaster Aids Notebook, May 1990, 3pp. Describes the purpose, organization, and contents of both notebooks.


7WW/FM–90/006 Technical Improvement Program, 5 p., 13 Sep 1990. Provides guidance on how to stay up to date technically—how to conduct forecasting studies, when to ask USAFTEC, etc.

7WW/FM–90/007 Operational Uses of Streamline Analyses, by SMSgt. Michael A. Jimenez, MSgt. Michael A. Moore, and SSgt. Michael R. Brenner, 27 p., May 1990. This FM is not intended to be the definitive document on streamlining, but merely to show actual
applications used at differing locales to produce operational forecasts.


4.9 30 WS Forecaster Memos

30th Weather Squadron belongs to AFSPC; however, the AFWTL has copies of the following documents. Order forecaster memos from the Air Force Weather Technical Library (AFWTL), 151 Patton Ave., Rm 120, Asheville NC 28801-5002 DSN 673-9019.

30WS/FM–05/001 Marine Layer Stratus Study, by Mr. Leonard Wells, 37 pp., 4 Nov 2005. The intent of this memo is to develop a better understanding of the behavior of late spring through early fall marine layer stratus and fog at Vandenberg AFB, which accounts for a majority of aviation forecasting difficulties. The author's meteorological objective was to use Leipper's study as a starting point to evaluate synoptic scale through microscale processes involved and identify specific meteorological parameters that affected the behavior of marine layer stratus and fog. After identifying those parameters, the study evaluates how well the various weather models forecast them. The main conclusion of this study is that weak upper-air dynamic features work with boundary layer motions to influence marine layer behavior. It highlights the importance of correctly forecasting the surface temperature by showing how it ties directly to the wind field. That wind field, modified by the local terrain, establishes the low-level convergence and divergence pattern and the resulting marine layer cloud thicknesses and visibilities.
Chapter 5

PROJECT REPORTS

5.1 USAF Environmental Technical Applications Center Project Reports

Although USAFETAC project reports have been produced since at least 1953 (and probably before that beginning with the Hq AAF, Weather Division, numbered reports — see pp. 15–54 of AWS Technical Report 166), few were actually published and/or registered with the Defense Technical Information Center (DTIC). Most project reports were only prepared in enough copies for the specific requester, with the apparent thought that the research involved was specific to that project and to that project only. Because all project reports, published or unpublished, normally apply to specific projects and time periods, readers should use caution in requesting and using a “project report” operationally. It is strongly recommended that potential users check with 14 WS before using data or drawing operational conclusions from any of the following documents. The listing represents all the reports found so far among the AFWTL’s cataloged and uncataloged holdings. Note that DoD technical report numbering (IAW current standards) began in 1978. Before that, reports were numbered serially, apparently in the order in which projects were begun, rather than finished. Beginning in 1995, documents that would have been issued as project reports were issued as technical notes.

**HQ AWS, DIRECTORATE OF CLIMATOLOGY**

1862 (ADE850688) *Weather Favorable for Aerial Photography, Parts A-BB*, 1953-55. Prepared for a number of countries and regions for the Army Map Service; criteria required clear skies, no obstructions to vision, no snow cover, and a solar altitude of at least 30 degrees. Report based on observations of simultaneous occurrence of total cloud cover less than 1/10, visibility greater than 6 miles.


2295 (AD-None) *Climate of Pakistan*, October 1955, 78 pp. Prepared for the Army Map Service, to provide a preliminary appraisal of weather as it bears on planning aerial photography in Pakistan.


2526 (AD-None) *Weather Factors Affecting Aerial Photography Over Cambodia*, 27 August 1956, 17 pp. Prepared for the Engineer Strategic Intelligence Division, Army Map Service, to provide a preliminary appraisal of weather as it bears on planning aerial photographic operations over Cambodia, Indochina.

2527 (AD-None) *Weather Factors Affecting Aerial Photography Over Laos*, 24 August 1956, 19 pp. Prepared for the Engineer Strategic Intelligence Division, Army Map Service, to provide a preliminary appraisal of weather as it bears on planning aerial photography in Laos, Indochina.

2529 (AD-None) *Weather factors affecting aerial photography in Venezuela*, 14 August 1956. Prepared for the Engineer Strategic Intelligence Division, Army Map Service, to provide a preliminary appraisal of weather as it bears on planning aerial photography in Venezuela.


2895 (AD-None) *Weather Factors Affecting Aerial Photography in Taiwan and the Ryukyu Islands*, March

3020 (AD-None) Mean Number of Days with Specified Total Cloud Amounts at Specified Hours — Soviet Union, 1 July 1958, 135 p. Prepared for the Electronics Research Directorate, Hq Air Force Cambridge Research Center.


- Part E “Geophysical and Astrophysical Data Handling in Support of Future Weapons Systems,” missing from files; not available.
- Part F “The Apparent Direction that will be taken in the National Program in the Atmospheric Sciences, 1961-1971, as Recommended by the Petterssen Report, and the Influence this Report may have on the Climatic Center for the Same Period,” July 1962.
- Part H “Survey of High-Altitude Rawin-Radiosonde Measuring Techniques and Accuracies and the Effect These Accuracies have on Wind, Temperature and Density Determinations in the Region of Overlapping with Meteorological Rocket Network Data,” July 1964.


3114 (AD-None) Climo for Hamadan, Iran. One page only—rest missing.

3173 (AD-None) Visual Reconnaissance Conditions for the Northern Hemisphere, April 1959, 22 p. A broad hemispheric picture that considers two basic recon heights: 5,000 and 50,000 feet or higher.


3633 (AD-None) Weather factors affecting aerial photography in Ecuador and Peru, July 1960. 35 pp. Prepared for the Army Map Service to appraise weather factors in planning aerial photographic operations in the Republics of Peru and Ecuador.

3634 (AD-None) Weather factors affecting aerial photography in Bolivia, September 1960. 31 pp. Prepared for the Army Map Service to appraise weather factors in planning aerial photographic operations in Bolivia.


3636 (AD-None) Weather factors affecting aerial photography in Uruguay, October 1960. 20 pp. Prepared for the Army Map Service to appraise weather factors in planning aerial photographic operations in Uruguay.

3637 (AD-None) Weather factors affecting aerial photography in Chile south of 37°S, December 1960. 25 pp. Prepared for the Army Map Service to appraise weather factors in planning aerial photographic operations in Chile.

3638 (AD-None) Weather factors affecting aerial photography in Coastal Brazil. December 1960. 45 pp. Prepared for the Army Map Service to appraise weather factors in planning aerial photographic operations in Coastal Brazil.

3640 (AD-None) Estimated Frequencies of Specified Ceiling Height-Surface Temperature Combinations for Stations in Eastern Europe, April 1960, 12 p. Prepared for Staffmet, Wright Air Development Division, ARDC, through Staffmet, AFGL.
3678 (AD-None) Weather factors affecting aerial photographic operations in Argentina, September 1960. 26 pp. Prepared for the Army Map Service to appraise weather factors in planning aerial photographic operations in Argentina.


3697 (AD-None) Weather Factors Affecting Aerial Photography in Libya, November 1960. Available only in opaque microcard format.

3751 (AD-None) Evaluation of Favorable and Unfavorable Meteorological Conditions Affecting Sound Propagation at the Cape Canaveral Missile Test Area, Florida, October 1960, 15 p. Prepared for the Martin Company at the request of 4th Weather Group. To be used in missile engine testing.

3789 (AD-None) Bibliographic Notes on Cloud in Russia and China in Relation to Synoptic Features, September 1960, 6 p. Prepared for AWSSS.


3873 (AD-None) Methods for Determining the Probability of Radiological Doses from a Nearby Target, April 1962, 49 p. Defensive planning against nuclear-bursts is complicated by the effect of fallout, because the effect may be felt at distances exceeding the range of the thermal and blast damage.


3896B (ADE850474) Relationships Between Mean Critical Frequencies of the F2 Layer and the Mean 50-mb Heights, July 1961, 16 p. Correlations are investigated between a familiar meteorological parameter, the height of a constant pressure surface, and a non-meteorological geophysical parameter, the critical frequency of the F2 layer of the ionosphere.

3900 (AD-None) Winds and Temperatures at the 100 Millibar Level Between 50° North and 80° North, February 1961, 17 p. This report was prepared to outline stratospheric conditions as a guide for several agencies.

3973 (AD-None) Probability of Star Seeing in Nine Areas, April 1961, 35 p. Prepared for Air Photographic and Charting Service (APCS) to provide estimates of frequency of sky cover 3/10 or less and visibility 6 miles or more in nine areas of the world.


4100 (AD-None) Precipitation Attenuation at 8 Kmc—Final Estimates, February 1962, 19 p. An analysis of weather effects on a communications system using 8-Kmc on beams elevated at least 5 degrees. Prepared for Rome Air Development Center, RAUO.


4155 (AD-None) Estimates of Parameters Used in Equation (10) of Report 3975, March 1962, 29 p. Contains estimated values for some parameters appearing in the equation describing the variance of the ballistic wind change about the mean change.

4167 (AD-None) Diffusion Study, December 1961, 40 p. Prepared for ADC; same as 4141, but for 6th Air Missile Squadron, Suffolk County AFB, NY.

4278 (AD-None) A Provisional Analysis of the Air Density Distribution over Patrick AFB to a Height of 400,000 Feet, April 1962, 20 p. Prepared for Det 11, 4th Weather Group.

4397 (AD-None) Climatological Investigation of Density, Temperature, Speed of Sound, and Wind for Eniwetok and Ascension, to a Height of 300,000 Feet, October 1962, 38 p. Prepared for Space Technology Laboratories, Inc., to be used in CEP Test Firings Contract AF 04(691)-1 and -3 for targeting missiles to the Atlantic and Pacific Missile Range splash nets.


4461 (AD-None) Supersonic Transport Environmental Factors, Part II, Ozone, December 1962, 21 p. Prepared for Douglas Aircraft Co. through ASD. To be used in FAA-NASADOD SST feasibility study.

4477 (AD-None) Provisional Report on the Variability of Density, Pressure, Temperature, and Mean Molecular Mass at 90 to 125-km, Part I, Density, January 1963, 14 p. Prepared for Martin Company and the Aerospace Corporation, to be used in design of Dyna-Soar transtage propellant settling and altitude control systems.

4498 (AD-None) A Method for Determining the Availability of Unimproved Landing Areas, May 1963, 14 p. Prepared as climatological support to OSR 407. Data used to compare areas annually, conditional on the antecedent precipitation index, on an assumed uniform drying power, and on critical index value in all areas.


4668 (AD-None) Probability of Occurrence of Ground Patterns of Thermal Radiation from High Altitude Nuclear Weapon Detonations, July 1963, 43 p. Final results expressed in terms of probability for Washington, DC.

4681 (AD-None) Proposed Revision to the Uniform Summary of Surface Weather Observations, February 1964, 75 p. For AWSOP. Reviews changes recommended by AWS wings and groups.

4809 (AD-None) Climatology of Solar Observatory Network, 15 pp., January 1964. Prepared for AWSSS to determine best low latitude locations around the Earth for the placement of three to six solar observatories. Defines best areas from the standpoint of macro-climatology.

4824 (AD-None) Frequency Attenuation Study, 75 pp., January 1964. Prepared for McDonnell Aircraft Corp. through ASD. An analysis of meteorological effects on infrared, visible, and microwave radiation transmitted to altitudes of 70,000-100,000 feet over specified regions. Includes analysis of effects of IR radiation passing through a shock wave.

4847 (AD-None) Total Cloud Cover, Africa and SE Asia, 25 pp., March 1961. Prepared for AWSSS. Two sets of cloud cover charts are provided: one for North and Central America, the other for Southeast Asia and Indonesia. Data for French Polynesia is given in tables because frequencies and discontinuities between islands make isoline analysis impossible.

5090 (AD-None) Cloud Cover Over Russia and China, 27 pp., December 1965. Charts (Monthly) charts of cloud cover over Russia and China.


5115 (AD-None) Cloudiness Study for Laminar Flow Control Applications, 7pp., December 1964. Prepared for ASD through ASBW Staffmet. Provides frequency of occurrence of clouds at two altitudes along four routes: Travis-Clark, Elmendorf-Dover, Dover-Panama, Dover-Rhein-Main.

5116 (AD-None) Unusual Weather at Five Bases, 9pp., 1964. Prepared for AFSC/BSD to evaluate contractor’s claim that there was unusual weather at five Midwestern air bases (Columbia, Missouri; Grandview, Missouri; Ft Leavenworth, Kansas; Knobnoster, Missouri; Kansas City, Missouri) from 1962 to 1964. Tables compare “normal” with “observed” conditions.

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5167 (AD-None) Optimum October-March 7-day Outdoor Activity Period: Ramey AFB, Puerto Rico, 12pp., March 1965. This study answers the question, “When is the best seven-day period between October and March for outdoor activity at Ramey AFB, Puerto Rico?” The answer is 10 through 16 March.

5426 (AD-None) Cloud Cover Over Russia and China, 49 pp., March 1966. A revision of Project 5090. Based on general POR of 3 years for Russia, 6 years for China.

McDonnell Aircraft Co. and Ballistic Systems Division, AFSC.

5483B (AD-None) Wind Shear and Turbulence over Selected Areas of the Northern Pacific Ocean. 34 pp., August 1966. Prepared for McDonnell Aircraft Co. and Ballistic Systems Division, AFSC. Contains vertical wind shear data for three selected areas of the north Pacific, turbulence data, and an analysis of these data.

5491 (AD-None) Density Altitude Climatology — West Pakistan. 9 pp. Prepared for Aeronautical Systems Division. Provides information on the frequency of occurrence of certain temperatures and density altitudes at various terrain elevations in order to select design values, and for use in operational effectiveness analysis of various aeronautical systems, particularly helicopters and V/STOL aircraft.

5501 (AD-None) Temperature Characteristics at 30 Kilometers. 19 pp., July 1966. Prepared for Space Systems Division, AFSC. Data to be used to form theoretical background for programs 681D, Advanced Space Guidance Program, Tak II, Horizon Scanner.

5519 (AD-None) Cloud Cover over Southeast Asia and Australia. 25 pp., November 1966. Extends Project 5426 (Cloud Cover over USSR and China) southeastward. POR varies from 3 to 10 years. Charts.


5534 (AD-None) Climatological Support for System 447A. 9 pp., July 1966. Prepared for ASD (ASBW). Includes mean monthly temperature and standard deviation for the 50-mb, 30-mb, and 10-mb levels of the northern hemisphere for an 18 by 72 grid. Provides information on moisture content for 70,000 to 85,000 feet.


5544 (AD-None) Density Altitude Climatology — Central America, April 1967. 8 pp.

5544 (AD-None) Density Altitude Climatology — Iraq. by Capt S. Takasugi, July 1969, 10 pp. Prepared for Aeronautical Systems Division. Provides information on the frequency of occurrence of certain temperatures and density altitudes at various terrain elevations in order to select design values, and for use in operational effectiveness analysis of various aeronautical systems, particularly helicopters and V/STOL aircraft.


5617 (AD-None) Climatological Outlook for a Trip to the Far East and Europe During Mid-November thru Early December. 3 pp., A look at daily temperatures during mid-November and December for Europe and the Far East.

5635B (AD-None) Tractionability Information—Southeast Asia. 10 pp., This report studies the frequency of occurrence of various tractionability classes by months as calculated from long-term temperature and precipitation data as presented.

5645 (AD-None) Wind Speed Distributions for VTOL Aircraft Study. 22 pp., December 1966. Prepared for ASD (ASBW) and Controls Criteria Branch of the Flight Dynamics Laboratory, RDD. Gives average annual distributions of surface wind speeds by class for 266 stations in contiguous U.S., 65 overseas. Chart shows isolines of average annual percent of time (hours) that surface wind speed exceeds 22 knots.
5651 (AD-None) Winds Aloft Summary (May, June, July, Aug) for Nandi Islands of the Pacific, 9 pp., This report contains an explanation of wind directions and wind velocity.


5655 (AD-None) Wind Statistics and Meridional Cross Sections for Viet Nam, 30 pp., January 1967. Prepared for Northrop Aircraft Corp. through AFSC. Statistical wind information for feasibility/cost analysis of rocket-launched, balloon-suspended, high altitude radio relay. Station-by-station variability of the monthly mean zonal wind and its standard deviation of the zonal wind about the monthly mean. Data are presented in tables, analyses in time (months)-altitude (30 to 60 kilometers) cross-section as well as profiles for selected levels. Station-by-station variability of the monthly mean zonal wind, 30 to 60 kilometers, is discussed. There is a discussion of the altitudinal, latitudinal, monthly, and seasonal variations with a designation of four seasons: Winter: (dominated by easterlies but with occasional westerlies), November through March; Spring: (transition of westerlies to easterlies), April and May; Summer: (persistent easterlies), June through August; and Fall: (transition of easterlies to westerlies), September and October. Published as AWS TR 195 (AD709727).

