AD 645617

UNITED STATES ARMY COMBAT DEVELOPMENTS COMMAND

STUDY

ORGANIZATION FOR RADIOLOGICAL SURVEY 1965 - 1970

PHASE I: THE DIVISION

USACDCCBRA 64-8

MARCH 1965

JAN 18 1967

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DEPARTMENT OF THE ARMY
UNITED STATES ARMY COMBAT DEVELOPMENTS COMMAND
CHEMICAL-BIOLOGICAL-RADIOLOGICAL AGENCY
FORT MCCLELLAN, ALABAMA 36205

CAGCB-RR 16 July 1965

SUBJECT: Department of the Army Approval of Study, "Organization for Radiological Survey, 1965-1970, Phase I: The Division," USACDCCBRA 64-8

TO: See Distribution (Inclosure 1)

1. Reference is made to letter, CAGCB-RR, this Agency, 12 March 1965, subject: "Organization for Radiological Survey 1965-1970, Phase I: The Division, USACDCCBRA 64-8," with subject study attached.

2. Department of the Army approved the conclusions, findings, and recommendations of subject study on 7 May 1965. Comments and recommendations provided by DA together with USACDC clarifications are inclosed (Inclosure 2).

3. This correspondence should be permanently attached to subject study.

FOR THE COMMANDER:

WILLIAM J. HARRINGTON, JR.
Lt Colonel, CmlC
Executive Officer

2 Incl
1. Dist List
2. Extract of DA comments

EXTRACT OF DA COMMENTS ON PHASE I of USACDCCBRA 64-8 (From 1st Ind, FOR CM PP, Hqs, DA, OACSFOR, 7 May 65, to Letter, CDCCD-F, Hq, USACDC, 9 Apr 65, "Study, 'Organization for Radiological Survey, 1965-1970, Phase I: The Division (U),' USACDCCBRA 64-8").

"1. The Department of the Army has reviewed subject study. The following comment and recommendations are provided:

"a. The description of the AN/ADR-6 Aerial Radiac Set (page 4, para 4e) is inaccurate in that the description infers that the AN/ADR-6:

"(1) Will record incident dose rates automatically corrected to those one-meter above the ground. (It will only if equipped with an absolute altimeter.)

"(2) Will correlate dose rate/aircraft location automatically. (There is no provision for automatic correlation of aircraft location.)

"(3) Is capable of data telemetry to ground stations (if additional equipment is available.)"

USACDC response: As described in the DA-approved Military Characteristics for an Aerial Radiac Instrument System dated 25 July 1961, the AN/ADR-6 aerial radiac system will record incident dose rates. If the aircraft is equipped with an absolute altimeter, the system will record incident dose rates which have been automatically corrected to those one meter above the ground by means of input signals from the absolute altimeter. If the aircraft is equipped with a position-determining device and a data link, the system <u>may</u> automatically correlate dose-rate and position information and telemeter this information to ground based equipment provided an undue cost, complexity, or delay does not result from obtaining this capability. Otherwise, a compatible ground position record is manually generated in the aircraft. As described in the proposed QMR for an Aerial Radiac Instrument System now being staffed by this Command to replace

the above-mentioned MC's, the AN/ADR-6 aerial radiac system will organically include an absolute altimeter and thus will inherently possess the capability to record height-corrected dose rates. All other capabilities will be similar to those described above.

"b. It is recommended that:

"(1) Consideration be given to radiological equipment requirements in the airmobile division."

USACDC response: Radiological equipment requirements will be developed for the airmobile division as soon as the TOE's are approved.

"(2) The feasibility of mounting Aerial Radiac System AN/ADR-6 on Air Force recon aircraft be investigated."

USACDC response: This Command will investigate in a separate action the feasibility of this concept.

"(3) Action be taken to change the priority of the AN/ADR-6 program to Priority I. The study recommends (page 8, para 6a) that action be taken to assure accelerated development of the AN/ADR-6. While the development program currently carries a CDOG Priority II, it is being handled as expeditiously as possible. However, a CDOG change to Priority I could lend emphasis to the desire for early operational availability."

USACDC response: By letter, CDCMR-P, 8 June 1965, subject: "Change in Priority of CDOG Paragraph 1239a(19), Aerial Radiac Instrument System," this Command recommended to OCRD, DA, that the priority be changed from Priority II to Priority I.

"(4) The operational capabilities of the AN/ADR-6 be reconfirmed since other equipment will be required and in some cases developed before the AN/ADR-6 will be able to automatically transmit useful survey data to a ground station."

USACDC response: The operational capabilities of the AN/ADR-6 are currently envisioned to be as stated in the USACDC response to paragraph 1a above. On 8 June 1965, an additional 4-month contract was initiated with

North Americal Aviation (the prime contractor on the AN/ADR-6) to investigate the feasibility of several approaches to correlating automatically ground position and dose-rate data by the AN/ADR-6. The output of this study may result in an "add-on" to the AN/ADR-6.

"2. The Department of the Army approves the conclusions, findings and recommendations of subject study."

USACDC response: Noted.

UNITED STATES ARMY
COMBAT DEVELOPMENTS COMMAND
CHEMICAL-BIOLOGICAL-RADIOLOGICAL AGENCY
Fort McClellan, Alabama

CAGCB-RR 12 March 1965

SUBJECT: Organization for Radiological Survey 1965-1970, Phase I: The Division, USACDCCBRA 64-8

TO: See Distribution (Annex F of Inclosure)

Subject study is inclosed for your retention. The study was approved by U. S. Army Combat Developments Command on 17 November 1964.

FOR THE COMMANDER:

1 Incl
as

VERNON E DEHNER
Lt Col, CmlC
Executive Officer

ACKNOWLEDGEMENT

This Combat Developments Command Study was prepared in response to paragraph 1220oo, Combat Development Objectives Guide.

It will be used as approved guidance within the command for the preparation of future specific studies and the formulation of combat development objectives and concepts relative to US Army participation in radiological survey during the 1965-1970 period.

Conclusions and recommendations of the study are those of the Commanding General, United States Army Combat Developments Command, and are based upon information gathered, and analysis performed, primarily by the U. S. Army Combat Developments Command CBR Agency of the U. S. Army Combat Developments Command Combined Arms Group.

ORGANIZATION FOR RADIOLOGICAL SURVEY, 1965-1970

PHASE I: THE DIVISION

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ABSTRACT

The organizational and operational concepts of radiological survey in Army divisions are reviewed in order to determine what changes are necessary in the 1965-1970 time frame in light of ROAD-65. The relative merits of aerial and ground radiological survey methods are investigated from standpoints of accuracy, responsiveness, and equipment. The impact of developmental radiac equipment on organizational and operational concepts for survey is analyzed. The manning level of the division CBRE and communications required to support radiological survey are investigated. Distribution of radiac survey instruments in DA-approved ROAD TOE's is reviewed for adequacy and changes are suggested as appropriate.

SUMMARY

This study reviews the organization and operational concepts of radiological survey in Army divisions in order to determine what changes are necessary in the 1965-1970 time frame in light of ROAD-65.

In order to be properly responsive to ROAD requirements, it is concluded that aerial survey--with its speed and simplicity of communications--must be the primary means of radiological survey in the division, but that the capability for ground survey should be retained. The present aerial survey instruments and procedures must be replaced with the automated AN/ADR-6 system (scheduled to become operational in 1967) for use in manned and unmanned aircraft if the requirements for accurate and timely radiological information in the division zone of interest are to be met. A proposed distribution of this system to ROAD units is presented.

The need for rapid transmission of contamination charts from division to major subordinate headquarters can be filled by authorization of facsimile or telautograph devices.

The organization for radiological monitoring and survey in the division appears to be adequate. All units perform monitoring and can provide teams for survey; reconnaissance and observation units have an assigned capability for radiological monitoring and survey. It is believed that communications planned for ROAD can support the proposed radiological monitoring and survey procedures.

The current distribution of radiac monitoring and survey instruments in DA-approved ROAD TOE's is reviewed. Changes are recommended to correct both serious and minor deficiencies.

ORGANIZATION FOR RADIOLOGICAL SURVEY 1965-1970, PHASE I: THE DIVISION

1. PROBLEM: To review and develop as appropriate organizational and operational concepts, capabilities, materiel requirements, and communications requirements for radiological survey, to include broad concepts for surveying enemy territory by reorganized Army units in a theater of operations.

2. ASSUMPTIONS:

a. Tactical nuclear weapons will be used by friendly and/or enemy forces in future wars.

b. When tactical nuclear weapons are used, accidental and/or deliberate fallout-producing nuclear bursts will occur.

c. Radiological monitoring and survey information will continue to be a required input for the overall radiological intelligence collection effort.

d. U. S. Army division, corps, and field army organization and tactical operations will be as envisioned in the ROAD-65 and RODAC-70 studies during the time frame of interest.

e. Combat service support to the U. S. Army will be as envisioned in the CO-STAR II study and as modified by TASTA-70 during the time frame of interest.

f. Army aerial platforms will assume increased responsibility for forward area surveillance during the time frame of interest.

3. FACTS BEARING ON THE PROBLEM:

a. Surface and subsurface bursts of nuclear weapons will produce areas of significant radioactive fallout.

b. Persons receiving large doses of nuclear radiation will become casualties.

c. In order to conserve and maximize fighting strength, the commander and his staff must be furnished radiation hazard information at the earliest possible time as a consideration to be weighed in making both plans and decisions.

4. DISCUSSION:

a. General. A previous study by the US Army Chemical Corps Field Requirements Agency, CMLCD 57-3, "Organization for

Radiological Survey," dated January 1958,[1/] treated the problem of the present study in the light of the 1960-1965 time frame. Many of the recommendations of that study have been implemented. Troop tests, common use, and advancing knowledge and technology have brought about some modifications; yet it seems appropriate that the doctrine and requirements for radiological survey should now be reviewed for Army divisions in the 1965-1970 time frame, particularly in view of the ROAD organization and concept of operations.[2, 3/] Phases II and III of this study, both to be produced later, will consider organization for radiological survey for the corps and field army, and for the communications zone, respectively.

b. As discussed in Annex B, the ROAD divisions do not differ radically from the PENTOMIC organization as far as radiological survey and monitoring are concerned. The use of three tactical brigade headquarters, which can be tailored with appropriate types and numbers of battalions, closely resembles that of the combat commands in the PENTOMIC armored division. ROAD operational concepts are characterized by mobility, fast reaction time, fire power, dispersion, and capability for sustained operations, all accentuated beyond the corresponding PENTOMIC concepts.

c. The Chemical, Biological, and Radiological Element (CBRE), physically located in the Tactical Operations Center(TOC) at division headquarters, is that portion of the division chemical section which processes and disseminates radiological (as well as chemical and biological) information in a usable form. Since present fallout prediction methods do not give a picture of the actual radiological contamination on the ground, radiological monitoring reports for occupied areas and radiological survey reports for those areas not occupied are required for the preparation of a useful radiological contamination chart showing dose rate contours. Radiological monitoring is performed by all units operating in a radiological environment. Certain organizations within the division, established by TOE for reconnaissance, are particularly concerned with radiological survey. Survey teams in general, however, are not fixed or established by TOE or TD; they are selected and equipped from units of the division according to SOP's. Thus the organization for radiological monitoring and survey is flexible and can be adapted to any division organization. Operational concepts of current doctrine, on the other hand, must be evaluated to insure that radiological information will be provided with the speed, accuracy, and detail required by divisions under the ROAD concept in the 1965-1970 time frame.

d. Ground survey, discussed in detail in Annex B, is one means used to secure radiological contamination information necessary for the production of contamination charts.