5661 (AD709727) Variability of the Monthly Mean Zonal Wind, 30-60 km, by Lloyd V. Mitchell, April 1970, 84 pp. An analysis of the monthly mean zonal wind and the standard deviation of the zonal wind about the monthly mean. Data are presented in tables, analyses in time (months)-altitude (30 to 60 kilometers) cross-section as well as profiles for selected levels. Station-by-station variability of the monthly mean zonal wind, 30 to 60 kilometers, is discussed. There is a discussion of the altitudinal, latitudinal, monthly, and seasonal variations with a designation of four seasons: Winter: (dominated by easterlies but with occasional westerlies), November through March; Spring: (transition of westerlies to easterlies), April and May; Summer: (persistent westerlies), June through August; and Fall: (transition of westerlies to westerlies), September and October. Published as AWS TR 195 (AD709727).

5662 (AD-None) Estimates of Indicated Air Speed to Obtain Optimum Weapon Release for Aircraft Flying at Low Level, 8 pp., December 1966. Problem: Given forecast pressure altitude and temperature for target, at what IAS should aircraft fly to hit target with weapon released a distance ("d") from target if aircraft is flying at a constant pressure altitude?

5665 (AD-None) Cloud Cover over Southeast Asia, 30 pp., April 1967. Expands Project 5426 (Cloud Cover over Russia and China) southeastward. Charts.


5807 (AD-None) Radiosonde Dew Point Accuracies 40°C to -40°C, 12 pp., July 1967. Most literature gives accuracies in terms of relative humidity; this provides accuracies in terms of dew point. Prepared for ASD. Published as AWS TR 198, August 1967.

5815 (AD-None) Monthly Standard Deviation of Hourly Sea Level Pressure (mb), Northern and Southern Hemispheres, 1 April 1969. Oversized. Unavailable at this time.

5850 (ADE850691) Working Paper for the Revision of MIL STD 210A, “Climatic Extremes for Military Equipment” (1KM to 30KM), 72 pp., by Oscar E. Richard and Hilda J. Snelling, June 1971. A backup document from which a portion of the final publication will be extracted. Statistics based on or evaluated from atmospheric sounding data on file at ETAC, DPD, and NCC.


5892 (AD-None) Part II, Monthly Climatological Tractionability Study for Three Strategic Areas around the DMZ, 8 pp., October 1967. This report provides a study for soil moisture and tractionability by months for the SEA.


6057 (ADE850472) Effect of Irrigation on Humidity at Three Air Force Bases, Southwest United States, by Oscar E. Richard and Hilda J. Snelling, Feb 1969, 35 pp., A study is made of the humidity changes at Castle AFB, Merced Ca., Cannon AFB, Clovis, NM and Nellis AFB, Las Vegas, NE.

6062 (AD-None) Edwards AFB Mountain Waves, by J. Wetzel, 10 pp., May 1968. Prepared for Det. 21, 6WW, in support of NASA laser probe tests.

6064 (AD-None) Adverse Weather Models- Identification and Attack of Ground Targets Mission Analysis Study Program, August 1968. Prepared for Meteorology and Related Sciences Office, ASD, specifically for identification and attack of ground targets with emphasis on night and adverse weather mission analysis and study program. This document has been replaced by ETAC-PR-6467 (ADE850693) Adverse

6067 (AD-None) Climatology Tables and CFLOS Data—Korea, 54 pp., 15 May 1968.


6077A (AD-None) S.E.A. Visibilities, 10 pp., June 1968. For ASD/ASW: Frequency of occurrence of visibilities below 7 miles, by reporting category, during daylight hours for three stations in North Vietnam. Also tops of fog and haze layers, by season, for the same stations.

6078 (AD-None) Cloud Study for Selected Stations in China, 45 pp., June 1968. Climo data for three stations: 52446 (Ting-Hsin), 52267 (So Kuo Nor), 52378 (name unknown).


6086X (AD-None) SEA Cloud Data, 6 pp., July 1968. Prepared for AMSMI-RRA, Army Missile Command. Mean cirrus heights for DaNang, other data.

6102 (AD-None) Density Altitude (Selected Areas), by Paul G. Crotty, 13 pp., August 1968. Prepared for AFSC (SCLAT) to be used in helicopter design: Frequency with which density altitude exceeds 7,000, 6,000, and 5,000 feet for hottest month and for the year in Laos, Pakistan, West Germany, Turkey, Colorado, Bermuda, and Wake Island.

6106 (AD-None) Rain Probabilities for Between 25°33’N and 80-100°W in Comparison to a Wind Regime from Surface to 7 km From Any Direction Located Over 28°-30’N, 86°-00°W, 32 pp., September 1968.

6118 (AD-None) Density Altitude Climatology, Greece, by Capt. Shoji Takasugi, 11 pp., November 1968. Prepared for HQ USAF (AFCSA) to evaluate aircraft performance in certain NATO countries.


6134 (AD-None) Environmental Design Information and Climatic Data, 210 pp., 5 March 1971. Covers 18 locations: Iran, Alaska, Corpus Christi Texas, Europe, Middle East, Algeria, French West Africa, Chad, Niger, Sudan, Guam, Tunisia, Greece, Japan, Libya, Hawaii, Italy, Thule AB, Greenland, Pakistan, Clark AB, Philippines and Korea. Project originally opened 24 October 1968 for GEEIA (Ground Electronic Engineering Installation Agency), but evolved into one that supplied general environmental design data on a continuing basis. With project closing, all further requests for similar information to be answered under separate projects. Also, ETAC-PR-6134-5 Extreme Temperatures for Determination of Procurement and Allocation of Portable Shelters, by Hilda J. Snelling, 4 pp., April 1969 is included in this report.

6142A (AD-None) Photo-Reconnaissance Climate Analysis, 15 pp., November-December 1968. Prepared for USAF Tactical Air Reconnaissance Center. Climatic maps of ten countries showing area of representativeness of each of 77 stations listed in CL 9697.


6239 (AD-None) Climatological Information for Southeast Asia, 122 pp., April 1969. General climatology, prepared for a DoD agency through ETAC Pentagon Liaison Officer. Charts and tables.

6247 (AD-None) Environmental Data For Hot Climates Outside the U.S., by Maj. Gordon A. Beals, 7 pp., May 1969. Attempts to provide actual data on combined occurrence of high temperatures and strong thermal radiation outside CONUS; discusses sources and applicability of the data.


6287 (AD-None) Spatial Continuity of the Maritime Inversion at Vandenberg AFB, by 1st Lt. Richard R.


6299 (AD-None) Climatology of the USSR-Sinkiang Border Area, 7 pp., August 1969. For Pentagon Command Post.


6326 (AD-None) Environmental Weather Data for the Fulda Area of Germany, Jan-Apr-Jul-Oct, by Capt. Max H. Peek, 5 pp., October 1969. For ACSI-TE.


6343B (AD-None) Rocketsonde Data Reduction, by Capt. Ronald D. Novotny and MSGt. Glen Grazier, 77 pp., October 1970. Describes the standardized rocketsonde EDP program that produces coded data in WDCA-1 format.

6344 (AD-None) Cloud Cover Over the Mekong Delta for Nighttime Visual Reconnaissance, 5 pp., November 1969. For a DoD agency through the Pentagon Liaison Officer.

6353 (AD-None) Frequency of Hurricanes in Reconnaissance Zones, 4 pp., December 1969. Gives frequency that hurricanes enter various air recon zones along Atlantic and Gulf coastal regions of United States. For SAES.

6363 (AD-None) CFLOS and Precipitation Data for Site Selection Study, by Capt. Patrick O’Reilly, 8 pp., January 1970. For SAMSO’s use in selecting site that provides best line-of-sight communications to a synchronous satellite.

6368 (ADB201090) Low Cloud Icing Climatological Data, by Capt. Shoji Takasugi, 22 pp., January 1970. Climatological data of seasonal cloud types and amounts and the seasonal range of the 0° isotherm in the vertical for ASBW, Wright-Patterson AFB, Ohio. To be used in icing condition tests over England and northern Germany at levels from 500 to 4,000 feet.

6375 (AD712934) Estimated Probabilities of Path-Cumulative Rain Intensity for Paths of 10 and 22 Nautical Miles in High Rain-Rate Areas, by Maj. Gordon A. Beals, 34 pp., June 1970. (Also FAA-RD-70-55). Prepared to assist ICAO’s Radio Communication Special Committee 117 in selecting a frequency band for a common military/civilian instrument landing system. Study restricted to distribution of rain-sized water drops—would not apply to problems requiring an estimate of the total mass of liquid water in cloud systems.

6382 (AD-None) Frequency Percentages of Specified Ceilings in Areas, Worldwide, by Capt. Shoji Takasugi, 6 pp., February 1970. Prepared for AFRDQ M1 for percent of time ceilings are less than 2,000 and 8,000 feet for the best and worst months, and annual average. To be used as input to all-weather weapon system study.


6492 (AD-None) Acid Mist Association with a Titan III-D Missile Launch, by Lt. Paul G. Shapin, 14 pp., February 1971. For Space and Missile Test Center
(SAMTC). Gives Information on deposition of HCl acid caused by launching TITAN III-D missile into stratus deck. Distribution authorized to U.S. Government Agencies and their contractors only: Administrative & Operational use: 18 Nov 2005: Other requests for this document shall be referred to 14 WS/DPC, 151 Patton Ave Rm 120, Asheville, NC 28801-5002.

6506  (AD-None) Precipitation Models for SAFSCOM, by Capt. Patrick J. O'Reilly, 9 pp., December 1970. Probability models in terms of liquid water content for Miami and selected areas in northern and central Plains states. For Martin Marietta Corp and Bell Telephone Labs to determine SPRINT missile performance.


6569  (AD-None) Climatological Data for Korea and the Northeast CONUS, by Capt. Richard C. Wagner, 22 pp., February 1971. For RADC in determining locations in Northeast US that are climatologically analogous to five Korean sites.


6609  (AD-None) Summary of Surface Weather Observations South Point Tracking Station, Ke Lae, Hawaii, 75 pp., August 1971. These summaries were prepared from unreduced surface weather data obtained by SAMSO/WE from HQ Pacific Missile Range. Only 4 observations per day were available. The period of record is short only 2-3 years.

6613  (AD-None) Clark AFB Precipitation Rates, 13pp., September 1968.

6652  (AD-None) Design Wind Speeds for Mobile Communications Units, by Oscar E. Richard, 5 pp., Jul 1971. This report was prepared in answer to a request from the office of the Director of Command Control and Communications (AF/RPC). AF/RPC is interested in solving a design wind speed problem for a set of mobile communications unit.


6700  (AD-None) Evaluation of a Relative-Humidity/Pollution-Related Visibility Forecast Equation, by Murray Young and Capt John L. Conley, December 1971, 12 pp. This report was prepared for the specific purpose of evaluating a 7WS forecast aid for visibility forecasting problems in the Heidelberg-Manheim area of Germany related to air pollution.


6765  (AD-None) Aircraft Noise Pollution, by 1st Lt. Dennis A. Trout, 5 pp., April 1972. For 17WS.

6780-12  (AD-None) Engineering Design Data for Three Locations in Washington and Oregon, by Hilda J. Snelling, 12 pp., May 1972. This report was prepared to provide planning for feasibility studies of future construction in these areas.

6821  (AD-None) Pollution Resulting from Warm Fog Dissipation by Jet Engine Exhaust, by 1st Lt. Dennis A. Trout, 21 pp., May 1972. Estimates air pollutant concentrations produced by jet engines used to aid in warm fog dissipation at Travis AFB, Calif.—for AWS.

6866  (AD-None) Evaluation of Humidity Conditions at Columbus, Ohio, by Oscar E. Richard, Hilda J. Snelling, and Dean D. Bowman, 12 pp., Jul 1972. This report was prepared to answer a request from the Office of the Army Judge Advocate General. It is to be used in answer to a claim by Stark Van Lines before the Armed Services Board of Contract Appeals in which contractor claims that mildew damage was due to an increased level of humidity in the Columbus, Ohio area.


7039  (AD-None) Bare Base Equipment Protection Study, by Thomas E. Fraser and H.J. Snelling, 15 pp., April 1973. This report was prepared for a climatic analysis in identifying five locations in the United States and one location each in Spain, Korea, and Germany for storage of bare base equipment.

7044 (AD-None) **Estimates of Gust**, by Major David S. Lydon, 16 July 1973. 7pp. This study presents statistics on the variation of the wind from the mean within the boundary layer (approximately the first 1000 feet).


7057 (AD-None) **Stability wind roses, Johnston Island**, 10 September 1973. 3 vols. This report was prepared by USAFETAC in answer to a request for an analysis of stability of the atmosphere within the lowest layers for use in an air pollution study. It is based on an objective computer program which classifies the hourly airport observations.


7070 (AD-None) **Langley Environmental Impact Study**, by Richard Fisher 5 pp., Oct 1973. This report was prepared by USAFETAC in answer to a request for an analysis of concentrations of air pollutants within the lowest layer for use in an environmental impact study.

7086 (AD-None) **Marsam Evaluation**, by John W. Louer, Dec 1973, 8pp., This report was prepared by USAFETAC in answer to a request from the AF Avionics Laboratory at Wright Patterson AFB, Ohio. The requester wanted an evaluation of the environmental data and its applications in the Multiple Airborne Reconnaissance Sensor Assessment Model (MARSAM), a mathematical computer model.

7107 (AD-None) **Climatology of the Continental Operations Range “Near-Term Period” Area**, by Oscar E. Richard, 57 pp, Sep 1973. This report was prepared in answer to a request from the HQ AF Special Weapons Center to develop a Continental Operations Range in the Nevada-Utah area.

7110 (AD-None) **Special Climatic Report for NATO Remotely-Piloted Vehicles Concerning Weather Factors in Germany**, by SMSgt. Luther M. Cantrell and MSgt. Marilyn V. Robinson, 23 pp., August 1973. For AGARD through AFSC.

7121 (AD-None) **Cyanometric Application to Photographic Reconnaissance**, by Capt. K. Nozaki, September 1973. An analysis of the historical and theoretical application of an optical cyanometric device having an internal scale for determining the “blueness” of the sky—for AF Avionics Laboratory.

7129 (AD-None) **Stability wind roses, Canton Island, 0000–2400 LST**, 26 September 1973. This report was prepared by USAFETAC in answer to a request for an analysis of stability of the atmosphere within the lowest layers for use in an air pollution study. It is based on an objective computer program which classifies the hourly airport observations.

7136 (AD-None) **Lowest Observed Frequency (LOF) Study**, by Capt. Vernon G. Patterson, June 1974. For 15th Communications Squadron (AFCS).

7178 (AD-None) **Heavy Lift Helicopters**, by O.E. Richard and H. J. Snelling, 46 pp., Feb 1974. USAFETAC was asked to furnish weather data to aid in determining design of a heavy lift helicopter. Wind speeds are a prime consideration in determining whether or not rotor blades should have a folding capability.

7179 (AD-None) **Cold Fog Climatology**, by Kenneth Y. Nozaki and Richard W. Fisher, 4 pp., 30 Nov 1973, This report was prepared in answer to a request from 2WW Lindsey AS, Germany, to determine the optimum time for deployment of WC-130 Cold-Fog seeding aircraft to Europe.

7222 (ADE850471) **Scheduling a Work Week to Conserve Energy**, by Capt. Thomas E. Fraser, 20 pp., April 1974. An interim paper that addresses the May-October cooling season.

7222 (AD-None) **Scheduling a Work Week to Conserve Energy II**, by Capt. Thomas E. Fraser, 40 pp., June 1975. Final Report addressing both the air conditioning/cooling season of May through October and the heating season of November through April.


7232 (AD-None) **Cloud-Free Line-of-Sight Probabilities for Selected Surveillance Sites**, February 33pp., 1974, Mean CFLOS probabilities for four time periods by month for six sites—for AF Avionics Laboratory.

Cloud cover and visibility categories consolidated from selected locations to provide representative data along the northern plains and central highlands portion of the East-West border.


7268 (AD-None) Stability wind roses with mean mixing depth, Johnston Island, 0000-2400 LST, 15 February 1975. This report was prepared by USAFETAC in answer to a request for an analysis of stability of the atmosphere within the lowest layers for use in an air pollution study. It is based on an objective computer program which classifies the hourly airport observations.

7269 (AD-None) Stability Wind Roses — Agana NAS, Guam, by Capt Kenneth Y. Nozaki, 8 February 1974. This report was prepared by USAFETAC in answer to a request for an analysis of stability of the atmosphere within the lowest layers for use in an air pollution study. It is based on an objective computer program which classifies the hourly airport observations.