(1) Such a survey can be conducted by vehicle or on foot according to SOP, using personnel, radios, and radiacmeters organic to a unit. Analysis of the distribution of the monitor and survey radiacmeter IM-174/PD in ROAD divisions (discussed in Annex C) indicates a fully adequate supply of radiacmeters in the division from a standpoint of ground survey. During the time frame of interest, the AN/VDR-1 Radiac Set is scheduled to replace the IM-174/PD for ground and vehicular survey.

(2) Ground surveys are conducted by either a centralized or a decentralized control system. According to doctrine, the CBRE controls the survey party and receives survey reports directly in the preferred centralized control system.[4] In the decentralized control system, which uses local control parties, reports are submitted through the chain of command, heavily loading the command communications nets. (The staff procedures for this system are illustrated in Appendix I to Annex B).

(3) Ground survey can be performed by day or night in almost any weather and produces detailed, accurate data. A ground survey capability is essential since aerial survey may not always be possible or even practical for accurate, detailed results that might be required. However, ground survey is an extremely slow means of collecting data and requires time-consuming planning and coordination, both inconsistent with the requirement for timely radiological contamination information. Further, this method of survey diverts key personnel--as well as equipment--from their primary mission and materially reduces their remaining radiation service.

(4) In view of the above, it is believed that the capability for ground survey is essential but that its use is justified only when the special capabilities peculiar to ground survey are required, or when aerial survey is impractical or impossible.

e. Aerial survey is the other survey technique used to secure radiological contamination information. This type of survey is discussed at length in Annex B.

(1) The division currently has a capability for aerial survey, but this capability is limited because the IM-174/PD radiacmeter is not well suited for aerial use. To maintain even this capability, however, one instrument must be distributed for every two observation and surveillance aircraft likely to be employed for radiological survey missions. With this concept in mind, an analysis of the ROAD distribution of the IM-174/PD for aerial survey indicates deficiencies which require correction (see Annex C). Communication of survey data collected using the IM-174/PD will be made directly to the CBRE through the area communications system. [5]

(2) As discussed in Annex B, aerial survey is an extremely rapid means of collecting radiological contamination data, and it shows promise for still more speed with application of technological developments. It has capabilities for large area survey, including enemy-controlled territory, and requires a minimum of organization and coordination. Aerial surveys, however, will probably always be less detailed than ground surveys. Manned aerial surveys are limited at night or in unfavorable weather, and they currently place demands for constant speed and ground clearance flying upon the pilot. In addition, the present radiacmeter has a very slow response time and, since its operation requires a monitor, cannot be employed in unmanned aircraft.

(3) In response to the requirement for improvement of the present aerial survey capability, the AN/ADR-6 aerial radiac set is being developed by the U. S. Army. Scheduled to become operational in Fiscal Year 1967,[6] this instrument will provide a more rapidly responsive and accurate capability in line with ROAD requirements. The AN/ADR-6 is a rapid-response radiacmeter which can record incident dose rates automatically corrected to those one meter above the ground and correlated with aircraft locations. A telemetry output is provided so that data may be telemetered to a ground station if the aircraft is equipped with a data link. This system will thus allow more accurate correlation of aircraft position with ground dose rate and will remove speed, altitude, and course restrictions on manned flights, increasing survivability of the aircraft forward of the FEBA. When the development of the drone navigational and flight control system has been completed, the new aerial radiac set can be employed in division drones, so that highly trained personnel are not risked. Aerial survey data can be telemetered to the aerial surveillance and target acquisition platoon of the aviation general support company and thence can be transmitted to division TOC using the division intelligence radio-teletype net.[5] Coordinated development of Army aircraft (including drones) and the aerial radiac system will provide a low-cost capability for nearly all Army aircraft to accept the AN/ADR-6 on a mission basis by "plug-in" arrangement.[6] This capability will greatly improve the flexibility of both the aircraft and the radiac system. In Annex C, this capability was assumed in recommending a basis of issue for the aerial radiac system. Twenty systems were recommended for each armored, infantry, and mechanized division; 18 for each airborne division. Staff procedures for aerial survey with this system are suggested in Appendix I to Annex B.

(4) Even with the present equipment and doctrine,[4] aerial survey has distinct advantages over ground survey in speed and simplicity of organization and communication. In addition, key personnel and equipment do not have to be removed from their

primary mission in combat units. The matter of speed is not a simple advantage; there is a requirement for radiological information to be available as fast as possible in order to meet the concepts of ROAD. Consequently, it is believed that aerial survey should be used for the delineation of all radiological contamination areas except in emergency or when extreme detail is required. It is recognized that a capability for ground survey must be maintained, but it should play an ever-decreasing role in radiological survey.

f. Radiological monitoring.

(1) Monitoring reports warn the unit and the command of radiological hazard and assist the CBRE in delineating the dose rate contours on a contamination chart (see Annex B).

(a) With few exceptions, DA-approved ROAD TOE's provide adequate distribution of IM-174/PD's for monitoring (see Annex C). In particular, the aviation battalion headquarters and headquarters detachment (armored, infantry, and mechanized divisions) and the airborne division supply and service company were overlooked in the distribution and each should be authorized one IM-174/PD.

(b) As seen in Annex B, FM 3-12 4/ prescribes only two monitor reports after contact with fallout: the initial contact report and the peak dose rate report. Local SOP's however, may require one or more intermediate reports. Communication channels for monitor reports are discussed in Annex C. The presence of two command headquarters between company and division in ROAD will slow reporting. At intermediate headquarters, users should examine these reports and rapidly pass them on after extracting pertinent data. This system should be tested in command post and field exercises under ROAD organization.

(2) Annex C examines the DA-approved TOE distribution of the special monitoring instrument for low dose rate beta-gamma radiation and that for alpha radiation.

(a) Monitoring of food, personnel, equipment, and water requires the ability to detect low levels of radiation. The radiac set AN/PDR-27J provides this capability. Annex C shows several deficiencies in the TOE distribution of this instrument for ROAD-65. In particular, engineer water points and most battalion medical sections (platoons) have not been authorized the AN/PDR-27J. Water points require this instrument for the monitoring of water for beta and gamma contamination, and medical sections should be authorized the AN/PDR-27J since casualties handled by battalion medical personnel can be expected to be radiologically contaminated, and contaminated equipment handled and facilities occupied over long periods of time can present a beta burn hazard. Additionally, one AN/PDR-27J should be provided to each combat

and combat support company-size unit, to enable the unit to monitor old contamination areas for unit occupancy and to monitor personnel and critical supplies.

(b) Alpha contamination is not a tactical hazard, but it may become a political problem in friendly countries. One AN/PDR-60 alpha instrument set at division chemical section will provide a full and adequate capability for the division in this area. There is no requirement for the current authorization of one set in the tank battalion of the airborne division.

(3) During the 1965-1970 time period (September 1968), the AN/VDR-1 Radiac Set is scheduled to replace both the IM-174/PD for area monitoring (as well as ground and vehicular survey) and the AN/PDR-27J for monitoring of food, water, personnel, and equipment. 7/ As discussed in Annex C, this dual replacement should result in considerable production and logistics savings.

g. The CBRE provides a capability for integrating and processing radiological (as well as chemical and biological) information.

(1) A troop test and field exercises have shown that CBRE's (formerly CBRC's) lack a sustained twenty-four-hour-day operating capability; the troop test states a requirement for two teams to provide this capability. 8/ In Annex B, it is pointed out that under ROAD concepts, the CBRE will continue to require augmentation by a CBR Center Team (Team JA, TOE 3-500E) to provide the required sustained operating capability.

(2) It should be emphasized that the CBRE is expected to have a capability to deal with chemical and biological situations. Cross-training of CBRE personnel is essential in "C, B, and R" as well as cross-training within the various functions of the element. The terms "Radl Cen," "Radl Computer," and "Radl Plotter" used in the approved ROAD TOE's would seem more accurate if changed to "CBRE," "CBR Computer," and "CBR Plotter," respectively.

(3) There is a requirement for rapid transfer of finished radiological (and also chemical and biological) contamination charts from the CBRE to higher headquarters and to major subordinate headquarters of the division. Facsimile or telautograph devices would fill the requirement.

h. Radiological survey of enemy-held territory is included in the requirement for survey of unoccupied areas of operational interest to the division. Broad concepts for enemy-territory survey are discussed in Annex D.

(1) The optimum system would appear to consist of the forthcoming AN/ADR-6 aerial radiac system mounted in a drone

equipped with telemetry. This system would offer a full capability for surveying enemy-controlled territory of interest to the division. In the event of loss through enemy action, no highly trained personnel would be lost.

(2) In special situations, clandestine foot patrols may be necessary to obtain specific, limited information along routes or at specific points, for example.

(3) Present capability for survey of enemy-controlled territory is limited to aerial survey by manned aircraft and ground survey by foot patrols and vehicles using the IM-174/PD radiacmeter. Vehicular survey of enemy territory will probably be restricted to "reconnaissance in force" types of missions.

5. CONCLUSIONS AND FINDINGS:

a. Aerial survey should be the routine method of radiological survey in the division.

b. The current capability for aerial survey is not adequate for the ROAD divisions during the 1965-1970 time frame.

c. There is an urgent requirement for the rapid completion of the AN/ADR-6 aerial radiac instrument system now under development.

d. All developmental Army observation, surveillance, and utility aircraft, both manned and unmanned, should be designed and equipped to receive the new aerial radiac system by a "plug-in" arrangement.

e. Twenty AN/ADR-6 radiac sets are required for distribution to each armored, infantry, and mechanized division; 18 are required for each airborne division.

f. Although it would be desirable to have a facsimile or telautographic system linking division TOC with certain subordinate units, to provide rapid transmission of pictorial radiological contamination charts, the division radiological survey system alone cannot justify such a system. The overall requirement should be determined in the Army Requirement for Tactical Communications (TACOM) study.

g. The capability for ground radiological survey must be retained for use in special situations requiring detailed results and for situations in which it is impractical or impossible to employ aerial survey.

h. The term "Radl Cen" (as well as "Radl Computer" and "Radl Plotter") used in approved ROAD TOE's does not properly reflect the chemical and biological aspects of this organization's mission.

i. Organization for radiological survey in the division is adequate. All units are capable of monitoring, and ground radiological survey can be assigned as an additional duty.

j. Numerical distribution of instruments for the purpose of ground radiological survey is fully adequate; for the purposes of aerial survey and radiological monitoring it is inadequate in several instances.

k. Monitor reporting under the FM 3-12 concept should be within the capabilities of currently planned communications.

l. The capability to perform radiological survey over enemy territory is dependent upon the development of navigational and flight control systems for drones and on the availability of the AN/ADR-6 aerial radiac instrument system.

6. RECOMMENDATIONS: It is recommended that:

a. Action be taken to insure the accelerated completion of the AN/ADR-6 aerial radiac instrument system.

b. Action be taken to insure coordination of the development of Army aircraft, both manned and unmanned, with that of the AN/ADR-6 aerial radiac system in order to insure that any applicable aircraft can accept the radiac sensor on a mission basis (by "plug-in" arrangement).

c. The recommended basis of issue of the AN/ADR-6 aerial radiac set be approved and included in applicable ROAD TOE's.

d. The term "Radl" used in approved ROAD TOE's (division chemical section) be changed to read "CBR" and the term "Radl Cen" be changed to read "CBRE."

e. The changes in radiac instrument distribution recommended in Annex C of the study be included in ROAD TOE's.

f. The compatibility of radiological monitoring and survey procedures with ROAD communication systems be made an objective of a major field exercise.

ANNEX A

STUDY DIRECTIVE

HEADQUARTERS
UNITED STATES ARMY COMBAT DEVELOPMENTS COMMAND
FORT BELVOIR, VIRGINIA

CDCCD-F 30 October 1963 *

SUBJECT: Combat Development Study Directive: USACDCCBRA 64-8, "Organization for Radiological Survey, 1965-1970 (U)"

TO: Commanding General
US Army Combat Developments Command
Combined Arms Group
Fort Leavenworth, Kansas

1. General: Request that a study be undertaken which will develop "Organization for Radiological Survey, 1965-1970 (U)" in consonance with the general objectives stated in paragraphs 1110b (8)(h), 1210a(3), and 1211b(3) of the Combat Development Objectives Guide.

2. Objective and Scope: To review and develop as appropriate, organizational and operational concepts, capabilities, materiel requirements, and communications requirements for radiological survey, to include broad concepts for surveying enemy territory, by reorganized Army units in a theater of operations, The study will be conducted in three phases: Phase I, for the Division, based on ROAD-65 organizational and operational concepts; Phase II, for the Corps and Field Army, based on RODAC organizational structure; Phase III, for the communications zone, based on the reorganization structure of the communications zone.

3. References:

a. Letter, CDCCD-F, Headquarters, US Army Combat Developments Command, 14 August 1963, subject: "Study Project USACDCCBRA 64-8, 'Organization for Radiological Survey, 1965-1970 (U)'," with 1st Ind, UNCLASSIFIED.

* As changed by Letter, CDCCD-F, HQ, USACDC, 8 November 1963, subject as above.

b. Final Report CMLCD 57-3, "Organization for Radiological Survey (U)," US Army Chemical Corps Field Requirements Agency, January 1958, CONFIDENTIAL.

c. Final Draft Study CMLCD 59-8, "Communications Requirements for Radiological Monitoring and Survey (U)," US Army CmlC Field Requirements Agency, December 1960, SECRET.

d. Letter, CMLMO-CD, Office of the Chief Chemical Officer, DA, 13 March 1961, subject: "Termination of Project CMLCD 59-8, 'Communication Requirements for Radiological Monitoring and Survey (U)'," UNCLASSIFIED.

e. Study, "Reorganization Objective Army Divisions 1965 (ROAD-65) (U)," USCONARC, 1 March 1961, SECRET.

f. Study, "Reorganization Objective Army Divisions 1965 (ROAD-65), Airborne Division (U)," USCONARC, 15 May 1961, SECRET.

g. Study, "Field Army Requirements for Air Reconnaissance and Aerial Surveillance (U)," US Army Combat Developments Command, May 1963, SECRET-NOFORN.

h. Final Draft Study, "Field Army Aerial Surveillance Systems Requirements (U)," US Army Combat Developments Command Combined Arms Agency, May 1963, SECRET-NOFORN.

i. POIR-2242, Operation Sun Beam, Shot Small Boy, Project 7.6, "Feasibility Evaluation of an Aerial Radiac Survey System (U)," US Army Electronic Proving Ground, November 1962, SECRET-RESTRICTED DATA.

j. POIR-2243, Operation Sun Beam, Shot Small Boy, Project 7.6.1, "Evaluation of Aerial Radiac Monitor Systems for Interim Tripartite Standardization (U)," US Army Electronic Proving Ground, September 1962, SECRET-RESTRICTED DATA.

k. DA-Approved Tables of Organization and Equipment, ROAD Infantry, Mechanized Infantry, and Armored Divisions, 15 July 1963, UNCLASSIFIED.

l. DA FM 30-20, "Aerial Surveillance-Reconnaissance, Field Army," 12 September 1961, UNCLASSIFIED.

m. Report of Test, "Light Observation Helicopter versus Fixed-Wing Aircraft Experiment, "US Army Combat Developments Command Experimentation Center, 25 June 1963, FOR OFFICIAL USE ONLY.

n. Draft Study, "Light Observation Helicopter (LOH) Program (U)," US Army Combat Developments Command Aviation Agency, July 1963, SECRET.

o. Final Study, "CO-STAR II (2nd Rev) (U)," US Army Combat Developments Command Combat Service Support Group, undated, FOR OFFICIAL USE ONLY.

p. Final Draft Study CMLCD 59-16, "Application of Automatic Data Processing System(s) (ADPS) to Chemical Corps Field Activities; Phase II, Part 3B, Radiological Contamination Charting Systems Analysis," US Army Combat Developments Command Chemical-Biological-Radiological Agency, December 1962, UNCLASSIFIED.

q. USACGSC Project, "Command Control Information Systems, 1970 (CCIS-70)," Office, Deputy Chief of Staff for Military Operations, 1 December 1961, CONFIDENTIAL.

r. Final Draft Study CBRCD 63-14, "Marking of CBR Contaminated Areas," US Army Combat Developments Command Chemical-Biological-Radiological Agency, July 1963, UNCLASSIFIED.

s. "Long Range Technological Forecast - 1963 - Part Two (U)," Office of the Chief of Research and Development, SECRET-NOFORN-RESTRICTED DATA.

t. Study, "The Army Force Development Plan, 1964-1983 (U)," Office of Assistant Chief of Staff for Force Development, DA, April 1963, SECRET-NOFORN.

u. Draft Proposed QMDO for Field Army Long-Range Aerial Surveillance System (U), US Army Combat Developments Command Combined Arms Agency, June 1963, CONFIDENTIAL.

v. Draft Proposed QMR for High Performance Unmanned Aerial Surveillance and Target Acquisition System (U) (Interim), US Army Combat Developments Command Combined Arms Agency, 24 April 1963, CONFIDENTIAL.

w. Draft Proposed QMR for High Performance Unmanned Aerial Surveillance and Target Acquisition System (U), US Army Combat Developments Command Combined Arms Agency, May 1963, CONFIDENTIAL.

x. Draft Proposed QMR for High Performance Manned Aircraft for Field Army Aerial Surveillance and Target Acquisition (U), US Army Combat Developments Command Combined Arms Agency, May 1963, CONFIDENTIAL.

y. Draft Proposed QMR for the Operational System of the Field Army Command Control Information Systems, US Army Combat Developments Command Combined Arms Agency, 29 October 1962, UNCLASSIFIED.

z. Draft Proposed QMR for an Intelligence Subsystem of the Command Control Information System (CCIS), US Army Combat Developments Command Intelligence Agency, 4 April 1963, UNCLASSIFIED.

aa. Final Draft - 1st Revision, "Reorganization Objectives, Division, Army and Corps - 1970 (U) (RODAC-70)," US Army Combat Developments Command Combined Arms Agency, 31 August 1963, SECRET-NOFORN-RESTRICTED DATA.

ab. Final Draft Study CAG 63-2, "Visualization of the RODAC Battlefield (VORB) (U)," US Army Combat Developments Command Combined Arms Agency, 15 April 1963, SECRET-NOFORN-RESTRICTED DATA.

ac. DA FM 101-5, "Staff Officers Field Manual, Staff Organization and Procedure," July 1960, UNCLASSIFIED.

ad. DA FM 3-12, "Operational Aspects of Radiological Defense," January 1963, with Draft Change 1, US Army Combat Developments Command Chemical-Biological-Radiological Agency, UNCLASSIFIED.

ae. STANAG No. 2103, "Reporting Nuclear Detonations, Radioactive Fallout, and Biological and Chemical Attacks," 3 May 1963, UNCLASSIFIED.

af. Exercise MAJOR DOMO, Draft General Plan of Test, Evaluation Test - AN/MSQ-19, US Army Combat Developments Command Combined Arms Agency, May 1963, UNCLASSIFIED.

ag. Conceptual Framework, "The Administrative Support, Theater Army 1965-1970 (TASTA-70)," US Army Combat Developments Command Combat Service Support Group, June 1963, FOR OFFICIAL USE ONLY.

ah. DA TC 101-2, "Tactical Operations Centers," 25 May 1960, UNCLASSIFIED.

4. <u>Assumptions</u>.

a. Tactical nuclear weapons will be used by friendly and/or enemy forces in future wars.

b. When tactical nuclear weapons are used, accidental and/or deliberate fallout-producing nuclear bursts will occur.

c. Radiological monitoring and survey information will continue to be a required input for the overall radiological intelligence collection effort.

d. US Army division, corps, and field army organization and tactical operations will be as envisioned in the ROAD-65 and RODAC-70 studies during the time frame of interest.

e. Combat service support to the US Army will be as envisioned in the CO-STAR II study and as modified by TASTA-70 during the time frame of interest.

f. Army aerial platforms will assume increased responsibility for forward area surveillance during the time frame of interest.

5. Guidance: In accordance with reference 3a, the requirements for Phase I of USACDCCBRA 64-8 will be satisfied by updating the final report of CMLCD 61-1, "Organization for Radiological Survey - Phase I: The Division," US Army Chemical Corps Field Requirements Agency, April 1962, which was submitted in response to an earlier requirement. Unless substantial conceptual changes in this document are required, it will not be necessary to re-coordinate a draft of Phase I.

6. Administration:

a. Coordination: Informal coordination and consultation with appropriate agencies and/or organizations within the Department of the Army which may contribute to this study are authorized. In addition, formal coordination of the initial draft study (with possible exception of Phase I - see paragraph 5) will be accomplished with the following agencies or organizations:

(1) US Army Combat Developments Command Combat Service Support Group.

(2) US Army Electronics Research and Development Laboratory.

(3) US Army Chemical Center and School

(4) US Army Combat Developments Command Nuclear Group.

CDCCD-F 30 October 1963

SUBJECT: Combat Development Study Directive: USACDCCBRA 64-8 "Organization for Radiological Survey, 1965-1970 (U)"

(5) US Army Combat Developments Command Command Control Information System Group.

b. Suspense dates: Target completion dates are as follows:

Phase I	(An updating of CMLCD 61-1, Phase I) Final Draft (updated):	29 February 1964
Phase II	Initial Draft:	13 March 1964
	Final Draft:	13 May 1964
Phase III	Initial Draft:	15 March 1965
	Final Draft:	15 May 1965

c. Distribution: A recommended distribution list for the final report will be submitted with the final draft study.