7269 (AD-None) Comparison of Tinian Island climatology with Crested Isle data, by Capt Kenneth Y. Nozaki, 15 February 1974. This report was prepared by USAFETAC in answer to a request from 1st Weather Wing for a meteorological analysis of the Tinian Island data collected under Project Crested Isle for 4 Nov. – 4 Dec 1973. 1st Weather Wing wants to determine the representativeness of the data and the feasibility of using the climatology of another station having a longer period of record for determining stability conditions on Tinian.


7318 (AD-None) Objective Forecast Wind Gust Study for Kelly AFB, Texas, by Murray J. Young, 9 pp., May 1975. A study for predicting occurrence or peak winds equal to or greater than 25 knots at Kelly AFB, Texas. For Det. 7, 15WS.


7364 (AD-None) Stability Wind Roses Ft Huachuca AZ 0000-2400 LST by Boundary Layer Section, 210 pp, 19 June 1974. This report was prepared for an analysis of stability of the atmosphere within the lowest layers for use in an air pollution study.

7408 (AD-None) Boundary Layer Models and Data for RPV Autoland Simulations, by Capt. Kenneth Y. Nozaki and Maj. Robert E. Dettling, 46 pp., October 1974. Presents atmospheric stability classifications and surface wind values for different Köppen climatic regimes, associated distribution of mixing depths of surface boundary layer, and neutral case wind shear and turbulence models important to designing the RPV auto land system. For AFFDL.


7490 (AD-None) A Line Source Model for Assessing the Gravitational Settling/Diffusion Model Associated with Aerial Spraying Operations, Maj. Robert E. Dettling, April 1975. For AF Directorate of Civil Engineering in determining “envelopes” to be expected from spray operations and weather conditions. This report is unavailable at this time.


7576 (AD-None) Stability wind roses, Howard AFB, Canal Zone, 0000–2400. 13 Jan 75. This report was prepared in answer to a request for an analysis of stability
of the atmosphere within the lowest layers for use in an air pollution study. It is based on an objective computer program which classifies the hourly airport observations.

7576 (AD-None) Stability wind roses, 0000–2400 LST, Cristobal, Panama, by boundary layer section. 23 Jan 75. This report was prepared in answer to a request for an analysis of stability of the atmosphere within the lowest layers for use in an air pollution study. It is based on an objective computer program which classifies the hourly airport observations.

???? (AD-None) Stability wind roses, Fairbanks AK, POR Jan 1946 – Jul 1970, WBAN # 26411, 17 May 1976. This report was prepared in answer to a request for an analysis of stability of the atmosphere within the lowest layers for use in an air pollution study. It is based on an objective computer program which classifies the hourly airport observations.

7584 (AD-None) A Model for Describing the Atmospheric Water Vapor Profile Above the –40C° Temperature Level, by Capt Laurence D. Mendenhall, Maj. Thomas E. Stanton, and 1st Lt. Harry W. Henderson, August 1975, 110pp., . Prepared for AWS/SYJ to satisfy operational requirements stated by users of AWS point analyses.


7621 (AD-None) An Analysis of the Spacial Variation of Selected Parameters in the Federal Republic of Germany, by Capt. Timothy M. Laur, 36 pp., December 1975. Prepared for ACS/Studies and Analysis. Investigates validity of using observations from one location to represent clouds and visibility at another. Area of interest is a part of western Europe centered in the Eifel Mountain region.


7639 (AD-None) A Simplified Meteorological Assessment for Spraying Dibrom at Langley AFB, VA., Part II. Prepared by Robert E. Dettling, 5 pp., May 1975. This report addresses the proposed spraying of Dibrom for mosquitoes at Langley AFB, VA.


7659 (AD-None) Vietnam Equipment Corrosion Climatology, by Capt. Thomas E. Fraser, 10 pp., May 1975. For Defense Intelligence Agency.


7768 (ADE850373) Estimated Wind Funneling Effects at Kelly AFB, Texas, by Murray J. Young, January 1976, 16pp. Prepared to solve a specific problem; not expected to have application beyond that problem.


7845 (AD-None) Distributions of Transmission (Percent) for the 8-12 and 1.06 Micron Regions at Stuttgart, Germany, for the Imaging Infrared/Laser Study, 256 pp., February 1975. Climatological distributions of transmission data given for Imaging Infrared/Laser Study of AGM-65 Maverick missile. Prepared for HQ USAF Assistant Chief of Staff for Studies and Analysis with LOWTRAN3.


7966 (AD-None) REFORGER 76 Support, by Murray J. Young, 12 pp., August 1976. Follows development of a programmed climatology program (CLIMO) and touches on its use in a tailored support program (TAILOR). For AFGWC input into REFORGER MSI production system.


8035 (ADA044363) An Evaluation of Several Models for Describing the Atmospheric Water-Vapor Profile Above the –40° Temperature Level, by Capt. Laurence D. Mendenhall, 35 pp., revised May 1977. The results of investigation into a simpler model for use in the point analysis program.


8065 REFORGER 77 Support
- Part A (ADA040093) An Independent Test of the REFORGER 76 Support CLIMO Program, by Murray J. Young, 17 pp., January 1977. Maximum difference between modeled and observed climatology compared; significant differences found.
- Part B (ADA041879) Test of a Suggested Approach to Spreading Climatology to Grid Points, by Murray J. Young, 37 pp., March 1977. A study of differences between two closely spaced stations is used to test hypothesis that climatology for both is the same. Hypotheses not proved true in all cases.

8135 (AD-None) Rain Attenuation Distribution for Key West, Florida, Part 1, 10 pp., September 1976. Tables showing attenuation rates and total two-way attenuation over a 75-NM path by rain rates at key West in number of occurrences and percent of time. Comments, conclusions.

8135 (AD-None) Instantaneous Precipitation Rate Models Miami, Florida, Part II, 5pp., Sep 1976. This report shows precipitation models for Miami, Florida.


8234 (AD-None) Extreme Winds and Their Vertical Profile at SLC-6 Launch Pad, Vandenberg AFB, California, by 2nd Lt. Tamzy J. Cunningham, February 1977, 21 pp. Prepared to aid in determination of wind loadings for launch complex. For SAMSO.


8343 (ADA044364) A Rainfall and Cloud Climatology for Indonesia, by CMSgt. C. Marshall Carter, June 1977, 12 pp. Monthly and annual rainfall amounts and cloud cover amounts (less than or equal to 1/8) with visibilities greater than or equal to 6 miles are presented for locations in Indonesia. The period of record for rainfall amounts varies from 26 to 63 years depending on the location while the period of record of cloud cover amounts and visibilities is 10 years.


8413 (AD-None) Buckley Dew-Formation Study, by Capt. Arnold L. Friend, June 1977, 6 pp. Surface weather observations at Buckley Air National Guard Base, Colorado, from 1966 to 1975 provide the basis for estimating the percentage frequency of occurrence of dew on a radome. Consideration is given to the effect of maintaining a minimum temperature of 5 C in the radome and to the moist plume of a nearby cooling-tower. Estimates are given of the percentage frequency of occurrence of dewfall by month for three hour time groups. The results show most of the dew formation to be caused by the cooling-tower plume intercepting the radome.


9708 (AD-None) Environmental Design Information for1 Microwave Equipment Sites in Spain, by Oscar E. Richard, Hilda J. Snelling, and Lt. William F. Markert, June 1974, 70 pp. This report was prepared at the request of Headquarters Electronic Systems Division (AFSC) in support of the COMBAT GRANDE, microwave equipment site location programs. In addition this report was prepared to provide engineering environmental design information for the specific sites requested.

9710 (AD-None) Environmental Design Information for Air Force Satellite Communications System Sites, by Lt. William F. Markert and Hilda J. Snelling, September 1974, 8 pp. This report was prepared at the request of Air Force Avionics Laboratory (AFSC) in support of Program 1205, Air Force Satellite communications Systems. In addition, this report was prepared to provide wind information for the specific sites requested.

9712 (AD-None) Environmental Design Information for the Joint Surveillance System, by Oscar E. Richard, Hilda J. Snelling, Lt. William F. Markert, and SSgt. Owen B. Addington, December 1974-June 1975. Parts 1 through 3; This report was prepared for Headquarters Electronic Systems Division (AFSC) in support of the Joint Surveillance System (JSS). In addition, the report was prepared to provide engineering environmental design information for the specific sites requested.


USAFETAC-PR-78-002 (ADA051981) Point Warning Climatology of Mt. Laguna, California, by Capt. James R. Clark, January 1978, 6 pp. An analysis of a 17-year period of record for weather warning criteria. Discusses four major storm types that affect southern California and...
gives monthly climatological values of temperature, precipitation, and wind for individual warming elements.

**USAFETAC-PR-78-003** Not used.

**USAFETAC-PR-78-004** (ADA097113) *Sizing an Environmental Data Set*, by Maj. Elden C. Taylor, April 1978, 4pp. Gives basic equation and four derivations that can be used to size environmental data sets. Equations formulated to document mass storage requirements for USAFETAC support to WWMCCS, but have wider applications.

**USAFETAC-PR-78-005** Not used.

**USAFETAC-PR-78-006** Not used.

**USAFETAC-PR-78-007** (AD-None) *An Objective Technique for Spreading Climatology*, by Capt. Arnold L. Friend, June 1978, 4pp. Errata 2 April 1980. Describes an objective analysis technique for modeling climatic probability of September ceiling and visibility at various threshold values, individually and jointly, for any area or point in Germany. The model, 4DCLIM, requires input of modeled station data, threshold values for the weather elements, and geographic information that defines the point or area of interest. Modeled station data obtained by fitting a curve to observations at a given station at a specific hour and month for each weather element. 4DCLIM model designed to support REFORGER 78, but has wider application.

**USAFETAC/PR–79/001** (ADA096417) *Vandenberg Air Force Base “Winds” Comparison Study*, by Capt. James R. Clark and Capt. Julius A. Jackson, March 1979, 31pp. Vandenberg’s “WINDS” Tower 301 was to provide data for space shuttle launch, but had shorter period or record than Tower 300 a few miles north. Study investigates feasibility of creating bogus POR for Tower 301 with Tower 300 data.


**USAFETAC/PR–80/001** (ADA085525) *Cloud Cover and Visibility Climatology for the Philippines*, by SSgt. Daniel E. Mitchell, May 1980, 14pp. Provides cloud cover and visibility climatology for 19 locations in the Philippines. Mean number of days with total cloud amount less than or equal to 1/10 and visibility greater than or equal to 6 miles for each month and by hour of day given for each location.


**USAFETAC/PR–81/002** (AD-None) *Cloud Cover and Visibility Climatology for Egypt*, by SSgt. Dale E. Mitchell, April 1981, 33pp. An analysis of cloud cover less than 10 percent and visibility greater than 6 statute miles to show best seasons for aerial photo over Egypt. Summer best for interior; late autumn and winter best over coastal areas. Northern Red Sea coast north of Port Sudan is exception—could be photographed in summer.

**USAFETAC/PR–86/001** (ADA167576) *Design Wind Analysis*, Project 387402, by Capt. Robert D. LaFebre, March 1986, 18pp. Provides a comprehensive literature review on methods of design wind analysis. Report notes there is no “best way” to raise winds from one level to another, pointing out that meteorologists and engineers have separate preferences. Notes also that while one method may work well for one investigation, it may result in false conclusions when used for another.

**USAFETAC/PR–86/002** (ADB102926) *Cloud-Free Line-of-Sight Simulation Models (Users Manual)*, by Capt. Dewey E. Harms, May 1986, 30pp. Provides information necessary to run cloud-Free line-of-sight (CFLOS) simulation models CFLOS4D and CFARC, as well as to understand and interpret model output. These simulations were developed to perform sensitivity analyses of potential ground-based lasers (GBLs) by generating downline statistics for systems consisting of one or more sites. *Distribution authorized to the Department of Defense and DoD contractors only, critical technology, 15 May 1986. Other requests shall be referred to 14 WS/DOC, 151 Patton Ave., Asheville NC 28801.* WARNING—This document contains technical data whose export is restricted by the Arms Control Act (Title 22, U.S.C., Sec 2751 et seq) or Executive Order 12470. Violations of these export laws are subject to severe criminal penalties.

**USAFETAC/PR–86/003** (ADA169651) *A Simulation Feasibility Study*, by 2nd Lt. Kevin L. Witte, June 1986, 14pp. The results of a pilot study performed for the Air Force Aerospace Medical Research Laboratory to determine the feasibility of simulating Pasquill Stability Index, wind speed, cloud cover, and wind direction for a diffusion model. Author concluded that wind speed and direction should be modeled together, but that cloud cover should be modeled separately because of the low correlation between cloud cover/wind speed and cloud cover/wind direction. Wind speed and cloud cover, according to the author, can be used to simulate a Pasquill Stability Index.

**USAFETAC/PR–87/001** (ADA183376) *Cumulus Cloud Dimension Statistics for New Orleans, Essen, and
**PROJECT REPORTS**

_Hannover_, by Capt. Randell J. Barry, June 1987, 68pp. Cumulus clouds at New Orleans, LA, and at Essen and Hannover, West Germany, are analyzed for mean, maximum, and minimum cloud base heights, cloud top heights, and cloud cover amounts using 10 years of USAFETAC DATSAV data. Frequency of occurrence statistics are also calculated. Statistics are produced for each of three different cumulus types (cumulus humilis/fractus, cumulus mediocris/congestus and cumulonimbus) in two categories: monthly, and hourly by season. Cloud tops are determined from a simple one-dimensional cumulus cloud model. All other cloud dimensions are obtained from surface weather observations. Methods used in determining the statistics are discussed and statistical limitations are noted.

**USAFETAC/PR--87/002** (ADB116398) _Global Transmissivity Study for Electrooptical Weapons Systems in the 8-12 and 3-4 Micron Bands_, by Maj. Roger T. Edson, Richard H. Grumm, and 1st Lt. John G. Miller, Jr., September 1987, 179pp. LOWTRAN6 was used to compute 10-year climatologies of atmospheric transmittance at the 8-12 and 3-4 micron frequency band for 16 stations and four geographical regions. A standard geometry or a 12.5m AGL sensor height and a 4km slant range was assumed. For most midlatitude locations, the 8-12 micron band offered higher transmittance values than the 3-5 micron band. For tropical locations and in regions where absolute humidity was much higher than 12gm-3 mean transmittance at 3-5 microns was equal to or better than at 8-12 microns. Overall, the trend in both IR bands showed higher transmissivities in winter and spring, lower in summer and fall. Results appeared to be directly related to monthly mean dew point or absolute humidity. The study also found considerable diurnal dependency in the data, with a minimum mean transmissivity in the morning. Examination of relative frequency or occurrence for bad to good transmittance values revealed a strong bimodal distribution to the data. Relationships were shown between transmissivity and dew point/absolute humidity that offered prediction of transmission to within 5 to 10 percent for rural (non-precipitating) aerosols. Distribution authorized to U.S. government agencies and their contractors, critical technology, 18 August 1987. Other requests for this document shall be referred to 14 WS/DOC, 151 Patton Ave., Asheville NC 28801.

**USAFETAC/PR--88/002** (ADA204777) _Corrosion Control Climatology_, by SSgt. Debra L. Stoner, October 1988, 42pp. Provides tabular climatological data for 183 locations worldwide; prepared for an Air Force corrosion prevention and control contractor. Tables give mean number of days with temperature less than or equal to 40° F at noon local time, precipitation greater than a trace, temperature greater than 85° F for 5 hours or more, thunderstorms, relative humidity greater than 60 percent at noon local time, winds greater than 15 knots between 0006 and 1800L, and wind greater than 15 knots—all hours.

**USAFETAC/PR--88/003** (ADA209361) _Upper-Wind Climatology for CONUS_, by MSGt. Susan Reyes-Sauter, November 1988, 115pp. Report consists of 12 sets (one set for each month) of CONUS maps with upper wind speed/direction plots at every 5 degrees of latitude and longitude. Winds are plotted at nine levels, starting at 5,000 feet MSL and ending at 45,000 feet MSL. Database used was the Air Force Global Weather Central’s SADS (Summarized Analysis Data Set), period of record 1977-1982.

**USAFETAC/PR--89/001** (ADA209137) _European Crosswind Frequencies_, by TSgt. Gary H. Tryon, February 1989, 443pp. Documents the results of a study (for 2WW/DN) to determine percent occurrence frequency of crosswinds at 39 selected European bases. Provides “percent frequency of occurrence” tables for crosswinds greater than or equal to 10, 15, 20, and 25 knots under various weather conditions such as precipitation and below-freezing temperatures. Sixteen tables are provided for each base, and each set is allowed by a “number of actual cases” table. The study should help forecasters, planners, and engineers in estimating crosswind possibilities at various speed thresholds; should also help in estimating those possibilities during rain, snow, and below-freezing conditions.

**USAFETAC/PR--89/002** (ADA228604) _Microwave Propagation Study for the Florida Gulf coast_, by Capt. Charles T. Linn, March 1989, 317pp. Documents a 1980 USAFETAC study of atmospheric refractivity and its effects on microwave communications along the Gulf...
The coast of Florida. The study involved 11 selected cases of both “good” and “bad” received signal levels (RLSs). The database incorporated weather sounding data from tethered balloons at Cape San Blas, White City, and Apalachicola, as well as surface weather observations from Apalachicola, Tyndall AFB, and Eglin AFB. Each case includes examples of RSL strip-charts, synoptic-scale weather maps, tables of surface weather observations, M-profile plots, and ray-trace plots. General conclusions and suggested ways to solve propagation problems are included.

USAFETAC/PR--89/003 (ADA210361) Climatology Handbook for V Corps Forward Areas. by SSgt. Dennis Murphy, April 1989, 110pp. Provides concise tabular climatology or certain weather conditions that affect tactical operations in V Corps forward areas of Germany. Operational categories include terrain flying, VFR helicopter flying, close air support, paratroopers, chemical operations. Weather categories include visibility, ground observation, winds, snow depth, temperature, precipitation, light data. Printed in 5 x 8 1/2-inch format to fit BDU trouser pockets.

USAFETAC/PR--90/001 (ADA243313) Temperature Climatology for 160 Army Installations in the CONUS and Hawaii. by SSgt. Debra L. Runyon, June 1990, 69pp. Provides tabular temperature climatology for 160 Army Installations in the CONUS and Hawaii. Data was prepared for the Army Corps of Engineers for inclusion in a study of the feasibility of using coal as a primary heating fuel. Tables gives the following for each location: Annual heating degree days: 99 and 97.5 percent winter design temperatures, mean annual temperature. Also given: Monthly heating degree days, mean temperatures, record low temperatures. All temperatures in degrees Fahrenheit.

USAFETAC/PR--90/002 (ADA232993) Temperature Climatology for 128 Navy Installations in the CONUS and Hawaii. by SSgt. Debra L. Runyon, December 1990, 64pp. Provides tabular temperature climatology for 128 Navy installations in the CONUS, Guam, Hawaii, and Puerto Rico. Data prepared for the Naval Energy and Environmental Support Activity for inclusion in a study of the feasibility of using coal as a primary heating fuel. Tables give the following for each location: Annual heating degree days; 99 and 97.5 percent winter design temperatures; and mean annual temperature. Also given: monthly heating degree days, mean temperatures, and record low temperatures. All temperatures in degrees Fahrenheit.

USAFETAC/PR--90/003 (ADB152198) SAC Contrail Forecasting Algorithm Validation Study, by Maj. Walter F. Miller, November 1990, 28pp. Documents results of a study to determine validity of a new RC-135 contrail validation algorithm (SACFCST) developed by 3WW/DNC. The study showed SACFCST to have almost the same skill as TROPFCST (an earlier AWS contrail algorithm) and the current AQFCWC contrail analysis. It also showed, however, that none of the methods studied were successful in forecasting when contrails would end if the aircraft maintained constant altitude. The PIREP database provided for this study was flawed in that nearly every observation included contrail reports; the result was gross over forecasting. The study concluded that a better database was needed—one that would provide systematic contrail observations along a specified flight path at 15- or 30-minute intervals. Even better would be one taken from actual aircraft soundings (surface to maximum service altitude) flown near a radiosonde launch site—the original AWS algorithm was developed from such a database. Distribution authorized to DoD and U.S. DoD contractors; critical technology; 17 October 1990. Other requests for this document should be directed to 14 WS/DOC, 151 Patton Ave., Asheville NC 28801.

USAFETAC/PR--90/004 (ADA231925) Griffiss AFB Lake Effect Snow Study, by Capt. John D. DeBlock and William R. Schaub, Jr., December 1990, 18pp. Describes USAFETAC’s effort in developing 11 new decision trees for forecasting lake-effect snow at Griffiss AFB, N.Y. To develop the new methods, USAFETAC modified a snow forecasting decision tree created by the National Weather Service Forecast Office (NWSFO) at Buffalo, N.Y., (Niziol, 1987). In addition to other changes, 10 of the 11 USAFETAC-developed trees were modified to use stability indices as input variables. All 12 trees were verified against a dependent period of record (1973 to 1986) and an independent period of record (1987 to 1988). Results showed that all 10 modified decision trees that used stability indices were effective in forecasting lake-effect snow at Griffiss AFB, N.Y., with little statistical difference among them.

USAFETAC/PR--90/005 (ADA231651) Effective Sunspot Number (SSN) Comparison Study, by Capt. Mary L. Hart, December 1990, 39pp. Documents results of a study done to determine whether or not reliable global Effective Sunspot Numbers (SSNs) for the Air Force Global Weather Central’s (AFGWC’s) Ionospheric Conductivity and Electron Density (ICED) model could be calculated based on the present number (11) or digital ionosonde sites. The study found that increasing the number of sites would have a limited effect on ICED output, and that it was feasible to run the ICED model using the present 11-station network, subject to certain limitations.

USAFETAC/PR--90/006 (ADA240489) Short-Term Hourly Temperature Interpolation, by Maj. Walter F. Miller, December 1990, 39pp. Describes the development of a computer method for interpolating missing hourly temperatures in weather observing records. Although a long-term interpolation method is under consideration,
this report deals with replacing missing temperatures over periods of less than 6 consecutive hours.

**USAFETAC/PR--90/007** (ADA231715) *Range Reference Atmosphere, Wake Island*, November 1990, corrected and reissued January 1941, this range reference atmosphere (RRA) is a statistical model (derived from upper-air observations) of the atmosphere from 0 to 30 km over Wake Island. It provides tabulations of monthly and annual means, standard deviations, and skewness coefficients for wind speed, pressure, temperature, density, water-vapor pressure, virtual temperature, and dew-point temperature. It also gives means and standard deviation for the zonal and meridional wind components and hydrostatic model atmosphere. Methodology is included, along with graphic displays of wind statistics that can be derived from the wind data. Updated information is available on the AFCCC Product Search web page.

**USAFETAC/PR--90/008** (ADA231926) *Range Reference Atmosphere, Nellis*, December 1990, 150pp. A statistical model (derived from upper-air observations) of the atmosphere from 0 to 30 km over the Nellis range complex. The data used to create this document was from Desert Rock (KDRA), about 50 NM west of Nellis AFB, Nev. The RRA provides tabulations of monthly and annual means, standard deviations, and skewness coefficients and wind speed, pressure, temperature, density, water-vapor pressure, virtual temperature, and dew-point temperature. It also gives means and standard deviation for the zonal and meridional wind components and hydrostatic model atmosphere. Methodology is included, along with graphic displays of wind statistics that can be derived from the wind data. Updated information is available on the AFCCC Product Search web page.

**USAFETAC/PR--91/001** (ADA233113) *Misawa Snow Accumulation Study*, by William R. Schaub, Jr., February 1991, 26pp. Describes the development of statistically significant thresholds of 11 atmospheric variables for forecasting snow at Misawa Air Base, Japan. The 11 variables were: gradient-level temperature and dew-point temperature, 850-mb temperature, 700-mb temperature, thicknesses for five layers between 1,000 feet AGL and 500 mb, gradient wind direction, and gradient wind speed. USAFETAC did simple correlations of each variable with observed 6-hour snowfall amounts to develop a linear regression equation that would predict 6-hourly snowfall amounts. Since the linear regression did not show skill, the study was expanded to develop a decision tree for making a “yes” or “no” snow determination. The new decision tree scored well using dependent data, but not very well on independent data (it lost to persistence). USAFETAC doesn’t recommend either technique for use in forecasting, but suggests further development and evaluation of the decision use over a longer period of record.

**USAFETAC/PR--91/002** (ADA232775) *Minot AFB Wind Study*, by Maj. Walter F. Miller, January 1991, 52pp. Documents the development and evaluation of 11 algorithms for forecasting gusty northwest winds at Minot AFB, N.D. Six of the algorithms used pressure gradients between Dickinson, N.D., and Portage la Prairie, Canada, and between Glasgow, Mt., and Yorkton, Canada. The other five used the 850- or 700-mb wind over Glasgow, MT. One of the algorithms was found to have skill in forecasting gusty winds and was recommended for operational use.

**USAFETAC/PR--91/003** (ADA232813) *Range Reference Atmosphere, Shemya*, January 1991, 164pp. A statistical model (derived from upper-air observations) of the atmosphere from 0 to 70 km over the Shemya range complex. The RRA provides tabulations of monthly and annual means, standard deviations, and skewness coefficients for wind speed, pressure, temperature, density, water-vapor pressure, virtual temperature, and dew-point temperature. It also gives means and standard deviation for the zonal and meridional wind components and hydrostatic model atmosphere. Methodology is included, along with graphic displays of wind statistics that can be derived from the wind data.

**USAFETAC/PR--91/004** (ADA232853) *A Smoothing Algorithm for Upper-Air Soundings*, by Capt. Gregory J. Reding, February 1991, 23pp. Describes the development of a filtering algorithm for smoothing vertical traces of temperature, pressure, and density through the atmosphere. An overlapping mean method employing an exponential weighting function was applied over several adjacent levels to calculate a smoothed value for the required point. The exponential function was chosen because it decreases symmetrically from a central value and easily incorporates a variable bandwidth; this lets users smooth profiles to the desired resolution. Upper-air data needs to be interpolated to evenly-spaced intervals in the vertical prior to program execution; if it is not, resulting profiles will not be hydrostatically consistent. Based on spectral analysis of samples from two test sites, no noise was introduced into the smoothed profiles.

**USAFETAC/PR--91/005** (ADB158050) *Caribbean Basin Radar Network Ray Trace Study*, by Michael F. Squires, June 1991, 11pp. This report documents a ray trace study of two Stations in the Caribbean Basin Radar Network (Santo Domingo, Dominican Republic, and San Andres Island, off the coast of Nicaragua). Ray trace calculations were done with the Engineer’s Refractive Effects Prediction System (EREPS). The study failed to show why both radars experienced clutter during testing, but it did detect significant altitude error: i.e., large differences between the actual height of the radar beam.
and what it would be in the standard atmosphere. Note: Distribution authorized to U.S. government agencies and their contractors, software documentation, 31 January 1991. Other requests for this document shall be referred to 14 WS/DOC, 151 Patton Ave., Asheville NC 28801.

USAFETAC/PR--91/006 (ADA232831) Range Reference Atmosphere, Thule. February 1991, 178pp. A statistical model (derived from upper-air observations) of the atmosphere from 0 to 70 km over the Thule range complex. The RRA provides tabulations of monthly and annual means, standard deviations, and skewness coefficients for wind speed, pressure, temperature, density, water-vapor pressure, virtual temperature, and dew-point temperature. It also gives means and standard deviation for the zonal and meridional wind components and hydrostatic model atmosphere. Methodology is included, along with graphic displays of wind statistics that can be derived from the wind data.

USAFETAC/PR--91/007 (ADA243314) Range Reference Atmosphere, Fairbanks. February 1991, 152pp. A statistical model (derived from upper-air observations) of the atmosphere from 0 to 30 km over the Fairbanks range complex. The RRA provides tabulations of monthly and annual means, standard deviations, and skewness coefficients and wind speed, pressure, temperature, density, water vapor pressure, virtual temperature, and dew-point temperature. It also gives means and standard deviation for the zonal and meridional wind components and hydrostatic model atmosphere. Methodology is included, along with graphic displays of wind statistics that can be derived from the wind data.

USAFETAC/PR--91/008 (ADA240485) Density Altitude Maps of Iran and Iraq, by Maj. Walter F. Miller, May 1991, 54pp. This report provides maps of Iran and Iraq with contours of mean monthly density altitude at the surface near the times of maximum and minimum temperatures. Surface values of temperature, vapor pressure, and pressure used to calculate DA were adjusted at each grid point using gridded terrain elevation from the Defense Mapping Agency (DMA) 100-meter Digital Terrain Database.

USAFETAC/PR--91/009 (ADA240702) Persian Gulf Contrail Altitude Limits, by Capt. Gregory J. Reding, June 1991, 51pp. Describes development of computer program (DNCONTRL) that determines the mean and extreme upper and lower limits for conditions that favor condensation trail formation over a given upper air reporting station. Output of the DNCONTRL program is provided in tabular form for 19 stations in the Persian Gulf region, not only as upper and lower altitudes for the formation of contrails, but as monthly percent occurrence frequency (POF) for favorable contrail formation at specified altitudes. These results were compared with an earlier, similar study, for the entire Northern Hemisphere and found to be consistent.

USAFETAC/PR--91/010 (ADA240484) Malmstrom AFB Chinook Wind Study, by Capt. Gregory J. Reding, May 1991, 31pp. This report documents efforts to determine correlations among certain weather variables at Malmstrom AFB, Mont., in an attempt to help forecast the onset of winds over 75 knots during Chinook season (October through April). Only weak relationships could be found. Predictive equations based on these correlations were developed using linear regression techniques; the equations allowed limited skill. USAFETAC then tried to improve the Heidke skill scores by including more predictor variables chosen by a stepwise regression technique; skill scores improved slightly, but remained below 0.50. Finally, USAFETAC looked for a favored time interval between development of a 10-mb sea-level pressure difference and onset of 25-knot gusts or sustained winds at Malmstrom; there was none.

USAFETAC/PR--91/011 (ADA240486) C-29A Aircraft Altimeter Errors, by William R. Schaub, Jr, June 1991, 39pp. This report documents the results of a study initiated to solve problems with pressure altimeter errors (differences between indicated and true altitude) aboard Air Force C-29A flight inspection aircraft. A basic review of altimetry is provided, along with an explanation of how atmospheric changes affect barometric pressure and pressure altimeters. A method for in-flight correction of altimeter errors is provided, along with an appendix that gives monthly error statistics for the three C-29A working flight levels (1,000, 1,500, and 2,000 feet above ground level). Although the results of this study are only applicable to Scott Air Force Base, Ill., they can be considered generally representative of other stations with similar field elevations in the midwestern United States. USAFETAC has the ability to produce climatological altimeter error data for any location from which representative upper-air and surface observations are available.

USAFETAC/PR--91/012 (ADA240456) Groves Model Accuracy Study, by Capt. Matthew C. Peterson, August 1991, 72pp. USAFETAC was tasked to review the scientific literature for studies of the Groves Neutral Density Climatology Model and compare the Groves Model with others in the 30-60 km range. The testing included a request to investigate the merits of comparing accuracy of the Groves Model to rocketsonde data. USAFETAC analysts found the Groves Model to be state of the art for middle atmospheric climatological models. In reviewing previous comparisons with other models and with space shuttle-derived atmospheric densities, good density vs. altitude agreement was found in almost all cases. A simple technique involving comparison of the model with range reference atmospheres was found to be the most economical way to compare the Groves Model
with rocketsonde data; an example of this type of analysis is provided in the report.

**USAFETAC/PR--91/013 (ADA240458) March AFB Forecasting Rules of Thumb Evaluation**, by Capt. Brian M. Bjornson, July 1991, 20pp. This report documents an evaluation of 23 different “rules of thumb” used in weather forecasting at March AFB, Calif. Surface and upper-air data was collected for selected cities in southern California and Nevada. Pressure differences, dew-point temperature, and 850-mb and 500-mb heights were calculated for the selected locations and used to predict ceiling and/or visibility, wind direction, or rain/drizzle events at March AFB. Predictor and predict and variables were identified. The procedure for determining the probability of the predicted variable, given the predictor, is described, and the accuracy and statistical significance of the results are tested statistically. Frequency distribution tables for each of the 23 rules-of-thumb are given in an appendix.

**USAFETAC/PR--91/014 (ADA242100) Height-Error Analysis for the FAA-Air Force Replacement Radar Program (FARR)**, by Michael F. Squires, August 1991, 375pp. This report documents an evaluation of three methods for determining radar beam height at 40 proposed FAA and USAF radar stations. All three methods were compared to radiosonde observations (RAOBs), which are assumed to be ground truth, in order to determine height errors. The report concluded that climatology was superior to the triexponential model at 70 percent of the stations studied. Both climatology, and the triexponential model were found to be superior to the standard atmosphere.