7. This project is assigned Project No. USACDCCBRA 64-8 and appears in paragraph 1220oo of the CDOG.

FOR THE COMMANDER:

/s/ Lewis V. Edner
/t/ LEWIS V. EDNER
Major, QMC
Asst Dir, Pers & Orders

DISTRIBUTION:
K

CAGO-S (30 Oct 63) 1st Ind
SUBJECT: Combat Development Study Directive: USACDCCBRA 64-8, "Organization for Radiological Survey, 1965-1970 (U)"

HQ, U. S. Army Combat Developments Command Combined Arms Group, Fort Leavenworth, Kansas 66027, 6 Nov 1963 *

TO: Commanding Officer, U. S. Army Combat Developments Command Chemical-Biological-Radiological Agency, Fort McClellan, Alabama

1. In addition to the coordination shown in inclosed study directive for Phase II and III, it is requested that formal coordination be accomplished with the following U. S. Army Combat Developments Combined Arms Group Agencies:

USA Combat Developments Command Infantry Agency
USA Combat Developments Command Engineer Agency
USA Combat Developments Command Communications-Electronics Agency
USA Combat Developments Command Combined Arms Agency
USA Combat Developments Command Aviation Agency
USA Combat Developments Command Intelligence Agency

2. It is requested that the Chemical-Biological-Radiological Agency undertake the action required in the inclosed study directive, and that final draft reach this headquarters not later than the dates shown below:

Phase I	13 February 1964
Phase II	27 April 1964
Phase III	15 April 1965

FOR THE COMMANDER:

/s/ William W. Cozad
/t/ WILLIAM W. COZAD
Lt Colonel, GS
Adjutant

* As changed by 1st Indorsement, CAGO-S, HQ, USACDCCAG, 15 November 1963 to Letter, CDCCD-F, HQ, USACDC, 8 November 1963, subject as above, and by Letter, CAGO-S, HQ, USACDCCAG, 2 December 1963, subject as above.

ANNEX B

ORGANIZATIONAL AND OPERATIONAL REQUIREMENTS FOR RADIOLOGICAL SURVEY

1. Introduction. It is the purpose of this annex to analyze the organizational and operational concepts for radiological survey in the 1965-1970 time frame. The ROAD organization and concept of operations, particularly the changes involved in transition from the PENTOMIC organization, have immediate bearing on the problem. Current doctrine for radiological survey-- to include area monitoring-- will be studied to determine what changes are necessary to satisfy the requirements of both ROAD and the time frame of interest.

2. Organization and Operational Concepts, ROAD. [2,3] As far as radiological survey and area monitoring are concerned, the ROAD divisions do not differ radically from those of the PENTOMIC concept. Division organizations under both concepts are intended to be capable of fighting both nuclear and non-nuclear war, and both give high priority to firepower, mobility, and dispersion. Certain changes, however, appear to have definite bearing on the analysis to follow:

a. ROAD divisions interpose two command headquarters between company and division rather than one, thereby improving the span of control but increasing the reaction time for communication (both directions) through the chain of command.

b. Brigades are tactical headquarters and have no fixed number of battalions; rather they are tailored with the number and type of battalions required for the mission.

c. Department of the Army approved TOE's provide for a chemical staff officer at brigade headquarters and a chemical non-commissioned officer at battalion headquarters. (In addition to the chemical staff officer, airborne and infantry brigade headquarters are authorized one chemical NCO.)

d. It is envisioned that dispersion will be between battalions. Mobility will provide units the ability to mass rapidly when required and then re-disperse.

e. The reserve may often be employed as a striking force.

3. Radiological Contamination Information: Since the ROAD division must be prepared to operate effectively in a radiological environment, accurate radiological intelligence must be continuously available to the division commander and his staff. Evaluation of the impact of a radiological hazard on tactical operations

will be mandatory for continued effectiveness and, in many cases, for survival. The availability of accurate and timely radiological information will permit the division to avoid contaminated areas when possible, compute accurate stay times for contaminated areas which must be entered, and select routes which result in the lowest possible dose commensurate with the mission. Radiological information can be divided into three broad categories: fallout prediction, radiological monitoring, and radiological survey.

a. Fallout prediction[9] is of two types: pre-strike and post-strike. Post-strike predictions involve fewer uncertainties than pre-strike; nevertheless, both types of prediction are estimates of the location of fallout contamination. The present reliability of meteorological data and knowledge of the mechanism of fallout do not allow accurate theoretical determination of dose rate contours. Fallout prediction is necessary for planning and warning, but it cannot fulfill the requirement for definitive contamination information on specific areas.

b. Radiological monitoring is a function performed by all units when operating in a radiological environment and does not significantly interfere with the primary mission of the unit. The purpose of monitoring is to give warning of a radiological hazard and to keep the unit commander informed of the degree of hazard present in the unit area. Monitor reports are also a necessary input to the division's radiological intelligence collection effort. These reports are the basis for warning the command; they also provide a picture of the hazard present in the occupied areas of the division zone and reduce the requirement for survey. (Radiological monitoring, in its broad sense, also includes the determination of radiological contamination on personnel, equipment, supplies, or facilities, which involves a much lower level of radioactivity than that in a contaminated area.)

c. Radiological survey is an organized effort to obtain radiological contamination information regarding specific areas. It is concerned primarily with areas of operational interest to the division which are not occupied by friendly units, and includes areas in enemy territory or under enemy control.

4. Radiological Survey.

a. The current organization for radiological survey is set forth in DA FM 3-12, "Operational aspects of Radiological Defense."[4] This organization is not fixed by TOE or TD. Survey teams and parties are organized as required, using available unit personnel and equipment. Unit SOP's usually prescribe which personnel and items of equipment will be employed for radiological survey. Thus, the current organization for radiological survey is flexible and can be adapted to any division organization.

b. The more important problem, then, is not to develop an organization for radiological survey, but rather to analyze current doctrine and procedure to determine if they will satisfy the operational requirements of the ROAD divisions in the 1965-1970 time frame. Questions that must be answered are: What are the advantages and disadvantages of current procedures, and will they furnish accurate information to the using agency (CBRE) fast enough? To be of tactical value, radiological survey data, like all intelligence data, must conform to the following requirements:

(1) Be timely. Data must arrive at the CBRE in a usable form with the least possible delay.

(2) Be accurate. Inaccurate data will cause confusion and delay.

(3) Be obtainable with reasonable effort. The collection effort should not limit the tactical efficiency of combat units or materially degrade the primary mission performance of other units.

5. Survey Doctrine. Current doctrine for radiological survey includes two principal techniques: ground survey and aerial survey. A description of the detailed procedures for conducting radiological surveys is not included in this annex, since the subject is adequately documented. 4/ However, the advantages and disadvantages of each technique will be considered in order to determine the changes desirable and/or necessary.

6. Ground Survey.

a. The following appear to be the major advantages and disadvantages of ground survey:

(1) Advantages:

(a) Can be accomplished by day or night.

(b) Can be accomplished in almost all weather conditions.

(c) Produces relatively detailed, accurate data including delineation of "hot spots."

(2) Disadvantages:

(a) Generation of data is slow.

(b) Transmission of reports may overload available communications circuits.

(c) Operation of survey parties diverts personnel and equipment--communication devices, vehicles, and radiacmeters--from the primary mission of the unit.

(d) The remaining radiation service of members of the survey party is materially reduced (no shielding is available unless personnel are mounted in wheeled or armored vehicles);

(e) Survey teams will not always be available. The tactical situation may preclude their use.

(f) Maximum coordination through command channels is required to initiate and complete an effective survey.

(g) Rate of survey is largely dependent on trafficability of the area.

(h) Areas which can be surveyed are limited; terrain barriers, mined areas, and areas under enemy surveillance or control may not permit conduct of ground survey.

b. A comparison of the advantages and disadvantages of the ground radiological survey technique shows many serious disadvantages and few advantages. Some of these factors merit further consideration.

(1) Liaison with the U. S. Army Infantry School revealed that platoon sergeants are habitually assigned the additional duty of radiological monitor in order to assure reliable radiological survey team performance. 10/ Although this study does not recommend such use of platoon sergeants, the fact remains that critical personnel and equipment are diverted from their primary duties for the effective conduct of ground radiological surveys. It would appear that only reserve units should be expected to furnish survey parties. Yet units in reserve may have to be committed on short notice, or may even conventionally have the role of striking force. Logically, survey parties should come from the units in closest proximity to the area to be surveyed, providing their primary mission can be maintained. Nevertheless, a significant reduction of key personnel, vehicles, and communication equipment even for short periods, will seriously limit the tactical efficiency of the division under the ROAD operational concept.

(2) Communications will be a serious limitation in the conduct of ground surveys. Present doctrine states that radiological surveys will be controlled by either a centralized or a decentralized control system, and that the centralized system is preferred. 4/ In the centralized system, survey teams report directly to the CBRE, whereas in the decentralized system, control is maintained at a headquarters subordinate to that ordering the survey and this subordinate headquarters relays data to the CBRE.

According to FM 3-12, reporting procedures for survey data in the preferred centralized system are as follows in order of preference: 4/

(a) Radio communication direct from the survey party to the CBRE. This method provides timely data and flexible control but depends on availability of radios, nets, and the distances involved.

(b) Radio communication from the survey party to the nearest area communications center and then to the CBRE, again depending on the availablility of radios or access facilities.

(c) Survey party physically proceeds to the nearest unit and uses its facilities to report through the area communications center to the CBRE.

(d) Survey party physically proceeds to the nearest area communications center and reports by available means to the CBRE.

(e) Survey party delivers data to the CBRE. In the case of the decentralized control system, reporting will usually be through command channels. In either system, then, survey data will impose a communications load, removing communication equipment from its principal service. If data must be relayed instead of transmitted directly, the collection effort is materially slowed; and if communication equipments are not available, generation of radiological intelligence will be extremely slow and incompatible with ROAD operational concepts.

(3) There will be a considerable delay between the time a decision is made at division headquarters to conduct a ground radiological survey and the time survey data arrive at the CBRE. The steps required to obtain radiological survey information by using ground survey are shown in Appendix I to this annex in order to give an idea of the complex planning and coordination required for effective survey. This planning process imposes an additional communications load.

c. Even if the system functions perfectly, and this is not likely in a combat situation, the conduct of ground radiological surveys will be a complicated and time-consuming operation. The diversion of combat troops and equipment from their primary duty, the load on communications, and the inherent slowness involved in ground surveys render them impractical except in emergency or very special situations.

d. The ultimate instrument desired for ground radiological survey during the 1965-1970 time frame is the AN/VDR-1 radiac set. This instrument is now being developed to satisfy both the

approved military characteristics for the Tactical Survey Meter and Vehicular Radiac System and the recently deleted military characteristics for the Tactical Monitoring Instrument. Thus, the AN/VDR-1 will replace both the IM-174/PD (the Standard-A area survey meter) and the AN/PDR-27J (the Standard-A low-range beta and gamma monitoring set). Particulars of these instruments are presented in Annex C. Service test models of the AN/VDR-1 are anticipated in Fiscal Year 1967, and this radiac set should be available in the field by September 1968. Meanwhile, the IM-174/PD will be used for vehicular and dismounted radiological survey.

7. Aerial Survey:

a. The following appear to be the current major advantages and disadvantages of aerial survey:

(1) Advantages:

(a) Produces data rapidly.

(b) Generates only a small communications load and requires a minimum of retransmissions.

(c) Diverts a minimum number of personnel from their primary duty.

(d) Army aircraft are readily available and responsive to division requirements.