**USAFETAC/PR--91/015 (ADA240459) Zaragoza AB Fog Study**, by Charles R. Coffin and Capt. Anthony J. Warren, July 1991, 18pp. This report documents efforts to provide an objective technique for forecasting the onset of fog and visibilities below certain specific thresholds at Zaragoza AB, Spain. The study was in response to a problem with dense fog at Zaragoza. The report addresses the problem in two parts: first, with tables that identify the number of hourly observations of fog at Zaragoza, stratified by certain weather variables and second, with a fog forecasting model based on discriminant analysis that provides an estimated probability of a specified visibility threshold as a function of time.

**USAFETAC/PR--91/016 (ADA321156) Spatial and Temporal Correlation of Surface Temperature and Wind Observations**, by Capt. Anthony J. Warren and Capt. John A. Rupp, November 1991, 144pp. Nearly all weather support products depend on the fundamental accuracy of the basic weather observation, and observational accuracy depends, at least in part, on frequency and spacing. In many parts of the world, surface observations are only taken at 3-hour intervals. Weather station spacing is irregular, and may exceed one station per 200 km. When a weather observation is needed at a specific time and place (as in climatological analysis), it is usually necessary to interpolate by using the data closest to that time from the nearest available weather station. There are errors inherent to this procedure, and users of such data normally require estimates of those errors. This study provides these error estimates as functions of time and distance for surface weather observations of temperature, wind speed, and wind direction. After the methodology is explained, results are provided in appendices as probability data in a series of charts that show percentiles of cumulative distribution of changes in temperature, wind speed, and wind direction as functions of distance or time.


**USAFETAC/PR--91/018 (ADA242186) Optimal Placement of a GEODSS (Ground-Based Electrooptical Deep-Space Surveillance) Sensor**, by Capt. Anthony J. Warren, August 1991, 26pp. Successful operation of the Ground-Based Electrooptical Deep-Space Surveillance (GEODSS) system, basically an optical video camera that tracks objects in high Earth orbit, requires that the following five conditions are met: Sun at least 6 degrees below the horizon; surface wind speed less than 25 knots; temperature more than -50°C; satellite elevation at least 15 degrees above horizon; and a 5-minute cloud-free line-of-sight between satellite and sensor. This report gives the probabilities of combinations of those conditions at twelve proposed Canadian GEODSS sites. It includes a review of fundamentals, a discussion of computer model results, and a comparison of results for each candidate location.

**USAFETAC/PR--91/019 (ADA243315) Comparison of Two Eighth-Mesh Terrain Databases**, by Capt. Richard B. Hartman, September 1991, 27pp. This report compares the accuracy of the new Phillips Laboratory Geophysics Directorate (GD) eighth-mesh terrain database with an older eighth-mesh terrain database developed and used by the Air Force Global Weather Central (AFGWC). Most of the eighth-mesh grid points laced over major land masses were examined by comparing the point values for each database with the elevation of nearby Air Weather Service Master Station Catalog (AWSMSC) stations. By subtracting the point values of each database from the AWSMSC, two sets of different values were created and
summarized with the root mean square error (RMSE) and mean of the absolute error (AE). The comparison showed that there was little difference between databases in the Northern Hemisphere, but that the GD database was much better than the AFGWC database in the Southern Hemisphere.

**USAFETAC/PR--91/020 (ADA260175)** *RTNEPH Total Cloud Cover Validation Study*, by Capt. Ronald P. Lowther, et al., October 1991, 51. In 1983, the Air Force Global Weather Central (AFGWC) implemented a new model to map and store an analysis of worldwide cloud-cover derived from surface and satellite data. This model, designated the Real-Time Nephanalysis (RTNEPH), contains analyses of total sky cover, cloud bases, and cloud heights. Studies assessing the accuracy of the RTNEPH database have, up to now, been limited. In this work, the RTNEPH total sky-cover database is evaluated against independent surface observations. Since the RTNEPH algorithm heavily weights available surface observations, this was not a simple task: more than 500,000 independent surface and RTNEPH observations had to be matched and evaluated. Frequency distributions of the differences in these two sources were computed and stratified by latitude, season, time of day (day vs. night), and age. Finally, statistical tests were run to obtain quantitative assessments of the results. In general, the RTNEPH total sky cover compared favorably with surface reports, but there were differences. Certain biases in the RTNEPH were also identified, most notably the underestimation of cloud cover in arctic regions and the poor resolution of RTNEPH in regions where the airways surface observation code is used.

**USAFETAC/PR--91/021** *Not used.*

**USAFETAC/PR--91/022 (ADA247446)** *Simulated and Observed Sunny Line-of-Sight Data at Palehua, Hawaii*, by Capt. Anthony J. Warren, November 1991, 17pp. Documents a study of the differences in the climatological probabilities of a cloud-free line-of-sight (CFLOS) at the Palehua, Hawaii, Solar Optical Observatory and the Barbers Point Naval Air Station. The study shows that sunny line-of-sight (SLOS- cloud-free line-of-sight from an observer to the Sun) probabilities are typically about 10 percent lower at Palehua, (elevation about 1,700 feet) than at Barbers Point (34 feet). The study compared 17 years of actual weather observations from Barbers Point and 5 years of Palehua solar optical site status reports (surface weather observations are not available from Palehua). The results of the study suggest that the Stanford Research Institute technique for relating fractional sky-cover and viewing angle to CFLOS probability (described by Malick, et al, 1979) is valid for use in Hawaii.

**USAFETAC/PR--91/023 (ADA247545)** *Wind-Speed Forecasting Study for Westover AFB, Massachusetts*, by William R. Schaub, Jr., December 1991, 34pp. Describes results of a wind-speed forecasting study for Westover AFB, located in the Connecticut River valley of western Massachusetts. The study was requested by the 21st Air Force Directorate of Weather to identify useful tools for forecasting wind speeds at Westover AFB. The results were five models that can be used as guides for forecasting maximum Westover wind speeds for 6-hour periods starting at any 3-hourly time (00Z, 03Z, etc.) in any season. Methodology is provided, along with a description of input data, verification of the models, and final results.

**USAFETAC/PR--91/024 (ADA321154)** *Optimal Placement of a GEODSS (Ground-Based Electrooptical Deep-Space Surveillance) Sensor, A Follow-on Report for 14 Candidate Sites Worldwide*, by Capt. Thomas H. Elio, November 1991, 16pp. A follow on report to USAFETAC/PR--91/018, which provided site specific data for 12 proposed Canadian Ground-Based Electrooptical Deep-Space Surveillance (GEODSS) stations. The follow-on provides much of the same general data, but with site-specific date for 13 different candidate GEODSS stations around the world. Successful operation of the system, basically an optical video camera that tracks objects in high Earth orbit, requires that the following five conditions are met: Sun at least 6 degrees below horizon; surface wind speed less than 25 knots; temperature more than -50° C; satellite elevation at least 15 degrees above horizon; and a 5-minute cloud-free line-of-sight between satellite and sensor. This follow on report gives the probabilities of combinations of those conditions at 14 proposed GEODSS sites; seven in Australia, four in Indonesia, and one each in Italy, the Philippines, and the Netherlands Antilles. It includes a review of fundamentals, a discussion of computer model results, and a comparison of results for each candidate location.

**USAFETAC/PR--92/001 (ADA254182)** *Wind-Speed Periodicity Study for Shemya AFB, Alaska*, by Capt. Christopher A. Donahue, April 1992, 20pp. Describes results of a time-series analysis that attempts to identify high frequency periodicities (fluctuations with periods of less than 1 hour) in wind speed at Shemya AFB, Alaska. Peaks in the power spectra at low frequencies were filtered out, and the remaining peaks were tested for significance. None of the peaks in the spectra at high frequencies were found to be significantly different from white noise.

**USAFETAC/PR--92/002 (ADA269339)** *DTED (Digital Terrain Elevation Data) Study*, by Capt. Donald R. Johnson, June 1992, 27pp. Terrain height errors have significant effects on studies sensitive to atmospheric quantity and structure, such as USAFETAC's atmospheric profiles (point analyses). A recent study concluded that the primary source of degradation in atmospheric profile
quality was caused by the coarse grid spacing of the eighth-mesh data used in the Air Force Global Weather Central (AFCWC) Atmospheric Slant Path Analysis Model (ASPAM). This report documents a study that determines the feasibility of incorporating the Defense Mapping Agency (DMA) high density Digital Terrain Elevation Data (DTED) into the AFGWC atmospheric profile model. The report also describes a procedure, developed by USAFETAC, to make the dataset smaller and save computer storage space.

**USAFTAC/PR--92/003 (ADA254410) SAC Contraill Formation Study**, by Capt. Brian M. Bjornson, May 1992, 48pp. This report documents the results of a study that compares the Appleman contraill forecasting method used at the Air Force Global Weather Central (AFGWC) with the SAC method using pilot report (PIREP) data collected by SAC/DOW between March 1990 and July 1991. The study resulted in development of two other contraill forecasting techniques. The first (ETACFCST) was developed using discriminant analysis schemes to obtain "best fit" curves of contrail formation as a function of altitude and temperature, or altitude, temperature, and vertical motion. Statistics showed ETACFCST to be better than either the Appleman or SAC contraill prediction curves. But another technique developed near the end of the study incorporated aircraft engine type as a factor for the first time. The new engine-specific contraill forecasting technique is recommended as a replacement for the Appleman method used at AFGWC.

**USAFTAC/PR--92/004 (ADA258065) Cloud Model Database Comparison Study**, by Capt. Kirk D. Poore, August 1992, 55pp. This report documents the results of a study that examines and compares the Air Force Global Weather Central’s (AFGWC’s) climatological cloud model databases: Real-Time Nephanalysis (RTNEPH) and Three-Dimensional Nephanalysis (3DNEPH). The study investigated their characteristics, determined the length of a climatologically sound period of record (POR), found a year with "typical" cloud cover for use as a baseline in future studies, and weighted the advantages and disadvantages of Multipurpose Simulator (MPS) databases derived from the RTNEPH and 3DNEPH. The older 3DNEPH cloud model, first used in the 1980s, produced worldwide, layered cloud analyses on a 25-NM grid. The RTNEPH replaced 3DNEPH at the beginning of 1984.

**USAFTAC/PR--92/005 (ADA260288) ASPAM (Atmospheric Slant Path Analysis Model) Statistical Paired Differences Study for Sample Size Determination**, by Capt. Thomas H. Elio, Charles R. Coffin, and Maj. Lauraleen O’Connor, November 1992, 42pp. Describes methodology and results of a pilot study intended to determine the required sample size for a statistically significant seasonal study of the differences between ground truth (represented by upper-air soundings) and (1) ASPAM optimum interpolation vertical profiles (OIVPs) and (2) alternate vertical profiles. This study builds on earlier ASPAM studies, incorporating lessons learned and user feedback. It found that a sample size of 50 observations was enough to determine if the differences between ground truth (upper-air soundings) and ASPAM vertical profiles were significant at the customer’s confidence level.

**USAFTAC/PR--92/006 (ADA263156) LIGHTPC Accuracy Study**, by Capt. Matthew C. Peterson, December 1992, 49pp. This report documents the results of a USAFETAC study of the accuracy of LIGHTPC and ICE PC small computer programs, both of which were used to compute astronomical data such as sunrise, sunset, moonrise, and moonset. It presents error distributions for programs at and above 60 degrees north. The report discusses weaknesses of the LIGHTPC program and errors in the ICE program. A technique for using LIGHTPC to correct ICE to produce better twilight end times than by using ICE alone is provided.

**USAFTAC/PR--92/007 (ADA261381) BitHit/Solar Activity Correlation Study**, by Capt. Mary L. Hart, December 1992, 36pp. This report documents a study of statistical correlations between Global Positioning Systems (GPS) satellite anomalies (“bit hits”) and the state of the actual space environment from 1 October 1984 through 31 March 1991. The study compared distributions of space environmental data with GPS anomalies to determine the correlations (if any) of GPS anomaly occurrences with space environment variables such as global geomagnetic index and proton/electron counts. Using stepwise linear regression and discriminant analysis, correlations were found to be very low. Regression equations were found to predict the probability of satellite anomalies only slightly better than random chance.

**USAFTAC/PR--93/001 (ADA269401) Thunderstorm Forecast Study for Eglin AFB, Florida**, by Capt. Daniel Cornell, March 1993, 48pp. This report describes the evaluation of an empirical technique (WINNDEX) for predicting air-mass thunderstorms at Eglin AFB, Fla. Results showed that the WINNDEX objective forecast technique had a Heidke skill score of .18 in predicting thunderstorm activity on the Eglin Range complex. A discriminant analysis model was developed that improved this skill to .32 in predicting the occurrence of thunderstorms during four 3-hour periods beginning at 1200Z. The study demonstrated the utility of USAFETAC’s lightning database in developing and verifying a thunderstorm forecast model for remote locations.

September 1993, 14pp. The study examines cloud-cover report quality, coverage, and frequency around the world during 1977. The results of the analysis are plotted on global maps.

USAFETAC/PR--93/003 (ADA271111) **Worldwide Frequency of Temperatures at Selected Altitudes**, by 1st Lt. James G. Saccomando, Jr., September 1993, 10pp. This report provides maps that give frequency of occurrence of temperatures less than or equal to certain values at selected altitudes worldwide. Monthly data is plotted on world maps, with contours of probability. The analysis was performed using the Air Force Global Weather Central’s HIRAS (HIGH RESOLUTION ANALYSIS) temperature and D-value data for 1985-1991. The analysis was accomplished for a 2.5 by 2.5 degree latitude/longitude global grid. The results of the analysis appear consistent with what meteorologists know about the atmosphere. The maps show USAFETAC’s recently acquired data visualization.

USAFETAC/PR--93/004 (ADA269403) **“Cloudiest Year” Study — An Analysis of the 3DNEPH and RTNEPH Databases**, by Billy D. Bainter, April 1993, 25pp. Describes techniques used to analyze total cloud cover values from the USAF Environmental Technical Applications Center’s nephanalysis databases: 3DNEPH and RTNEPH. Object of the study was to determine if total cloud cover differed significantly on a year-to-year basis. Contoured global maps in an appendix show the results.

USAFETAC/PR--93/005 (ADA286832) **Computing Optimum Heights for Balloon-Borne Radar**, by Michael F. Squires, November 1993, 18pp. The Air Defense Initiative is considering the use of balloon-borne radar transmitters. Tethering these balloons at an optimum height based on the effects of atmospheric refraction maximizes target detection efficiency. This report provides information for determining those optimum tethering heights. The data is provided on one 5 1/4-inch diskette (included) as tables of radar detection data stratified by transmitter and target heights. Tables are accessible through a user-friendly interactive PC program that displays the data. Instructions for access to and interpretation of the tables included. Report summarizes assumptions, data, and methods used to create tables.

USAFETAC/PR--93/006 (ADA277884) **Upper-Air Quality Control, A Comparison Study**, by Capt. David J. Speltz, November 1993, 30pp. Compares the upper air quality control (QC) and data correction methods used by the Air Force Global Weather Central (AFGWC) and the National Meteorological Center (NMC). AFGWC uses the New Upper-Air Validator (NUAV), while NMC uses the Complex QC procedure for rawinsonde heights and temperatures (CQCHT). The study identifies advantages, disadvantages, and added value of both correction schemes.

USAFETAC/PR--94/001 (ADB183617) **ASPAM (Atmospheric Slant-Path Analysis Model) Baseline Study**, by Maj. Lauraleen O’Connor and Charles R. Coffin, January 1994, 141pp. Compares temperature and humidity profiles from the Atmospheric Slant-Path Analysis Model (ASPAM) with independent ground-truth radiosonde data in three worldwide regions for four seasons. Ground-truth radiosonde observations (RAOBs) from 17 randomly chosen sites were denied to the ASPAM optimum interpolation (OI), including the first-guess provided by the high-resolution analysis Model (HIRAS) model run at the Air Force Global Weather Central (AFGWC). Using all other available RAOB, surface, and satellite sounding data, the ASPAM OI produced vertical profiles (OIVP) of temperature and absolute humidity for comparisons with ground-truth vertical profiles (GTVP). Alternate vertical profiles (ALTVP), being the OIVP plus or minus a model estimate of one standard deviation for temperature or absolute humidity, were also compared to the GTVP and OIVP, respectively. The mean and standard deviations of the OIVP agreed well with expectations based on OI theory and the seasonal behavior of the ground-truth data. Distribution authorized to the Department of Defense and DoD contractors, administrative or operational use, 5 February 1993. Other requests shall be referred to 14 WS/DOC, 151 Patton Ave., Asheville NC 28801.

USAFETAC/PR--95/001 (AD-None) **Atmospheric Sand and Dust Aerosols: Worldwide Particle-Size Distributions**, by Capt Gary L. Welch, unpublished manuscript. This report summarizes and presents particle-size distributions for sand- and dust-based aerosols at various locations around the world. It also compares the horizontal and vertical extent, as well as frequency of occurrence, of sand and dust storms. Summarized data was compiled from a number of existing independent studies and databases. This report was never finalized. A draft copy, dated September 1995, is available from AFWTL upon request.
5.2 AFGWC Project Reports
Refer requests to AFWTL, 151 Patton Ave., Asheville NC 28801, DSN 673-9019.

AFGWC/PR--82/001 (AD--NONE) *An Integrated Data Base Model Using Graphic Vectors*, by James L. Hatch, April 1982, 48pp. Describes, how to build an integrated data base and products by using graphic vector manipulation. No attempt made to design a total system; basic concepts of graphic vector operations presented to Satisfy problems of data storage and management for a data base supporting an interactive meteorological display system.

AFGWC/PR--82/002 (AD--NONE) *AWS vs NWS CONUS MOS Test*, by Stephen P. Pryor, June 1982, 21pp. Describes a comparison of ceiling and visibility forecasts generated by the AWS Model Output Statistics system with similar forecasts produced by the National Weather Service. Forecasts for 21 stations in NE United States used in test. AWS system showed overall skill when forecasts measured against persistence Forecasts and climatology, but in general did not perform as well as the NWS system.

AFGWC/PR--83/001 (ADA139129) *Air Weather Service Model Output Statistics System*, by Donald L. Best and Stephen P. Pryor, October 1983, 89pp. Describes development and operation of AWS Model Output Statistics (MOS) system. Provides short history of migration of MOS technology and software from National Weather Service Technique Development Laboratory (TDL) to AFGWC.

AFGWC/PR--84/001 (ADA144853) *Automated Aircraft Icing Forecast Techniques Project Report*, by M. Vance Mansur, 31 May 1984, 73pp. Provides a comprehensive overview of state of the art in icing forecasting and associated problems. Describes an attempt to automate a manual icing forecast technique; discuss weaknesses, software design, and algorithms. Attempts to filter out excess areal coverage, as produced by other automated procedures, were unsuccessful. Moderating the filtering resulted in a sieve effect with no better results than forecasts already produced by other automated methods. Final examination revealed other reasons for poor performance in automated mode. Manual technique has advantage of human pattern recognition vastly superior to coarse mesh grid data used in this study, as well as access to frontal positions. Some valuable lessons learned regarding theoretical limitations to skill scores and inherent limitations of the models.
Chapter 6

USERS HANDBOOKS

Order these handbooks from the AFWTL, 151 Patton Ave., Asheville NC 28801-5002 DSN 673-9019.

6.1 AFCCC Climatic Database Users Handbooks

These handbooks provide potential users of selected AFCCC climatic databases with descriptions of those databases and information on how to obtain and use them. AFCCC/TN-96/001 is a directory of all AFCCC databases.


USAFETAC/UH--93/001 (ADB269402) AWSMSC (Air Weather Service Master Station Catalog) USAFETAC Climatic Database Users Handbook No. 6, by Tom Kotz and Phil Clouse, March 1993. Provides users of the Air Weather Service Master Station Catalog with information database history, production, and content. Also discusses processing and quality control, tells users how to obtain the data.


AFCCC/UH--96/003 (ADB-B207995) Atmospheric Slant-Path Analysis Model (ASPAM) Hold Output Users Handbook, by Diane P. Johnson, March 1996, 88 pp. AFWA and AFCCC use the Atmospheric Slant Path Analysis Model (ASPAM) to provide vertical profiles of meteorological data to numerous military and government customers. This guide details how the computer model uses hold output data to produce a point analysis. Distribution limited to U.S. government agencies and their contractors. Other requests must be referred to AFCCC/DOO, 151 Patton Ave., Asheville NC 28801.


AFCCC/UH--96/005 (ADB-B208028) Climatology of Cloud Statistics Users Handbook, by Capt. Paul Lewis, February 1996, 16pp. Climatology of Cloud Statistics, a global cloud-cover database that supplies a broad spectrum of sky cover related statistics, is available in two forms: FORTRAN and QuickBasic. This users guide
illustrates use of the FORTRAN version. Distribution limited to U.S. government agencies and their contractors. Other requests must be referred to AFCCC/DOO, 151 Patton Ave., Asheville NC 28801-5002

6.2 AFGWC Users Handbooks

Chapter 7

MICROCOMPUTER PROGRAMS

The following microcomputer programs are available in CD-ROM format. Like the microcomputer programs previously listed, order these CD-ROM products from the AFWTL, 151 Patton Ave., Asheville NC 28801-5002. Note: some of these programs are DOS based and/or not Y2K compliant. Before ordering inquire about the currency of the particular program.

CD-0001 International Station Meteorological Climate Summary (ISMCS) Version 2.0. A joint Navy/NOAA/USAFAETAC project, on one CD-ROM disc. ISMCS includes summary data for 640 stations taken from Navy PC-SMOS, USAFAETAC SOCS, and Navy Worldwide Airfield Summaries. User can print from disc and write selected data to an ASCII file for reformating in a word processor. System requirements and setup instructions are on the back of each disc. Previously named PC-0041.

CD-0011 TIPS Oct 97 (ver 1.0) This compact disk is a compilation of weather programs/help files developed by AFWA Technical training branch and the air force combat climatology center. The intent was to provide a “single-source” of information for air force weather units to use for training, or in tactical environments, to conserve hard drive. Tips is a computerized help file consisting of hypertext links and jumps identified by “hot words.” It guides forecasters through the “forecast process” and provides a wealth of reference material for just about any forecast objective. The “forecast process” consists of shift change, metwatch, analysis, and forecast development. MetTIPS is a consolidation of many forecaster aids, including rules of thumb, checklists, conversion charts, and reference tables. This CD is not, nor was it intended to be all inclusive, as AFCCC has many other programs available to you. Please note the following problems that you will encounter on the CD:

**Important!** This CD can be run on systems with Windows version 3.1 or Windows 95/98. If you have any questions about this program, please contact HQ AFWA/DNTT at DSN 576-4721.

CD-0020 Interactive Space Weather Training and Requirements Module, January 2000, 614 Space Operations Group. In addition to terrestrial weather, space weather plays a key role in the warfighters’ ability to plan and conduct operations. To aid in the training and requirements process, we have developed this Interactive Space Weather Training and Requirements Module. This interactive module provides a wealth of information organized to facilitate quick reference to pertinent data. Topics addressed include: general background information, a worksheet to help you and your customer establish operational space weather requirements; education and training documents and briefings on space environments as how it impacts military operations and additional information on the SIPRNet, NIPRnet and other resources.

CD-0025 Mark IVB - The Forecaster and GIDS Viewer manipulate weather data provided by the Meteorological Data Station AN/UMQ-13(V), commonly referred to as Mark IVB. Software is requested through the AFWA Customer Service Center (afwa.csc@afwa.af.mil). Distribution authorized to U.S. Government Agencies and their contractors only; critical technology; other requests for this will be made to HQ AFWA/A5R, Offutt AFB NE 68113.

CD-0030 Joint Southwest Asia Deployment Climatology (20 September 2005, Version 3) DVD contains products from both the Air Force Combat Climatology Center and the Fleet Numerical METOC Detachment, Asheville NC. Products include Airfield Reliability Summaries, Narratives, Operational Climatic Data Summaries (OCDS), Station Observation Climatic Summaries (SOCS), Technical Notes, Briefings, and Station Climatic Summaries. Zipped AFCCPC software programs are also included. For those programs requiring data, separate directories have been set up for users to access. DVD is current as of March 2005. Users may want to visit one of AFCCCs's web sites or the FNMOD web site to get any information or data that has been created since the disc was made. Countries included: Iran, Iraq, Oman, Saudi Arabia, UAE, Jordan, Afghanistan, Bahrain, Djibouti, Egypt, Gulf of Aden, Kazakhstan, Kuwait, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan, Israel, Pakistan, (CD-0035-39) AFWTL Technical Document CDs, 15 Mar 04. Each CD(s) includes the regional climatologies, forecaster memos, technical notes and technical reports for the specified topic.

- **CD-0035 USEUCOM AOR.** Distribution authorized to U.S. Government agencies only; proprietary information, 12 Dec 03.
- **CD-0036 USCENTCOM AOR.** Distribution authorized to U.S. Government agencies only; critical technology; 12 Dec 03. Export Control.
- **CD-0037 USPACOM AOR**
MICROCOMPUTER PROGRAMS

- **CD-0038 US SOUTHCOM AOR.** Distribution authorized to U.S. Government agencies and their contractors only; critical technology; 12 Dec 03.
- **CD-0039 Convective Weather**

**CD-0040 Eugene M. Weber.** This CD combines on a single disc the four Regimes technical notes by CMSgt (ret.) Eugene M. Weber (*Summer Regimes, Winter Regimes, Spring Regimes, and Autumn Regimes*) as well as his *Freezing Precipitation.*

**CD-0042 Joint Far East Deployment Climatology DVD**
- November 2005. Distribution limited to DoD and DoD contractors only; administrative or operational use; 18 October 2005. Destroy by any method that will prevent disclosure of contents or reconstitution of the DVD.

**CD-0044 Joint Africa Deployment Climatology** (20 July 2007, Version 1) DVD contains products from both the Air Force Combat Climatology Center and the Fleet Numerical METOC Detachment, Asheville NC. Products include Airfield Reliability Summaries, Narratives, Operational Climatic Data Summaries (OCDS), Station Observation Climatic Summaries (SOCS), Technical Notes, Briefings, and Station Climatic Summaries. Zipped AFCCC PC software programs are also included. For those programs requiring data, separate directories have been set up for users to access. DVD is current as of July 2007. Users may want to visit one of AFCCC’s web sites or the FNMOD web site to get any information or data that has been created since the disc was made.
Chapter 8

COUNTRY CLIMATOLOGY DIGESTS

These are climatology studies that describe conditions in a specified region, country, or location. These studies are in the narrative, or written, form and are syntheses of information available on the climate. Most are full year studies, but some cover only part of the year. After describing the geography and major meteorological features of the entire region, the study discusses in detail the climatic controls of each location’s weather. Each “season” is defined and discussed in considerable detail with emphasis on general weather, hazards, clouds, visibility, winds, precipitation, and temperature.

These are available for download to U.S. military users via the “Search for Products” page at the 14th Weather Squadron web site (https://www.afcc.afrn.mil). They can also be ordered from the AF Weather Technical Library (see Chapter 1 for ordering information).


AFCCC/CCD–06/005 Algeria: a full year study, by Patrick Giese, 1 August 2006, 62 pp.


1WW SS 105-1 (AD235309) *Far East Climatology of the Jet Stream*, September 1955, 111pp. This ‘Special Study’, prepared by the Climatology Division, Tokyo Weather Central 1st Weather Wing was published for the information and guidance of personnel assigned that unit in the year 1955.

1WW SS 105-2 (AD115818) *Forecasting rules and techniques used in Tokyo Weather Central*, by LtCol Donald E. Martin, August 1956, 141pp. The Tokyo Weather Central has been conducting a comprehensive program aimed at incorporating into the daily forecasting routine certain techniques employing vorticity advection and a consideration of departure from normal, or anomaly, fields. Our objective forecasting techniques are evaluated by computing Correlation Coefficients for the objective forecasts for a grid of geographical points.

1WW SS 105-2/1-12 (AD–None) *Monthly Climate of Korea*, 1968 (revised December 1976). Separate document (1-12) for each month. The 1st Weather Wing Special Studies 105-2/1-12(Revised) describes the Korean climate. The statistics presented should be used only as planning aids. Includes the 1968 study for the Far East Climatic Atlas, Climatology Summaries, as well as revisions included in 1976 for Means and Extremes values.

1WW SS 105-3A (AD469408) *Climatic Data Summaries for selected Asian and Pacific stations*, August 1965, 137 pp.

1WW SS 105-3B (AD819674) *Climatic Data Summaries for Republic of Vietnam stations*, April 1967, 29 pp

1WW SS 105-4 (AD469409) *Climate of North Vietnam*, (Revised) June 1965, 92pp. This report was prepared primarily as a planning aid to assist detachments within 1st Weather Wing and its subordinate squadrons in providing basic climatic data for North Vietnam. It contains up to date charts for most parameters as well as new and more comprehensive ceiling/ visibility data for individual stations listed in the back of the book.

1WW SS 105-5 (AD469410) *Climate of Malaysia*, October 1964, 96pp This study was prepared primarily as a planning aid to assist detachments within 1st Weather Wing and its subordinate squadrons in providing basic climatic data for Malaysia.

1WW SS 105-6 (AD409249) *Climatic Atlas of Indochina*, December 1964, 265 pp. This special study pertaining to Indochina was prepared primarily as a planning aid to assist 1st Weather Wing units in providing basic climatic data for Indochina. The period of record for data used in the analyses varies from two years to over fifty years. The study excludes data for Malaya and Burma.

1WW SS 105-7 (AD469411) *Far East Climatic Atlas*, January 1965, 243pp. This special study was prepared primarily as a planning aid to assist 1st Weather Wing units in providing basic climatic data for the Far East. More detailed analyses for Indochina are contained in 1st Weather Wing Special Study 105-6.

1WW SS 105-8 (AD704599) *Climatology for the Western Pacific area*, March 1970, 74pp. by Environmental Services HQ 1st WW, APO, San Francisco. This study is a revised publication dealing with the climate of the Western Pacific Area. For the purpose of this study the Western Pacific Area is defined as Southeast Asia, Philippines, Taiwan, Okinawa, Japan, Korea, and the islands of Guam and Iwo Jima.

1WW SS 105-9 (AD689786) *Climate of Republic of Vietnam*, (Revised) March 1969, 138pp. 1st Weather Wing Special Study 105-9 (Revised) is an updated study of weather conditions over the Republic of Vietnam for all months and seasons.

1WW SS 105-9/1-12 (AD–None) *Climate of the Republic of Vietnam* (one document for each month), prepared from November 1969 to October 1970, 12-15pp per document. 1st Weather Wing Special Study 105-9/1 through 105-9/12 are studies of climatic conditions over the Republic of Vietnam during January through December. The material presented is based upon climatic averages and is intended as an aid in planning only.

1WW SS 105-10 (AD470686) *Climate of Thailand*, August 1965, 127pp. This study was prepared primarily as a planning aid to assist detachments within 1st Weather Wing and its subordinate squadrons in providing basic climatic data for Thailand. This is one of a series of such studies, which are being prepared for all countries in Southeast Asia, including Indonesia, Philippines and Taiwan. Climatological information to support a specific mission or exercise should be requested through...
appropriate Air Weather Service channels. A Staff Weather Officer should make further interpretation of the data in this study.

1WW SS 105-11/1-12 Climate of Southeast Asia (one document for each month), prepared from December 1969 through October 1970, 59-70 pp per document. 1st Weather Wing Special Studies 105-11/1 through 105-11/12 are studies of climatic conditions over Southeast Asia for each month of the year. (AD700785; AD701748; AD701749; AD703326; AD705569; AD706887; AD709725; AD711386; AD713132; AD713120; AD714566; AD714070)

1WW SS 105-11P (AD697751) Southeast Asia Precipitation Analyses, Jan 1969. Contains monthly and annual isoline analyses of six precipitation parameters — maximum, mean, minimum and 24-hour maximum precipitation amounts in inches and number of days with precipitation and thunderstorms.

1WW SS 105-12/1 (AD707496) Ceiling and Visibility Atlas for Southeast Asia (1,000/2), May 1970, 104pp. This study contains isoline analyses of ceiling equal to or greater than 1000 feet accompanied by a surface visibility of at least 21/2 miles (greater than 1000/2/1/2). The area covered by the charts is Southeast Asia (SEA). For the purposes of this study, SEA is considered to the North and South Vietnam, Laos, Cambodia, and all of Thailand. The charts are drawn for eight hours of the day (01 LST plus every 3 hours) for each month of the year, with a 20% isoline interval.

1WW SS 105-12/2 (AD707494) Ceiling and Visibility Atlas for Southeast Asia (5,000/5), May 1970, 104pp. Consists of isoline maps (scale 1:9,000,000) of Southeast Asia showing the distribution of percent frequency of occurrence of ceilings 5000 ft and visibility 5 miles at 0100, 0400, 0700, 1000, 1300, 1600, 1900, and 2200 LST. This publication supersedes the “Ceiling/Visibility Atlas for Southeast Asia (5000 & 5)”, published by 20th Weather Squadron in May 1966.

1WW SS 105-12/3 (AD489616) Sky Cover/Visibility Atlas for Southeast Asia (3/10 & 2 1/2), August 1966, 55pp. This special study was prepared primarily as a planning aid to assist 1st Weather Wing units in providing basic climatic data for Southeast Asia. For the purpose of this study Southeast Asia is defined as North Vietnam, Republic of Vietnam, Laos, Cambodia, and Thailand.