(e) Capable of surveying large areas in a short time.

(f) Capable of surveying areas inaccessible to ground units, such as terrain obstacles and enemy-controlled areas.

(g) Exposes personnel to a much lower dose rate than ground survey.

(2) Disadvantages:

(a) Produces less detailed information than ground survey.

(b) Operation of manned aircraft depends on favorable weather conditions (drones, however, are expected to be able to operate under almost all weather conditions).

(c) At present, manned aircraft using ground-based radar have only a limited operating capability during darkness or marginal weather conditions; therefore, there is little current capability for aerial survey at night.

(d) At present, pilot-monitor teams require skill development training (maintenance of constant ground clearance and constant ground speed, timing, and determination of air-ground correlation factors).

(e) Aircraft may become a target for the enemy when employed in forward areas or when the enemy has air superiority.

b. The advantages of aerial survey are in distinct contrast to the severe limitations of ground survey. The speed of completion and the minimum diversion of personnel and equipment from their primary mission are factors which require the recognition of aerial survey as the principal radiological survey technique. There are definite disadvantages to aerial survey, but most are the result of currently inadequate instrumentation rather than tactical limitations or control problems. Unlike the disadvantages in ground survey, there is promise of overcoming most of the disadvantages in aerial survey by use of the forthcoming aerial radiac instrument system.

c. The aerial radiac instrument system available in the 1965-1970 time frame will be a significant advance over that now in use.

(1) The current ("clipboard") method involves use of the IM-174/PD survey meter by a monitor in the aircraft who records the dose rate readings at certain intervals. The pilot is required to fly at a constant altitude above ground level, so that a single air-ground correlation factor (AGCF) will correct the aerial readings for a particular flight leg to the dose rate at ground level. Further, he must maintain a straight line path between check points when using the course leg technique of aerial survey. Disadvantages of this system are apparent. It is improbable that manned aircraft can survive forward of the FEBA when such flight restrictions are imposed. In addition, the system is obviously not applicable to unmanned aircraft. A detailed discussion of current aerial survey techniques is found in FM 3-12.[4]

(2) In July 1961, Department of the Army approved military characteristics (MC's) for an Aerial Radiac Instrument System and, subsequently, a developmental program was initiated to satisfy these requirements. This project is currently assigned Priority II. [11]

(3) Designated the AN/ADR-6, this system incorporates a rapid response (scintillation) radiacmeter and a chart recorder, eliminating speed restrictions on the aircraft and the need for someone aboard the aircraft to monitor the readings. In conjunction with a radar altimeter, the aerial radiac set performs

automatic in-flight altitude correction of the aerial dose rate at operational flight levels from 200 to 800 feet, increasing it by the proper factor (AGCF) to account for the reduced gamma intensity at a particular altitude and to make the meter and recorder indicate approximate ground radiation levels. 6/ In case no radar altimeter is available with the aircraft, the automatic altitude correction circuit can be disconnected and the instrument simply measures and records aerial radiation levels. Altitude correction would then be accomplished manually or by computer in the process of data reduction on the ground, based on an assumed constant ground clearance of the aircraft. A telemetry output is available and can be used with existing data links. To protect against electronic failures, chart recording should always be used whether or not telemetry is available. Such an automated system eliminates the need for personnel other than the pilot in manned aircraft and allows aerial survey to be performed in unmanned aircraft. In addition, a restriction is not imposed upon the pilot or drone control team to maintain a constant ground clearance. The system can be readily installed in or removed from all surveillance, observation, and utility type Army aircraft (including drones) to insure flexibility and responsiveness. 6/

(4) The aerial radiac system will be compatible with existing or developmental aircraft positioning devices, and will simultaneously record aircraft positions provided by such devices on the same chart as the radiation measurements. If the aircraft is not equipped with position fixing devices, the aircraft position will be manually recorded. If telemetry is used, correlated aircraft position can be telemetered to the ground receiving station along with the dose rate readings.

(5) The AN/ADR-6 should be organic to the using unit rather than pooled at higher echelon since rapid reaction time is one of the principal objectives of this system. ROAD units with an aerial radiological survey mission and/or capability are discussed later in this annex. A suggested distribution of AN/ADR-6 systems to these units is presented in Annex C. It is anticipated that service test models will be realized during Fiscal Year 1966, 6/ and the system should be available in the field by Fiscal Year 1967.

d. With the coordinated development of aerial navigation aids and the aerial radiac instrument system specified in the MC's, the limitation of present-day aerial survey to favorable weather conditions and daylight will be reduced. With the drone survey system, a particularly important additional advantage is gained: survey of enemy-controlled territory can be carried out without risk of losing highly trained personnel. With either manned or drone system, the change from manual to automatic position determination and from manual to automatic correction of the observed dose rate to that one meter above the ground will significantly speed both the gathering and processing of radiological survey data.

e. With the ROAD concept of operation, rapid decision-making and rapid reaction become ever more important. It has been pointed out that consideration of radiological intelligence is mandatory for continued combat effectiveness and, in many cases, for accomplishment of the mission at hand. Speed is one of the great advantages of the proposed aerial survey system; but the currently slow process of manually tabulating or decoding the data when received at the CBRE, plotting them on a map, and drawing in dose rate contours also requires improvement. These functions are expected to be automated to a major degree late in the 1965-70 time period by the Tactical Operations System of the Command Control Information Systems (CCIS). [12] A capability for radiological contamination charting by a computer and auxiliary equipment will exist at the division TOC. (This capability will also be available at corps and field army echelons and will be discussed in Phase II of this study--Corps and Field Army.) The computer will be programmed so that, on command, it will print out the best contamination map (overlay) consistent with reliable data accumulated to that time. The contamination overlay can be disseminated to those with a "need to know" by automatic data link or by facsimile. The application of automatic data processing to contamination charting is more fully discussed in a recent study by this Agency: CMLCD 59-16, "Application of Automatic Data Processing System(s) (ADPS) to Chemical Corps Field Activities, Phase II, Part 3B--Radiological Contamination Charting Systems Analysis." [13]

8. Radiological Monitoring: Since monitor reports can provide the same type of contamination contour charts for friendly occupied areas as surveys do for other areas, and since monitor reports extend and substantiate survey data, radiological monitoring will be considered briefly in this study.

a. Based on conclusions of Exercise Dragon Head [8] and of a detailed study, [14] FM 31-12 [4] prescribes that automatic monitoring reports will consist only of the following:

(1) A "contact report" is submitted when the ground dose rate builds up to 5 rad/hr in an area predicted to receive fallout, or when an initial ground dose rate of 1 rad/hr is detected at a location not expected to receive fallout. Such reports are submitted by the most expeditious means of communication available so that major commands can issue warnings.

(2) A "peak dose rate report" is submitted when the meter needle reaches its maximum reading (or comes back on scale).

b. The criterion in paragraph 8a(1) requires revision. Although an area is predicted to receive fallout, the monitor may not always know (owing to communications failure) whether or not he is in such an area. A better criterion is for all units, regardless of location, to submit contact reports on encountering a ground dose rate of 1 rad/hr.

c. Other reports may be required by SOP's at certain dose rates or certain time intervals, but they are not prescribed by the field manual. There may also be a requirement for certain special reports; for example, a series of reports--one every half hour for three or four hours--may be required for selected units in order to determine decay rates.

d. With this number of reports, the system for submitting monitor reports should be manageable with existing communications. However, the presence of two command headquarters between company and division in ROAD, in contrast to previous organization, will increase the retransmission problem and create delay. At intermediate echelons, users should examine these reports and rapidly pass them on after extracting pertinent data. This system should be tested in ROAD command post and field exercises to determine the adequacy of communications. In the event of unsatisfactory results, attention will have to be given to allocation of special communication channels for reporting radiological information.

e. Radiological monitoring reports include the dose rate reading, type of report (contact, intermediate, or peak), time of reading, and location of reading. Reports sent in the clear would therefore divulge the location of the monitor and, possibly, the unit, as well as provide the enemy radiological information. Comments from different agencies on another study 14/ have advocated both encoding monitor reports and sending them in the clear. Reasons for encoding were to deny the enemy radiological and unit position information; reasons for sending in the clear were speed, less chance of error, and an argument that the enemy will secure radiological information by his own methods anyway. It appears that a rigid solution is not practical. Since a decision would depend on the situation, each division should publish instructions in the SOI for transmission of monitor reports. If coding is used, only location coordinates should be encoded and other data sent in the clear. Maximum reporting speed consistent with security will be provided.

9. <u>ROAD Units with Radiological Monitoring and Survey Capabilities.</u>

a. All ROAD division units have a monitoring mission and will do so in accordance with doctrine expressed in FM 3-12 and with unit SOP. DA-approved TOE's for ROAD units are reviewed in Annex C to insure that each unit is equipped to accomplish this mission.

b. Personnel and equipment to conduct ground radiological surveys are normally obtained from division troop units. However, the scout sections of the armored cavalry troops and the scout sections of the infantry, airborne infantry, mechanized infantry, and tank battalion headquarters and headquarters companies have a

special responsibility for ground vehicular survey. Each infantry and mechanized division is equipped with 76, each airborne division with 64, and each armored division with 80 reconnaissance vehicles in the scout sections, providing the ROAD division with an adequate capability to conduct extensive surveys on a priority basis when required. The chemical operations support company of the field army chemical group (proposed in another study [15] by this Agency) has ground radiological survey among its missions. This company (or elements of it) may be made available to the division commander for conducting required surveys.

c. DA-approved ROAD TOE's indicate that each armored, infantry, and mechanized infantry division is equipped with 1 AN/USD-1 drone system and with 101 manned aircraft, distributed as shown in Table B-1. Instead of the drone system, the aviation GS company of the airborne division is equipped with 2 additional OV-1 aircraft, resulting in a division total of 103 manned aircraft, Aircraft of the aviation general support company, the air cavalry troop, and the brigade headquarters and headquarters company (aviation platoon) will be used for radiological survey purposes more frequently than those of other units. In some instances, helicopters of the division artillery headquarters and headquarters battery may fly radiological survey missions. A recommended distribution of AN/ADR-6 aerial radiac sets to these units is presented in Annex C.

TABLE B-1

DISTRIBUTION OF MANNED AIRCRAFT TO ROAD DIVISIONS

	Unit	LOH	UH-1	OV-1	Total
*1.	Avn GS Co, Avn Bn	10	6	4(6)*	20(22)
2.	Airmbl Co, Avn Bn		25		25
3.	Air Cav Trp, Armd Cav Sqdn	9	17		26
4.	Hq & Hq Co, Bde (3/Div)	(6/Cox3)=18			18
5.	Hq & Hq Btry, Div Arty	10			10
6.	Trans Acft Maint Co, Maint Bn, Div Spt Comd		2		2
	TOTAL	47	50	4(6)	101(103)

* The aviation GS company is also equipped with 1 AN/USD-1 drone system (in all but the airborne division, in which this company contains two additional OV-1 aircraft instead).