1WW SS 105-12/4 (AD806745) Sky Cover/Visibility Atlas for Southeast Asia (<3/10 below 10,000 feet & 5 mi), January 1967, 55pp. This special study was prepared primarily as a planning aid to assist 1st Weather Wing units in providing basic climatic data for Southeast Asia. For the purpose of this study Southeast Asia is defined as North Vietnam, Republic of Vietnam, Laos, Cambodia, and Thailand.

1WW SS 105-13/1 (AD488117) Medium-Level Persistency Analysis for Southeast Asia (5,000/5), July 1966, 144pp. This special study was prepared primarily as a planning aid to assist forecasters in 1st Weather Wing units located in Southeast Asia. For the purpose of this study Southeast Asia is defined as North Vietnam, Republic of Vietnam, Laos, Cambodia and Thailand.

1WW SS 105-13/2 (AD650903) Low-Level Persistency Analysis for Southeast Asia (2,000/3), March 1967, 144pp. This special study was prepared primarily as a planning aid to forecasters in 1st Weather Wing units located in Southeast Asia. For the purpose of this study Southeast Asia is defined as North Vietnam, Republic of Vietnam Laos, Cambodia and Thailand. Information contained in this publication is based on climatic averages and should not be construed as a forecast. Interpretation of data should be made only by a qualified weather forecaster. Minor differences may appear between similar maps in this book and 1st Weather Wing 105-12/1 due to less available data for this study.

1WW SS 105-14 (AD697791) Climate of Laos, October 1969, 232pp. In two parts. Part I is an annual discussion; Part II, a monthly discussion. Essentially based on previously available data, however, precipitation analyses and ceiling and visibility data are new. Part I has an introduction with geographical sketch, climatic outline with expanded statements on temperature, relative humidity, precipitation, cloudiness, winds; a regional discussion (mountains and Mekong lowlands); climatic conditions discussing general circulation, seasonal weather, air masses; geographic controls including effects of topography, continentality, oceans and latitude; special phenomena including local winds, floods and droughts, tornadoes, hail dust storms, extra-tropical cyclones, fronts, tropical cyclones convergence zones; and a weather elements section with detailed discussions of temperature, humidity, precipitation, cloudiness, visibility, obstructions to vision, winds, temperatures aloft and combined ceiling/visibility, etc.

1WW SS 105-15 (AD670553) Climate of Cambodia, May 1968, 62pp. Cambodia’s climate is monsoonal in nature and is characterized by distinct wet and dry seasons. In general, the southwest monsoon (mid-May through mid-October) has heavy and frequent precipitation, high humidities, maximum cloudiness, relatively good visibility, and except at higher elevations, high temperatures. In contrast, the northeast monsoon (November through mid-March) usually brings little precipitation, lower humidities, minimum cloudiness, frequent low precipitation, frequent low visibilities, and lowest temperatures. These major seasons are separated by short transitional periods, each with fairly well marked characteristics.
1WW SS 105-55 (ADA055750) Occurrence of Typhoons/Typhoons (1949-1969) at Selected Locations. April 1970, (updated through 1977, June 1978), 55pp. Both the occurrences of typhoons and the occurrences of typhoons and tropical storms within 60, 120, and 240 nautical miles are presented by month for 106 Western Pacific locations. The occurrences for Clark AB PI, Kadena AB JA, Yokota AB JA, Kunsan AB ROK, Osan AB ROK, and Andersen AFB GU, have been updated to include 1970-1977 data. Superseded by 1WW/FM-89/001, Tropical Cyclone Climatology, Western Pacific.

1WW SS 105-60 (AD–686798) Climatology for Asian and Pacific Visits. April 1969, 128pp. This is a study of the climate of Asian and Pacific areas visited by military staff officers. It contains mean monthly or seasonal meteorological parameters for selected countries and was prepared primarily as planning guide for staff visits. The information contained in this publication is based on climatic averages.

1WW TS 1 (AD645087) Taiwan low study. August 1966. 37 pp. The report discusses the various aspects of Taiwan Low developments and movements. The climatology of the Taiwan area during the northeast monsoon, a general description of Taiwan Lows, and a review of several forecast studies and associated weather are given. Various rules of thumb connected with the Lows are also presented.

1WW TS 2 (AD645088) The problems of fog and stratus forecasting at Misawa AB, Japan, by George Taniguchi, September 1966. 21 pp. The study describes the physical nature of summertime fog and stratus phenomenon at Misawa Air Base, Japan; its frequency of occurrence, and the forecasting problems involved. All known forecast techniques and their effectiveness are reviewed.

1WW TS 3 (AD645089) A preliminary estimate of extreme wind speeds in Thailand, October 1966. 31 pp. Estimates of extreme wind speeds for various cumulative probabilities or return periods are made for 13 Thailand stations using the double-exponential distribution Annual Peak wind gusts for a 10 year period, 1956-1965, are used in the analysis. Comparison of expected peak gusts are made between stations and with stations in the interior United States. Seasonal and monthly differences in expected peak gusts are discussed. Correction factors for elevation differences and conversion factors to determine sustained winds are presented. Also given is the directions and occurrence times of extreme winds.

1WW TS 4 (AD645090) Objective method to forecast low morning visibilities at Ubon, Thailand — (Jan-Mar), November 1966. 14 pp. An objective method is derived to forecast occurrence of surface visibilities less than 5 miles caused by ground fog, haze and/or smoke at Ubon, Thailand from 1 January to 15 March.

1WW TS 5 (AD–None) Forecasting low level turbulence for light aircraft, by MSGt Charles A. Bihler, November 1966. 10 pp. The study describes a semi-objective method for forecasting low level turbulence for light aircraft operation, designed primarily for use in Korea. Maximum surface or gradient level wind speeds and low level stability are used as predictors. The method can be applied in any area where mechanical turbulence due to rough terrain occurs.

1WW TS 6 (AD645596) Comparison of VFR percentages in Southeast Asia, by Capt Gary D. Atkinson, December 1966. 20 pp. VFR (ceiling ≥ 1500 feet and visibility ≥ 3 miles) percentages obtained from various sources are compared for major air bases in Southeast Asia. In general, previous estimates obtained primarily from N Summaries and 1st Weather Wing Special Summaries give significantly higher percentages below VFR than data obtained from hourly WBAN observations. Since up to four years of these WBAN observations are now available, the author recommends using them to modify previous estimates of VFR percentages.

1WW TS 7 (AD646031) Mid-latitude frontal cloud models, by George Taniguchi, January 1967. This study presents typical cloud patterns associated with mid-latitude weather systems. These models can be used as a guide when preparing prognostic HWS (horizontal weather depiction) charts or making flight forecasts (vertical cross section). The study also illustrates how forecasters can extract valuable information from APT satellite pictures to use in conjunction with synoptic charts, pilot reports, RAOB data and other information.

1WW TS 8 (AD646350) Typhoon Frequencies for Pacific air bases, by CMSgt Hiram E. Penland Jr., January 1967. 11 pp. The study gives the average frequencies of typhoons, monthly and annually, passing within specified distances of 14 Pacific air bases during the period 1947-1966. Also given is a technique to estimate the corresponding frequencies for typhoons and/or tropical storms.

1WW TS 9 (AD647595) A practical approach to streamline analysis, by Capt Patrick E. Pickett, rev. February 1967. 28 pp. The study is a revision of a paper originally prepared by Capt Pickett during his tour in Southeast Asia during 1964-1965. It presents several basic fundamentals and practical exercises of streamline analysis. The study is designed as a training aid for meteorologists with little or no experience or training in tropical meteorology.

1WW TS 10 (AD648143) The effects of typhoons on weather at Clark Air Base, by George Taniguchi, et al.,...
rev. February 1967. 64 pp. This study illustrates weather and wind conditions at Clark Air Base, Philippines when a typhoon or a tropical storm center is within 400 nautical miles of the Base. Part I of the study consists of typhoon tracks grouped by months and the maximum winds observed at Clark, based on data from 1947 to 1965. Tracks for 1966 have also been added in a separate chart. Part II shows the sequence of weather events observed at Clark during typhoon passages. This study can be used as a guide when making wind speed and weather forecasts during a typhoon passage.

**1WW TS 11 (AD650257) Thunderstorms in Southeast Asia**, by Capt Gary D. Atkinson, March 1967. 55 pp. The study presents a comprehensive survey of thunderstorms in Southeast Asia (Republic of Vietnam, Cambodia, Thailand, Laos and North Vietnam). Various Southeast Asian data sources are used, and the reliability of these sources as well as the difficulties involved in obtaining reliable thunderstorm data are discussed. The monthly and annual frequencies of thunderstorm days for 83 stations in Southeast Asia are given in both table and isoline-map forms. Year to year variations in the numbers of thunderstorms observed monthly and annually are discussed. The duration and diurnal variation of thunderstorms are also considered. A thunderstorm persistency model was developed from ten years of daily thunderstorm records for selected Thailand stations. The report shows how the local thunderstorm climatology can be approximated for a Southeast Asian location where no data are available.

**1WW TS 12 (AD-None) Typhoon weather models**, by Capt Gary D. Atkinson and CMSgt Hiram E. Penland, April 1967. Synoptic models are developed to relate the maximum surface wind gusts, lowest flying weather conditions, and six-hour rainfall amounts at Kadena AB, Okinawa to the positions and intensities of typhoons. Both the mean and 90% highest values are given for the wind speeds and rainfall amounts. Independent testing indicates that these models can be used to prepare realistic and consistent terminal forecasts of typhoon produced weather at Kadena.

**1WW TS 13 (AD661278) Climatology of significant weather at Mactan AB, Philippines**, by Capt Gary D. Atkinson, October 1967. 20 pp. The climatology of significant weather at Mactan is presented in graphical and table form. Significant weather is defined as: the occurrence of thunderstorms, ceiling/visibility conditions below VFR, surface wind gusts greater than or equal to 20 knots, and or rainfall. Observations for a limited period at Mactan are compared with a 10 to 15 year summary of observations at Cebu. There appears to be no significant climatic differences between the two locations. A screening of predictors to forecast thunderstorms at Mactan indicates that low level wind speed gives the best indication of thunderstorm probability (thunderstorms much more likely with light winds). (Author)


- (AD666260) **Part I: Text**. Synoptic models designed to improve weather forecasts in the Tokyo, Japan area are presented. The most important weather producers for Tokyo are low pressure centers which develop near Shanghai, China, and in the Yellow and East China Seas. Rugged terrain over Eastern Asia reroutes and distorts synoptic features approaching Japan from the west. The more important geographical effects and the clues they give to low development are discussed. The development of mesoscale features near Japan in advance of major lows is stressed. All synoptic features are named to identify their location or origin. Examples of development and movement of each feature are presented. Included are case studies of heavy snowfall, thunderstorms, typhoons, the rainy season (Bai-U), extended poor flying weather, etc., affecting Tokyo. Preliminary relationships are established between frontal surges over Southeast Asia and passage of synoptic features near Tokyo. Brief climatological summaries of Tokyo area weather and monthly typhoon frequency are included. Long wave patterns are related to Tokyo weather in generalized form.

- (AD666096) **Part II: Figures**. Figures showing synoptic feature geography, storm tracks, and a composite map of recurring synoptic features relevant to weather forecasting for Tokyo, Japan are presented.

**1WW TS 15 (AD667550) Pressure data for stations in Thailand and South Vietnam**, by Capt Gordon K.T. Ing, February 1968. 40 pp. The study illustrates the computations of forecast altimeter settings and various pressure altitude values for stations in Southeast Asia using mean diurnal pressure curves. Appendix I contains diurnal pressure curves for 7 stations in Thailand and 12 stations in South Vietnam. Appendix II presents the data from Appendix I rearranged to list pressure values by month.

**1WW TS 16 (AD667551) Extreme daily rainfall amounts in the Republic of Vietnam**, by Capt Gary D. Atkinson, March 1968. 34 pp. The double exponential distribution is applied to extreme daily rainfall amounts in the Republic of Vietnam. With few exceptions, this distribution fits the annual extremes very well and is used to determine expected daily extremes for return periods of 5 to 100 years. The expected extremes for a 100 year return period range from 6 to 8 inches in the Southern lowlands to over 20 inches in the mountainous regions in the north. The double exponential distribution also gives a
fair fit to the monthly extremes during the wetter months. The seasonal distribution and physical causes of the annual daily extremes are discussed. Along the east coast and northern mountains, the highest daily rainfall amount each year generally occurs between mid-September and mid-December corresponding to the maximum frequency of tropical cyclones during this period. Over the remainder of the country, the annual extremes are caused by heavy thunderstorms and can occur any time during the southwest monsoon or transition months (April through November).

1WW TS 17 (AD667532) Case studies of spring and summer sea stratus at Kunsan Air Base, Korea by William B. Blakenship, K. S. Pak, and George Taniguchi (Scientific Services, 20th Wea Sq.), March 1968. 30 pp. Spring and summer sea stratus is a major forecasting problem at Kunsan AB. Stratus moves in rapidly from the sea quite often without warning and causes below VFR conditions at Kunsan lasting from a few hours to several days, at times bringing ceilings as low as 100 feet. Case studies of 1964 spring and summer stratus occurrences were made and from these, ideal synoptic situations for occurrences were determined. Formation of sea stratus seems to be well correlated with frontal passages. However, approaches and passages of fronts merely trigger sea stratus formation. Principal causes are the existence of strong cold or warm air advection near the frontal boundaries. This can result in ceiling and visibility as low as W0X 1/16 due to advection of sea stratus or fog from offshore inlands over the station with the mixing of cold and warm air occurring over the Yellow Sea.

1WW TS 18 (AD0669636) Objective Method To Forecast Gusty Surface Winds At Mactan AB, Philippines. May 1968. The relationship between the maximum surface wind gusts and the maximum wind speed in the lowest 10,000 feet is used to develop an objective technique to forecast surface wind gusts equal to or exceeding 20 knots at Mactan Air Base. Considering only the days when gusty surface winds are likely, the dependent sample shows 73% correct forecasts and a Heidke skill score of 0.46. The corresponding figures for the independent data are 69% and 0.39.

1WW TS 19 (AD977792) Synoptic Application Of Satellite Cloud Pictures Over The Far East, by K. S. Pak, 08 Oct 1969. The study describes the application of satellite data in daily synoptic analysis and forecasts. General characteristics of the appearance of clouds in satellite pictures are briefly discussed. Rules which are directly useful for daily forecasting are itemized and divided into various terrain effects and synoptic patterns. Selected examples of photographs from ESSA 2 and 4 and Nimbus 2 are discussed.

1WW TS 20 (AD705567) Forecasting Snowshowers At Misawa Air Base, Japan. by George Taniguchi (Technical Services, 20th Wea Sqd), Feb 1970, 34 pp. The study describes various snowshower forecast methods that have been attempted at Misawa AB, Japan. A brief summary of each method is presented. Conclusion, at the present state of the art only favorable conditions for snowshowers can be predicted.

1WW TS 21 (AD705568) The August 1969 Atmospheric Singularity — Southeast Asia, Lynn L. LeBlanc, Apr 1970. The study describes the progression of the tropical buffer ridge as it moves north through Southeast Asia producing clear weather. This same synoptic situation had previously been identified with July.

1WW TS 22 (AD705723) Thunderstorms Over The Kanto District, by H. Hatakeyama, S. Kitazawa, and H. Nojima, May 1970. The research is a synthetic report on the thunderstorms over the Kanto District, Japan, containing statistical surveys of thunderstorms, the results of special observations of thunderstorms, radar studies of thunderstorms, cloud seeding experiments and thunderstorms, volcanic eruption and thunderstorms, case studies of local heavy rainfall with thunderstorms, thunderstorms accompanied by hail and the forecasting of thunderstorms.

1WW TS 23 (AD726107) Forecasting low level turbulence for light aircraft in Hawaii, by Capt Donald L. Best, April 1971, 6 p. The proposition is to forecast the intensities of turbulence below 10,000 ft MSL for aircraft weighing less than 10,000 pounds operating along the Hawaiian Island Chain during the 24 hour period beginning at 1200Z (0200 local standard time). The intensities of turbulence to be forecasted are light, moderate, and severe. Light turbulence cases slight, erratic changes in altitude, and/or altitude. Moderate turbulence is similar to light but of greater intensity while the aircraft is still in positive control. Severe turbulence causes large, abrupt changes in altitude and/or attitude and the aircraft may be momentarily out of control.
Chapter 10

CLIMATIC DATA SUMMARIES

Climatic data summaries (or DS’s) are published collections of climatic data for stations, regions, or (very occasionally) on a specific climatic element, such as aircraft icing climatology. All the products listed here are available from the AF Weather Technical Library (AFWTL), Asheville, NC, DSN 673-9019.

10.1 Situation Climatic Briefs

USAFETAC/DS--85/030 (AD-B099414) Situation Climatic Briefs, November 1985, 521 pp. A collection of brief narrative climatological summaries for various countries and/or regions worldwide. Briefs are assembled alphabetically by country or region in eight parts: Part A, Africa; Part B, Antarctica, Australia, and Oceania; Part C, Asia; Part D, China; Part E, Europe; Part F, Latin America; Part G, North America; and Part H, the USSR. A July 1987 errata (62pp.) replaces original Part G, North America. Most briefs are organized by season. Individual briefs include a general climatic discussion; descriptions of flying, reconnaissance, terminal, exposure, and paradrop weather, and astronomical data (civil twilight tables). Some briefs include remarks on sea state, port and beach conditions, and extreme weather. This data summary got its name when the individual briefs that comprise the present volume were prepared and filed in the Joint Chiefs of Staff “Situation Book” for quick reference. Despite expanded use throughout the DoD and AWS, the title remains. Existing situation climatic briefs were prepared by USAFETAC’s Operational Readiness Section (USAFETAC/ECR) in response to requests by Det 2, Headquarters Air Weather Service. NOTE: Out of print — available in microfiche only.

10.2 Station Climatic Summaries

Formerly “AWS Climatic Briefs.” Regional collections of individual station climatic summaries for each of the seven major geographical areas shown below. Collections are revised when and as required. A typical dataset for a given station might consist of an “AWS Climatic Brief” (one or two pages prepared by OL-A, USAFETAC, sometimes with a one-page addendum). An “Operational Climatic Data Summary” (OCDS), normally four pages of climatic data prepared by USAFETAC/ECO, might constitute another dataset for certain stations. Current OCDS’s are available digitally to US military units via the Product Locator on the 14th Weather Squadron web page. A two-page “Operational Climatic Data Summary Supplement” (also prepared by USAFETAC/ECO) might accompany an “AWS Climatic Brief.” All datasets normally include monthly and annual climatic data for at least these elements: temperature (means and extremes, daily and monthly), relative humidity, vapor pressure, and dew point; pressure altitude, surface winds, precipitation, and mean cloud cover; thunderstorm and fog occurrence (mean number of days); and flying weather by ceiling and visibility categories. Station Climatic Summaries are available in paper or microfiche.


USAFETAC/DS--90/038 (AD-A229376) Antarctica, Australia, and Oceania, August 1990, 89pp. Supersedes DS--87/038, March 1987 (AD-A179242).
10.3 Worldwide Parachute Climatology

These summaries give probability of occurrence of simultaneous ceiling, visibility, and surface wind conditions (including gusts) for each of five parachute categories, in three geographical areas specified by the titles. All were prepared by Capt Robert S. Moonan, Jr., in November 1981. Available from the AFWTL in microfiche only.


USAFETAC/DS--81/098 (AD-A109871) Europe, 444 pp.

USAFETAC/DS--81/099 (AD-A109872) USSR, Asia, and Africa, 656 pp.

10.4 Worldwide Airfield Climatic Data

These data compilations were prepared by USAFETAC in 12 volumes (most with multiple parts) for selected airfields and areas worldwide. Individually available from the AFWTL in microfiche only.

Volume I Southeast Asia (Revised), AD-706355, May 1970.

Volume II Middle East (Revised)

Volume III Far East, AD-662426, October 1967.


Volume V Australia, South Pacific, Antarctica, AD-662648, December 1967.

Volume VI South America
Part 1 Argentina, Brazil, Uruguay, AD-664828, January 1968.
Part 2 Except Argentina, Brazil, Uruguay, AD-664829, January 1968.


Volume VIII United States of America
Part 1 West Coast, Western Mountains, and Great Basin, AD-688472, May 1969.
Part 2 Rocky Mountains and Northwest Basin, AD-689792, June 1969.
Part 5 Mississippi Valley Area, AD-699917, December 1969.

Part 7 Appalachian Mountains, Middle Atlantic, and Northeast, AD-703606, March 1970.
Part 8 Alaska and Hawaii, AD-704607, April 1970.

Volume IX Africa

Volume X Europe
Part 1 Scandinavia and Northern Europe, AD-719907, April 1971.
Part 2 Low Countries and British Isles, AD-719908, April 1971.
Part 3 Alps and SW Europe, AD-720708, April 1971.
Part 4 Mediterranean, AD-721160, April 1971.

Volume XI Eastern Europe and USSR
Part 1 Undated, AD-776611.
Part 2 Undated, AD-776612.

Volume XII Peoples Republic of China
Part 1 Sinkiang, Tibet, Inner Mongolia, China proper (including SE Coast and Shanghai), AD-776615, February 1974.
Part 2 Manchuria, China proper, east coast (except Shanghai area), SE coast interior, North Korea, Mongolia, AD-776616, February 1974.
10.5 Climatological Atlases

Climatological (or climatic) atlases are collections of graphic or pictorial climatology data for a specified country or area. Some atlases are AF Weather Technical Library reprints of unique documents that provide for expanded application of rare data.


**USAFETAC/DS--86/001 (ADA174260) Climatic Atlas of Icing Potential Over North America**, January 1986, 126pp. A climatic atlas of charts that show percent frequency of occurrence of potential icing conditions over North America. A climatology of elements for potential icing conditions such as liquid water content and temperature. The Smith-Feddes Liquid Water Content (LWC) computer model used input from AFGWC’s 3DNEPH database and upper-air Analysis Data Set (ADS). Output consisted of percent frequency of occurrence of a liquid water content threshold concentration in a defined layer and temperature range. Output was for three concentrations, three layers, and for temperatures at or below freezing. Data was then manually converted into 117 monthly and annual maps showing percent frequency of occurrence for potential icing conditions.

10.6 14th Weather Squadron Surface Observation Climatic Summaries

Climatic summaries for individual stations are available via the Product Locator on the 14th Weather Squadron web site (https://www.afccc.af.mil). Paper or microfiche copies of those products produced before production moved to the web are available from the AF Weather Technical Library. Descriptions of the various types of surface observation climatic summaries produced in the past follow:

**SOCS — Surface Observation Climatic Summary.** A fully automated product that replaced the RUSSWO and LISOSCs in late 1988. Although similar in content to RUSSWO/LISOSCs, the SOCS is fully automated. Among other improvements over the RUSSWO/LISOSCs, SOCS offers two additional summary sections. Contents of each section are explained in individual section prefaces.

**RUSSWO — Revised Uniform Summary of Surface Observations.** Replaced in production by the SOCS, above. Like SOCS, RUSSWOs consist of surface weather observation summaries for individual stations. Period of record is 10 years (5 years for new summaries). RUSSWOs are only available for stations with a 24-hour, 7 day, observing function. USAFETAC/TN-83/001, An Aid for Using the RUSSWOs, gives a detailed description of content. The last RUSSWO was produced in 1988.

**MSOCS — Limited Surface Observation Climatic Summary.** Another USAFETAC product, also replaced by SOCS. Similar to the RUSSWO, but for observing stations that take observations less than 24 hours a day/7 days a week. The last LISOCS was produced in 1988.

**USSWO — Uniform Summary of Surface Observations.** The original USAFETAC product that was “revised” to put the “R” in “RUSSWO.” USSWOS are no longer produced.

**PUSSWO — Partial Uniform Summary of Surface Observations.** A modification of the original USSWO described above. PUSSWOs are no longer produced.

**SFCSUM — Surface Summary.** A very early (circa 1940) predecessor of the products described above.
10.7 Other AWS Climatic Data Summaries (WSCC and TT/ $T_dT_d$).

Wind Stratified Conditional Climatology Tables (WSCC) and Temperature/Dew Point Curves (TT/$T_dT_d$) are available via the Product Locator on the 14th Weather Squadron web site (https://www.afccc.af.mil). Older versions are available on microfiche from the AF Weather Technical Library.
Chapter 11

FOR YOUR INFORMATION (FYIs)

An FYI (For Your Information) is a publication that provides new and useful information relevant to the Air Force Weather mission. FYIs discuss topics ranging from new meteorological equipment to space forecasting products. An FYI can also include information such as how to utilize a platform or techniques to exploit meteorological data in a remote area. All FYIs are developed as a result of a need to educate weather personnel. FYIs can be developed to help anyone, but are normally designed to assist the forecaster at the CWT. Until the FYIs have been migrated to the AF Portal at the HQ AFWA/A3OT – Training page (Publications → Manuals, Handbooks and Guides), they can be accessed at the old AFWA Training Division Website (https://wwwmil.offutt.af.mil/afwadnt/).

FYI 00. Publishing an FYI, by Mr. Mark Mireles, March 2004. The purpose of this FYI is to outline the steps involved in getting an FYI published and posted to the DNT Website.

FYI 1. PC-Based WX Data Backup Systems (Maintained by CWC), Jul 92 (Deleted)

FYI 2. Pallet Configurations (Maintained by CWC), Aug 92

FYI 3. MARWIN Troubleshooting (Maintained by CWC), Aug 92

FYI 4. Battlefield WX Equipment SOPs (Maintained by CWC), Aug 92

FYI 5. More Battlefield WX Equipment SOPs (Maintained by CWC), Aug 92

FYI 6. Gallup (launch and leave) (Maintained by CWC), Sep 92

FYI 7. Ceilometer, Sep 92

FYI 8. RDIT Troubleshooting (Maintained by CWC), Sep 92

FYI 9. MOS Guidance, Nov 92

FYI 10. Technical Improvement, 6 pp. This FYI provides information that can be used to help improve the technical skills of your unit and promote growth.

FYI 11. Commanders WX Info Pamphlet, Nov 92 (Deleted)

FYI 12. TAFVER, Nov 92

FYI 13. Cellular Telephone, Jan 93

FYI 14. Fixed Meteorological Equipment, Feb 93 (Deleted)

FYI 15. Battlefield Meteorological Equipment (Maintained by CWC), Feb 93

FYI 16. RVR-2, Feb 93

FYI 17. Lightning Detection System, Feb 93

FYI 18. The Technology Transition Bulletin Board, Apr 93 (Deleted)

FYI 19. Marwin Rawinsonde Improvements (Antennas) (Maintained by CWC), May 93 (Deleted)

FYI 20. Integrated Meteorological System (IMETS) (Maintained by CWC), Jun 93 (Deleted)

FYI 21. Medium-Range Forecast (MRF) Based Objective Forecast Message (OFM), Jul 93 (Deleted)

FYI 22. TAFVER II Statistical Output, Sep 93 (Deleted)

FYI 23. Conditional Climatology (CC) Tables, 11 pp. Given an initial set of conditions the Wind-Stratified Conditional Climatology Summaries (CC tables) will tell you how many times these conditions have occurred and for the next 48 hours tell you what happened within the selected ceiling and visibility categories.

FYI 24. A Layman’s Guide To Developing A Forecast Study, Jan 94 (Deleted)

FYI 25. The Air Force Global Weather Central Dial-in System, Feb 94 (Deleted)

FYI 26. Deployed LAFP Development Deployed LAFP Development (Maintained by CWC), Mar 94 (Deleted)

FYI 27. Weather Staff Officers Guide to Climatology, by Mr. Kenneth Walters, 1993, revised 1 Dec 2003 by Mrs. Melody Higdon, 22 pp. Based on 5WW/FM-86/003. This guide shows how to use climatology in staff duties. It is divided into five sections and has four appendices. The first three sections cover concepts and procedures needed to apply climatic information to the planning process. The fourth and fifth sections deal with climatology resources.

FYI 28. The HQ AWS Bulletin Board (Superseded by FYI 30), May 94 (Deleted)

FYI 29. SHARP, Aug 94 (Deleted)

FYI 30. Air Force Weather Bulletin Board, Aug 95 (Deleted)


FYI 34. Continuation Training, by HQ AWS, Aerospace Sciences Division, 7 pp. This program is merely a shell, or infrastructure, to help CT managers arrange training activities and training material into a logical method for injecting meteorology back into station operations.

FYI 35. METSAT Training, Sep 96 (Deleted)


FYI 41. Ceiling/Visibility Update, by Mr. Arthur J. Nelson, August 1997, 14 pp. This publication provides information you can use to make ceiling and visibility forecasts. It updates information found in T-TWOS #9, AWDS Ceiling Forecasting Techniques, and focuses on new techniques and tools.


FYI 44. AFW Communications, March 2000, 22 pp. Distribution authorized to U.S. Government Agencies and their contractors only: Administrative/Operational Use; 7 April 2008. Other requests for this document shall be referred to HQ AFWA/DNTT.

FYI 45. Individual Mobilization Augmentees (IMAs) in Air Force Weather by Lt Col Beth McNulty, June 2000, 16 pp. This FYI is designed for the active duty supervisor (or counterpart) and the Individual Mobilization Augmentee (IMA). General information important to all readers is contained in the first section. The second section looks at the IMA program from the active duty perspective. The third section uses the IMA’s perspective. An outline of suggested training goals is included in Appendix A. A glossary of terms and acronyms appears in Appendix B.


FYI 48. Mission Tailoring by MSgt Michael G. Brooks, January 2002, 12 pp. Weather personnel must tailor and present the information for specific applications so battlespace managers and/or mission planners, etc., can quickly assess limiting factors and direct their operations accordingly. Current and forecasted weather conditions will directly influence the planning process. These conditions affect mission profiles (i.e., number of aircraft, ingress/egress strategies), munitions selection (smart bombs versus conventional bombs), logistics (maintenance, munitions construction, etc.), and other combat support elements required for mission success.


FYI 50. Install AOS v1.3 on TMOS, (AFCWC), Jun 02. (Deleted)


FYI 52. Manual Observing System (MOS), December 2002, 7 pp. The purpose of this FYI is to update the information provided earlier in FYI #31 as many of the components in the MOS kit have been upgraded. It will provide information on how to order both new kits and replacement components. This FYI will briefly explain the capabilities of the components in the MOS kit.

FYI 53. Effective use of the Kestrel 4000, February 2003, 11 pp.


FYI 56. RQ-1 Predator — A (W)ISR platform FAQ by MSgt Craig McDougall (17 RS/DOWX), August 2003, 12 pp. This FYI has been written to answer many weather related questions asked of the Predator CWTs.

FYI 57. Installing the Automated Observing System (AOS) Ver. 2.0-2, August 2003, 16 pp.


FYI 61. Synoptic Meteorology (Regimes): “The Scales of Motion” by MSgt Michael A. Sadovsky and MSgt
Clark W. Lind, Nov 2004, 12 pp. AFWA/DNT has taken the important information from the (legacy) Synoptic Meteorology Regime Qualification Training Package (QTP) and incorporated it into this FYI to reemphasize the importance of regime identification and the use of regime information in the forecast process.

FYI 62, N-TFS 3.1.1.8 Auto-Update Capability, August 2005, 21 pp. Distribution authorized to DoD and DoD contractors only.


FYI 66, TURBCAT Version 2.1.1 (Jan 2004) (For Your Information) by Mr. John F. Polander, Mr. Kerry Joens, and Mr. Mark Mireles, January 2006, 11 pp. In a continuing effort to improve turbulence forecasting, Detachment 3 AFWA (formerly 88th Weather Squadron) at Wright-Patterson AFB developed a computer software application to calculate aircraft in-flight turbulence categories. The program is called “TurbCat.” TurbCat is a new application delivered with the NTFS version 3.2 baseline software. Weather technicians will find TurbCat to be a simple, yet powerful tool to assist in creating “tailored” turbulence forecasts for their parent/host flying customers as part the Mission Execution Forecast Process (MEFP).


FYI 69, Forecast Reviews by MSgt Brian W. Anderson and Mr. Mark R. Mireles, August 2006, 13 pp. A forecast review is an after-the-fact reassessment of the forecast data to include observations, analyses, model solutions, and local forecast aids (Rules Of Thumb) that were available to the forecaster.

FYI 70, Forecast Seminars by SMSgt D. G. McGrew and Sgt Francis G. Tower, December 2006, 8 pp. Forecast seminars are an integral part of weather operations at the OWS and CWT level. The old 2nd Weather Wing Forecaster Memo 86/007 was the career field’s guide on how to conduct a seminar program. This has been resurrected by this FYI, and with minor modifications, updated for use today.

FYI 71, Forecast Studies by Maj Gregory D. Nastrom and MSgt Louis D. Pell, March 2007, 15 pp. A forecast study focuses on particular weather phenomena (i.e. morning fog) for a point or region. It is aimed at developing forecast tools or methods based on empirical examination of a series of weather events. The forecast study is used in the same way as a forecast review, to work toward possible solutions to forecast problems (missed forecast) or to identify sound practices (good forecast). Normally, a forecast study should have one or more of the following objectives: to determine the reliability of centralized forecast guidance or techniques; to modify or refine existing forecast techniques; to try new or untried forecast procedures; or to develop new techniques.