10. The CBRE. The Chemical, Biological, Radiological Element (CBRE) at division headquarters tactical operations center will be the agency to receive data from radiological monitoring and survey and to convert these data into radiological intelligence.

a. The PENTOMIC divisions had an organic CBR Center (CBRC) manned as follows:

(1) 1 Captain, CBRC Director

(2) 1 E-6, Radiological Computer

(3) 2 E-5's, Radiological Plotters

The operations sergeant (E-8) and general clerk (E-3) from the division chemical section were usually employed in the CBRC also. Yet field exercises have shown that this organization had one major deficiency: it lacked a sustained twenty-four-hour-day operating capability. The policy was to augment the CBRC with a JA cellular team (TOE 3-500E) of one officer and four enlisted men when a continuous operating capability was required.

b. Under the ROAD concept, the division must continue to be staffed for sustained twenty-four-hour operations in order to maintain its required capability to operate in nuclear, non-nuclear, chemical, and/or biological environments. Approved ROAD TOE's authorize the following manning level for the division chemical section:

	TITLE	NO.	MOS	GRADE
	Div Cml O	1	57314	Lt Colonel
	Asst Cml O	1	57314	Captain
*	Radl Cen Dir	1	57314	Captain
	Cml Op Sgt	1	534.80	E-8
*	Radl Plotter	2	534.70	E-7
*	Radl Computer	1	534.10	E-5
	Cml Staff Sp	2	534.10	E-5
*	Clk/Typ	1	711.20	E-4

Personnel marked with an asterisk will normally work in the CBRE when the TOC is in operation. A sustained twenty-four-hour capability in a nuclear environment is not inherent in this manning level. Although there are advantages in obtaining this sustained capability by increasing the organic CBRE manning level, current austerity policies on staffing headquarters units preclude this. In order to possess a two-shift sustained operating capability as

suggested in DA TC 101-2, "Tactical Operations Centers," 16/ the CBRE will continue to require augmentation by a CBR Center Team (Team JA, TOE 3-500E) on an "as required" basis. This team is manned as follows:

TITLE	NO.	MOS	GRADE
CBR Cen Dir	1	57314	Captain
Plotter	1	534.70	E-7
Computer	2	534.10	E-5
Gen Clk	1	710.00	E-3

c. It should be recognized that CBRE's must also be proficient in handling chemical and biological operations. If the current manning level is to be adequate, computers and plotters must be cross-trained and capable in chemical, biological, and radiological operations. In accord with the concept of a CBRE, it would seem appropriate to replace the terms "Radl Cen," "Radl Computer," and "Radl Plotter" used in the DA-approved ROAD TOE's with "CBRE," "CBR Computer," and "CBR Plotter," respectively.

d. At brigade headquarters, the allocation of a chemical officer (captain) and, in some cases, a chemical non-commissioned officer (E-6 -- in airborne and infantry division only), as shown in approved ROAD TOE's, will provide an extremely limited capability to interpret and produce radiological information. This capability will be particularly valuable when the brigade is engaged in independent or semi-independent operations, or when a brigade headquarters is required to assume command of the division. In the event the brigade must conduct extended independent operations, the capability of organic chemical personnel for processing radiological information will have to be augmented with a JA team.

APPENDIX I

STAFF PROCEDURES IN RADIOLOGICAL SURVEY

1. The steps necessary for the conduct of a ground radiological survey controlled by the decentralized method in divisions of the ROAD type are believed to be essentially the following. (When the TOC is in operation, many of the functions ascribed to the division chemical officer, G-2, and G-3 may be carried out by their TOC representatives in the CBRE, G-2 Element, and G-3 Element.)

a. Division chemical officer, in coordination with the division G-2, determines that a radiological survey is required in order to obtain vital information concerning an area of operational interest to the division.

b. Division chemical officer submits his recommendations to the division G-3 and requests the use of unit radiological survey teams to conduct the survey.

c. Division G-3 determines that sufficient troop units are available to conduct the survey and that diversion from their primary duty is justified by the urgent requirement for radiological information.

d. Division G-3 decides which brigade will conduct the survey and notifies the brigade operations section.

e. Brigade operations section determines which battalion or battalions can furnish survey teams, This decision will be influenced by the current mission and location of the area to be surveyed.

f. Brigade operations section orders the selected battalions to conduct the survey and assigns specific areas of responsibility.

g. Battalion operations section determines how many survey teams are available and assigns the selected companies their mission.

h. The company receives the order and notifies the platoons to assemble their survey parties for briefing.

i. Company commander briefs the survey team, checks equipment, and issues his order.

j. Survey team proceeds to its assigned area, initiates the survey, and records the data.

k. Survey team transmits data to the control party (company headquarters) by the most expeditious means (for example--FM company command radio net).

l. Control party screens data for adequacy and reasonability and, without further processing, forwards data through command channels to the CBRE via the area communications system.

m. Data are received in CBRE from area communications system.

n. Division CBRE evaluates survey data and submits its report to the G-3.

2. With the AN/ADR-6 aerial radiac instrument system, the steps necessary for the conduct of an aerial survey controlled by the centralized method are believed to be the following. (When the TOC is in operation, many of the functions ascribed to the division chemical officer, aviation officer, G-2, and G-3 may be carried out by their TOC representatives in the CBRE, AAE, G-2 Element, and G-3 Element.)

a. Division chemical officer, in coordination with the division G-2, determines that a radiological survey is required in order to obtain vital information concerning an area of operational interest to the division.

b. Division chemical officer submits his recommendation to the division G-3 and requests approval for an aerial radiological survey mission.

c. Division G-3 approves the mission request.

d. Division chemical officer and aviation officer make a map study of the area to be surveyed and develop a general flight plan.

e. Division aviation officer contacts division air operations and order the mission.

f. Division air operations schedules the mission and briefs the pilot or drone control team.

g. Ground crew installs the AN/ADR-6 sensor package in the aircraft.

h. Division air operations instructs the aerial surveillance and target acquisition platoon of the aviation general support company to telemeter the mission.

i. Pilot or drone control team flies the mission. Data are received by the aerial surveillance and target acquisition platoon via the telemetry link. These data are transmitted to the division G-2 intelligence system complex by radioteletype, using the division intelligence net.

j. Division G-2 intelligence system complex relays survey data to the CBRE. The CBRE receives the survey data almost as soon as they are measured.

k. Division CBRE evaluates data and submits its report to the G-3.

ANNEX C

EQUIPMENT REQUIREMENTS

Introduction: It will be the purpose of this annex to review the type and distribution of current radiological survey and monitoring equipment in DA-approved ROAD TOE's and to recommend changes deemed necessary. The replacement for two of these equipments will be discussed, and in addition, a proposed distribution of the new AN/ADR-6 aerial radiac sets to ROAD units will be presented. Communications requirements will be considered. Finally, a chart will be presented which describes sequential equipment changes from the present survey and monitoring system to that ultimately expected in 1970.

1. Distribution of Current Radiological Survey and Monitoring Equipment, DA-Approved ROAD TOE's: Applicable portions of the DA-approved TOE's for airborne, infantry, mechanized infantry, and armored divisions have been extracted and are attached as Appendix I to this annex.

a. IM-174/PD: The IM-174/PD [17] is a standard-A portable tactical survey instrument operating on the ion chamber principle and designed to measure gamma radiation dose rates from 0 to 500 rad/hour. Field accuracy is rated at ± 25%. A three-second time constant results in a slow response time, a considerable disadvantage in aerial survey. This instrument will be used during the early part of the time frame of interest for conducting radiological surveys on foot or in ground vehicles, and for area monitoring. Until the new aerial radiac set becomes available, the IM-174/PD will also be used for aerial radiological survey (see Table C-2). Appendix I to this annex reviews the distribution of IM-174/PD radiacmeters in approved ROAD division TOE's. Although in some instances the TOE's list the older IM-108/PD radiacmeter (which was replaced by the IM-174/PD), quantities of this instrument are tabulated in Appendix I as IM-174/PD's. The nomenclature should be changed accordingly when the TOE's concerned are next revised.

(1) Radiological monitoring, as discussed in paragraph 3b of Annex B, is a function performed by all units when operating in a radioactively contaminated environment in order to give warning and information of the hazard present. From the viewpoint of radiological monitoring, analysis of the IM-174/PD TOE distribution indicates, in general, a full adequacy, with only a few exceptions. In fact, several units are believed to be authorized an excess of this instrument from a monitoring standpoint.

(a) The aviation battalion headquarters and headquarters detachment, organic to the armored, infantry, and mechanized divisions, and the airborne division supply and service

company have been overlooked in the distrubution. Each unit should be authorized one IM-174/PD.

(b) The forward area signal center platoons of the division forward communication companies have not been authorized IM-174/PD's on a consistent basis. Each platoon in the company organic to the armored, infantry, and mechanized divisions has been authorized one instrument while platoons in the airborne division forward communication company have not. It is believed that each platoon has sufficient independence of action and position to require authorization of one IM-174/PD.

(c) In the division support command headquarters, headquarters company and band, two instruments have been authorized the band and one authorized company headquarters in the airborne division unit, while no instrument is provided company headquarters in the armored, infantry, and mechanized division support commands. It is believed that instances when the band is separated from company headquarters are sufficiently numerous to justify one IM-174/PD in the company headquarters of this unit.

(d) One additional IM-174/PD (resulting in a total of two) is recommended for the transportation aircraft maintenance company organic to armored, infantry, and mechanized divisions, because of the independence of action and position of the forward support platoon. The transportation aircraft maintenance company organic to the airborne division is currently authorized two IM-174/PD's.

(e) It is recommended that the IM-174/PD radiacmeters in the battalion maintenance section of the engineer battalion headquarters and headquarters company, (armored, infantry, and mechanized divisions) and the medical section of this unit in the airborne division be replaced with an AN/PDR-27J, since the need for radiac equipment in these sections is generally one of monitoring personnel and/or equipment.

(f) Several TOE units have sub-units currently authorized IM-174/PD radiacmeters which do not have sufficient independence of action and position to justify this authorization. In particular, it is recommended that distribution of IM-174/PD's to the administration, operations, and division engineer sections of the engineer battalion headquarters and headquarters company (armored, infantry, and mechanized divisions) be deleted. Further, the two IM-174/PD's authorized the platoon headquarters of the headquarters and headquarters troop squadron support platoon (airborne division armored calvary squadron) preclude the necessity for two such instruments in the platoon supply section. For similar reasons, it is recommended that the two IM-174/PD's in the battalion headquarters section of the headquarters and headquarters

company, supply and transportation battalion (armored, infantry, and mechanized divisions) be deleted.

(g) Finally, the number of IM-174/PD's authorized several TOE units is recommended to be reduced by one. It is believed that each of these units still possesses a fully adequate number of IM-174/PD radiacmeters to perform its radiological monitoring mission.

(2) Ground survey is performed by teams composed of personnel and equipment selected as prescribed by SOP's from the unit. Analysis of IM-174/PD distribution on this basis indicates full adequacy. A rather special responsibility for monitoring/limited-survey falls upon the scout sections of the division armored cavalry troops and the scout sections of the infantry, airborne infantry, mechanized infantry, and tank battalion headquarters and headquarters companies. All sections have been properly provided with one IM-174/PD for each reconnaissance vehicle.

(3) Aerial survey will be performed with the IM-174/PD as an interim measure pending the completion of the AN/ADR-6 aerial radiac instrument system, although it is recognized that the slow response time makes the former instrument far from ideal as an aerial survey meter. Therefore, it is considered that one IM-174/PD should be authorized for every two observation, surveillance, and utility aircraft slated to be used in an aerial survey role. This criterion has been used in proposing adjustments to the number of IM-174/PD's currently authorized the units discussed below.

(a) The aviation general support company organic to the armored, infantry, and mechanized divisions has been authorized one IM-174/PD for each aircraft in the tactical support (10 LOH), aerial radar (2 OV-1), and aerial infrared (2 OV-1) sections. The airborne division aviation GS company has an additional OV-1 vehicle in both of the latter two sections, but with an unchanged authorization of IM-174/PD's. It is recommended that the tactical support section allocation (in all divisions) be reduced to five IM-174/PD's and that the aerial radar section and aerial infrared section allocations (in all but the airborne division) be reduced to one IM-174/PD radiacmeters.

(b) Ten IM-174/PD radiacmeters are authorized the aviation section (10 LOH) of each armored, infantry, and mechanized division artillery headquarters and headquarters battery. The same section in the airborne division also has 10 LOH but is authorized only one IM-174/PD. Using the criterion established above, the authorization in the aviation section of the airborne division artillery should be increased to, and those in the other divisions reduced to, 5 IM-174/PD radiacmeters.

(c) The aviation section (6 LOH) of the airborne brigade headquarters and headquarters company is allotted 6 IM-174/PD's while no such meters are distributed to the aviation section of the armored, infantry, and mechanized brigade headquarters and headquarters companies. It is recommended that these allocations be changed to 3 IM-174/PD radiacmeters in each of these units.

(d) In the air cavalry troop, 4 LOH are authorized each of the two light aero scout sections and 4 UH-1 are found in the heavy aero scout section. IM-174/PD's are authorized in like number to the aircraft in each of these sections, with the exception of the heavy aero scout section of the air cavalry troop organic to armored, infantry, or mechanized division, which has none. For the sake of consistency, it is recommended that 2 IM-174/PD radiacmeters be authorized in each aero scout section.

b. AN/PDR-27J. The IM-141/PDR-27J radiacmeter of the AN/PDR-27J radiac set 18/ is a portable tactical monitoring instrument operating on the Geiger-Muller principle and designed to measure gamma radiation dose rates from 0.05 to 500 millirad/hour and to detect beta radiation. The set is equipped with an external probe which is used to detect beta radiation and may be used when measuring gamma dose rates. The AN/PDR-27J is Standard-A and will be used in the early part of the 1965-1970 period for monitoring personnel, food, water, and equipment (see Table C-2). Appendix I to this annex reviews the distribution of AN/PDR-27J radiac sets in approved ROAD division TOE's.

(1) The AN/PDR-27J has been distributed to division, brigade, and (excepting the airborne division) division artillery headquarters. The situation of the chemical officer at division support command headquarters is comparable to that of brigade chemical officer and requires authorization of 1 AN/PDR-27J. Further, one set should also be authorized the airborne division artillery headquarters, correcting the current oversight.

(2) Engineer water points (five per supply section of engineer battalion headquarters and headquarters company) have properly each been provided with an IM-174/PD in accordance with their independence of position. However, the AN/PDR-27J is also a necessity for each water point, allowing monitoring of water for beta and gamma contamination. It is imperative that five AN/PDR-27J radiac sets be authorized each such supply section.

(3) The medical platoons of the tank, airborne infantry, and armored cavalry battalion headquarters companies have each been authorized one AN/PDR-27J whereas infantry, mechanized infantry, artillery, aviation, and engineer battalion headquarters medical sections are not authorized this instrument. There is a

requirement for all battalion medical sections to be able to monitor casualties for protection of themselves and the casualties. Further, since prolonged physical contact with radiological contamination can produce beta burn casualties, there is a requirement to monitor equipment and facilities, likely to be contaminated, requiring repeated handling and long contact. Thus, infantry, mechanized infantry, engineer, artillery, and aviation battalion medical sections should also be authorized one AN/PDR-27J each.

(4) The forward support companies (detachments) in the maintenance battalions of the armored, infantry, mechanized, and airborne divisions have not been allocated the AN/PDR-27J on a consistent basis. In the mechanized division, this company has two sets; in the infantry division it has one set; and in the armored and airborne divisions, they have none. In view of the mission of these units in providing maintenance support for ordnance, signal, and engineer equipment in the brigade, the AN/PDR-27J should be provided the maintenance platoon of each company (detachment) since prolonged physical contact with contaminated equipment can result in incapacitation from beta burns. One AN/PDR-27J should be adequate for each of these units.

(5) The distribution of AN/PDR-27J sets to the division supply and service companies has been shuffled to allow more efficient use of these instruments. In the supply and service company organic to the armored, infantry, and mechanized divisions, the two sets currently authorized company headquarters should be relocated in maintenance supply platoon headquarters and one additional set should be authorized this latter unit, providing a capability for each of the three supply class sections assigned the platoon. Other AN/PDR-27J's in this company are considered to be appropriately located. In the airborne division supply and service company, the two sets located in company headquarters are considered unnecessary and are recommended to be deleted.

(6) Each division headquarters and headquarters company is authorized 2 AN/PDR-27J radiac sets in company headquarters. For the reasons discussed in subparagraph (3) above, one set in each of these companies should be relocated in the medical section.

(7) Each armored, infantry, and mechanized division supply and service company may be augmented by a bath section containing nine bath units, and the supply and service company organic to the airborne division may be augmented by a similar section with four bath units. Since bathing is an excellent means of removing radiological contamination from the body surface, there is a requirement for determining radiological cleanliness after bathing by monitoring the body surface. Although not included in the unit total (and not included in the charts in appendices

to this annex), 4 AN/PDR-27J's are authorized the augmenting bath section in the airborne division, one for each bath unit. However, none are provided for the nine units in the bath section sometimes augmenting the other divisions. It is therefore recommended that 9 AN/PDR-27J's be authorized this section.

(8) The distribution of AN/PDR-27J's sets to engineer battalion headquarters and headquarters companies and medical battalion headquarters and support companies has also been slightly altered to allow more efficient use of these instruments.

(9) One AN/PDR-27J should be authorized each combat and combat support company-size unit, to provide such units with a capability for monitoring personnel and equipment. This radiac set is also required for monitoring old contamination areas for unit occupancy. Prolonged stay times in such areas where dose rates are in the 100 millirad/hour to 1 rad/hour range, will result in undesirable troop exposures. The IM-174/PD would be of marginal use in these situations. Accordingly, it is recommended that 1 AN/PDR-27J be provided to the company, troop, or battery headquarters of each combat and combat support unit not already authorized this radiac set.

c. AN/PDR-60: The AN/PDR-60 [19] is a Standard-A scintillation-type instrument designed to measure alpha radiation counting rates from 0 to 2,000,000 counts/minute. The alpha probe may be replaced with a probe sensitive to low energy gamma radiation such as that emitted by decay products of plutonium. Alpha contamination, which usually results from incidents (accidents), is not considered tactically significant radiological contamination. On friendly foreign territory, however, such contamination could be of considerable concern to the division commander. In such instances, the AN/PDR-60 at division chemical section could be used by chemical personnel to identify the alpha contamination and determine the requirement for assistance from higher headquarters. There appears to be no justification for the AN/PDR-60 in the tank battalion of the airborne division. The AN/PDR-60 will be used throughout the 1965-1970 period for detecting alpha contamination (see Table C-2). Appendix I to this annex reviews the distribution of AN/PDR-60 radiac sets in approved ROAD division TOE's. Although in some instances the TOE's list the older IM-156/PD radiacmeter (which was replaced by the AN/PDR-60), quantities of this instrument are tabulated in Appendix I as AN/PDR-60's. The nomenclature should be changed accordingly when the TOE's concerned are next revised.

d. A summary of the recommended changes in current radiac instrument distribution discussed above is provided in tabular form in Appendix II to this annex. Charts indicating the radiac instrument distribution proposed by this study are provided in Appendix III to this annex.

2. A Dual Replacement - Radiac Set AN/VDR-1: The AN/VDR-1 [7] is scheduled to replace both the IM-174/PD and the AN/PDR-27J during the time frame of interest (see Table C-2). This instrument, which is being designed to satisfy both the approved MC's for the Tactical Survey Meter and Vehicular Radiac System and the recently deleted MC's for the Tactical Monitoring Instrument will measure gamma radiation dose rates from 1 millirad/hour to 1000 rad/hour and will detect beta radiation. The set is intended to enable personnel to make vehicular or dismounted radiological surveys and to perform area, personnel, food, water, and equipment radiological monitoring. One of the probes will be mounted external to the vehicle and will be used when making rapid vehicular survey. A detector embodied within the radiacmeter itself will be used for dismounted survey. A third, plug-in detector with a side window allows monitoring of personnel and materiel for beta and/or gamma contamination. Service test models of the AN/VDR-1 are anticipated by 1st quarter, Fiscal Year 1967. [7] Generally, 1 AN/VDR-1 radiac set will be supplied when available to sub-units within the ROAD TOE units on a replacement basis for each IM-174/PD or for each AN/PDR-27J authorized, whichever total is the greater.

3. Proposed Distribution of the AN/ADR-6 Aerial Radiac Instrument System: Following is a proposed distribution of the AN/ADR-6 aerial radiac system described in Annex B, paragraph 7c:

TABLE C-1

RECOMMENDED DISTRIBUTION OF THE AN/ADR-6 AERIAL RADIAC SET

	Inf, Armd, Mech Div	Abn Div
Avn GS Co, Avn Bn	6	4
Air Cav Trp, Armd Cav Sqdn	6	6
Brigade Hq & Hq Co(3/Div)(2/Co x 3)	6	6
Hq & Hq Btry, Div Arty	2	2
Total in Division	20	18

The authorization of six systems to the aviation GS company provides two for the tactical support section (10 LOH) of the GS platoon, two for the drone section (10 AN/USD-1 drones--1 drone system) and one each for the aerial radar and aerial infrared sections (2 OV-1 each) of the aerial surveillance and target acquisition platoon. (The airborne division has no drone section and thus requires two fewer aerial radiac sets. Although its aerial radar and infrared sections

each contain one additional combat surveillance airplane (3 OV-1 each), it is believed that one system is still sufficient for each section.) The distribution of more than one AN/ADR-6 to a particular section is designed to insure against loss or malfunction of equipment as well as to provide survey of large areas by more than one system. In accord with this concept, the six systems allotted for the air cavalry troop include two for each of the three aero scout sections (4 LOH or 4 UH-1), and two systems are recommended for the aviation section (6 LOH) of each brigade headquarters and headquarters company. In some special situations, helicopters in the aviation section (10 LOH) of the division artillery headquarters and headquarters battery may fly radiological survey missions and, accordingly, two systems are allotted to that unit.

4. Communications Requirements: There is a requirement for a means of receiving monitor and survey information at the CBRE and for disseminating processed information to those with a "need-to-know."

a. Receipt of data: Monitoring reports will be furnished the CBRE through command channels, using available communications nets. These reports may be examined and pertinent data extracted by users at echelons below division, after which the reports will be rapidly passed on. According to current doctrine, survey data are reported to the control party of the authority directing the survey without processing by intermediate headquarters.[4/] In the decentralized method of survey control, the control party (usually company headquarters) receives data from the survey party by radio. Data are subsequently transmitted to the CBRE through command channels (without processing), using communication nets similar to those used for submission of monitoring reports. In the centralized method of survey control, a ground survey party would transmit directly to division CBRE if a point-to-point sole user circuit has been provided. Alternately, the survey party will report by radio to the nearest area communications center which will in turn transmit directly to division TOC. (See Annex B, paragraph 6b(2).) Aerial survey data may be telemetered to the aerial surveillance and target acquisition platoon of the aviation general support company and thence are transmitted to division TOC. It is apparent that the transmission of radiological monitor and survey data will impose a heavy communications load. It is believed, however, that the current doctrine for radiological monitoring and the versatile capability of the division area communication system will provide a workable and adequate interim means for the CBRE to receive both monitor and survey information, providing adequate priority is afforded such messages. The integration of automatic data processing equipment (to include computers, display consoles, and ancillary data transmission devices) into the division late in the 1965-1970 time frame should result in a distinct reduction in reaction time. Although the volume of radiological intelligence transmitted will be essentially unchanged, greater speed and accuracy of

transmission should materially reduce strain on the communication system. This area should be appropriate for early testing when ADP equipment first becomes operational.

b. Dissemination of Information: After radiological monitor and survey readings have been plotted, dose rate contours are drawn to produce contamination charts. The radiological information is then in a highly useful form, but there is at present no means of transmitting this graphic or pictorial display to the brigades or to other major subordinate units of the division. The chart must be transformed into a series of readings and coordinates for transmission (NBC 5 report); the data received must then be plotted and does rate contours drawn in, a time-consuming process. One facsimile set, the AN/TXC-1, is authorized the signal battalion command operations company of each division (except airborne). Physically located at division headquarters, this device could be used to transmit contamination overlays to higher commands. There is a definite additional requirement, however, for a capability to transmit contamination charts--chemical and biological as well as radiological--to the three brigades, the division artillery, the armored cavalry squadron, the aviation, signal, and engineer battalions, the MP company and the support command of the division. This requirement could be fulfilled by facsimile or telautograph devices, which should also find many other applications. Such a requirement was noted in Exercise Dragonhead 8/ and is also reflected by the fact that U. S. Forces in Europe have locally procured facsimile devices for transmitting contamination overlays. It is envisioned that the computer and ancillary equipment being developed for use at division TOC will be capable of automatically disseminating contamination charts to subordinate, adjacent, and higher commands. This and other applications of ADP to contamination charting are more fully discussed in a recent study. 13/

5. Time-Phasing of Equipments--1965-1970: Table C-2 describes sequential equipment changes from the present radiological survey and monitoring system to that ultimately expected for 1970.

TABLE C-2

TIME-PHASING OF EQUIPMENTS--1965-1970

	PRESENT	1966	1968	1970
Aerial Survey	Performed with IM-174/PD in manned aerial platforms. Data recorded manually in-flight and delivered to CBRE by physical drop, radio, or telephone.	No change.	Performed with AN/ADR-6 in manned and unmanned aerial vehicles. Data recorded automatically in-flight and may be telemetered via aviation GS company to CBRE.	No change.
Ground Survey	Performed with IM-174/PD. Data recorded manually and radioed or phoned via area communications system to CBRE.	No change.	Performed with AN/VDR-1. No other change.	No change.
Radiological Monitoring	Area monitoring performed with IM-174/PD. Data reported through command channels to CBRE. Low-range beta-gamma monitoring performed with AN/PDR-27J. Alpha contamination detected with AN/PDR-60.	No change.	Area monitoring and low-range beta-gamma monitoring performed with AN/VDR-1. No other change.	No change.
Contamination Charting	Data plotted manually in CBRE. Disseminated to higher HQ by facsimile, to major subordinate commands by RATT.	Disseminated to major subordinate commands by facsimile. No other change.	No change.	Data plotted and disseminated automatically by the operations portion of CCIS-70.

APPENDIX I

CURRENT DISTRIBUTION OF RADIAC EQUIPMENT IN ROAD DIVISIONS

TOE	UNIT	IM-174/PD	AN/PDR-27J	AN/PDR-60
57E	AIRBORNED DIVISION	444	34	2
57-4E	Hq & Hq Co	3	2	1
19-67E	MP Co	4		
1-55E	Avn Bn	19		
1-56E	Hq & Hq Det	2		
1-57E	Air Mbl Co (Lt)	2		
1-58E	Avn GS Co	15		
11-215E	Sig Bn	3		
11-216E	Hq & Hq Co	1		
11-217E	Comd Op Co	1		
11-218E	Fwd Comm Co	1		
5-25E	Engr Bn	26	2	
5-26E	Hq & Hq Co	14	2	
5-27E	Engr Co (3/Bn)	4/Co x 3 = 12		
57-42E	Brigade Hq & Hq Co (3/Div)	27 (9/Co x 3)	3 (1/Co x 3)	
17-75E	Armd Cav Sqn	53	1	
17-76E	Hq & Hq Trp	8	1	
17-77E	Armd Cav Trp (2/Sqn)	14/Trp x 2 = 28		
17-78E	Air Cav Trp	17		
6-200E	Division Artillery			
6-201E	Hq & Hq Btry	2		
6-215E	FA How Bn 105mm (3/Div)	12 (4/Bn x 3)		
6-216E	Hq, Hq & Svc Btry	1		
6-217E	How Btry, 105mm (3/Bn)	1/Btry x 3 = 3		
6-228E	FA Btry, LJ	1		
29-51E	Division Spt Comd			
29-52E	Hq & Hq Co & Band	3		
12-157E	Admin Co	1		
29-45E	Sup & Trans Bn	3	8	
29-46E	Hq & Hq Det	2	1	
10-37E	Sup & Svc Co		7	
10-337E	QM Air Equip Spt Co	1		
8-65E	Med Bn	5	8	
8-66E	Hq & Spt Co	2	2	
8-67E	Med Co (3/Bn)	1/Co x 3 = 3	2/Co x 3 = 6	
29-55E	Maint Bn	6		
29-56E	Hq & Main Spt Co	1		
29-57E	Fwd Spt Det (3/Bn)	1/Det x 3 = 3		
55-99E	Trans Acft Maint Co	2		
17-15E	Tank Bn	24	1	1
17-16E	Hq & Hq Co	9	1	1
17-18E	Tank Co (3/Bn)	5/Co x 3 = 15		
7-35E	Inf Bn (9/Div)	252 (28/Bn x 9)	9 (1/Bn x 9)	
7-36E	Hq & Hq Co	13	1	
7-37E	Rifle Co (3/Bn)	5/Co x 3 = 15		

TABLE C-I-1

CURRENT DISTRIBUTION OF RADIAC EQUIPMENT IN THE AIRBORNE DIVISION

DA-APPROVED TOE's - 15 AUGUST 1963

TOE	UNIT	IM-174/PD	AN/PDR-27J	AN/PDR-60
17E	ARMORED DIVISION	483	32	1
17-4E	Hq & Hq Co	3	2	1
19-27E	MP Co	5		
1-75E	Avn Bn	16		
1-76E	Hq & Hq Det			
1-77E	Air Mbl Co (Lt)	1		
1-78E	Avn GS Co	15		
11-35E	Sig Bn	7		
11-36E	Hq & Hq Co	1		
11-37E	Comd Op Co	1		
11-38E	Fwd Comm Co	4		
11-39E	Sig Spt Op Co	1		
5-145E	Engr Bn	38	2	
5-146E	Hq & Hq Co	18	2	
5-147E	Cmbt Engr Co (4/Bn)	4/Co x 4 = 16		
5-148E	Bridge Co	4		
17-42E	Brigade Hq & Hq Co (3/Div)	9(3/Co x 3)	3 (1/Co x 3)	
17-105E	Armd Cav Sqn	61	1	
17-106E	Hq & Hq Trp	6	1	
17-107E	Armd Cav Trp (3/Sqn)	14/Trp x 3 = 42		
17-108E	Air Cav Trp	13		
6-300E	Division Artillery			
6-302E	Hq & Hq Btry	11	1	
6-345E	FA How Bn, 105mm (3/Div)	12 (4/Bn x 3)		
6-346E	Hq, Hq & Svc Btry	1		
6-347E	How Btry, 105mm (3/Bn)	1/Btry x 3 = 3		
6-355E	FA How Bn, 155mm, 8-in.	6		
6-356E	Hq, Hq & Svc Btry	1		
6-357E	How Btry, 155mm (3/Bn)	1/Btry x 3 = 3		
6-358E	How Btry, 8-in.	2		
6-175E	FA Msl Bn, HJ	5		
6-176E	Hq & Hq Btry	1		
6-177E	FA Msl Btry, HJ (2/Bn)	2/Btry x 2 = 4		
29-21E	Division Spt Comd			
29-2E	Hq & Hq Co & Band	2		
12-37E	Admin Co	1		
29-65E	Sup & Trans Bn	6	6	
29-6E	Hq & Hq Co	4	1	
10-7E	Sup & Svc Co	1	5	
55-87E	Trans Mtr Tnspt Co	1		
8-35E	Med Bn	5	11	
8-36E	Hq & Spt Co	2	5	
8-37E	Med Co (3/Bn)	1/Co x 3 = 3	2/Co x 3 = 6	
29-35E	Maint Bn	5		
29-36E	Hq & Main Spt Co	1		
29-37E	Fwd Spt Co (3/Bn)	1/Co x 3 = 3		
55-89E	Trans Acft Maint Co	1		
17-35E	Tank Bn (6/Div)	156(26/Bn x 6)	6 (1/Bn x 6)	
17-36E	Hq & Hq Co	11	1	
17-37E	Tank Co (3/Bn)	5/Co x 3 = 15		
7-45E	Mech Inf Bn (5/Div)	135 (27/Bn x 5)		
7-46E	Hq & Hq Co	12		
7-47E	Rifle Co (3/Bn)	5/Co x 3 = 15		

TABLE C-I-2

CURRENT DISTRIBUTION OF RADIAC EQUIPMENT IN THE ARMORED DIVISION

DA-APPROVED TOE's - 15 JULY 1963

TOE	UNIT	IM-174/PD		AN/PDR-27J		AN/PDR-60
7E	INFANTRY DIVISION	459		31		1
7-4E	Hq & Hq Co	3		2		1
19-27E	MP Co	5				
1-75E	Avn Bn	16				
1-76E	Hq & Hq Det					
1-77E	Air Mbl Co (Lt)		1			
1-78E	Avn GS Co		15			
11-35E	Sig Bn	7				
11-36E	Hq & Hq Co		1			
11-37E	Comd Op Co		1			
11-38E	Fwd Comm Co		4			
11-39E	Sig Spt Op Co		1			
5-155E	Engr Bn	38		2		
5-156E	Hq & Hq Co		18		2	
5-157E	Cmbt Engr Co (4/Bn)	4/Co x 4 =	16			
5-148E	Bridge Co		4			
7-42E	Brigade Hq & Hq Co (3/Div)	9 (3/Co x 3)		3 (1/Co x 3)		
17-105E	Armd Cav Sqn	61		1		
17-106E	Hq & Hq Trp		6		1	
17-107E	Armd Cav Trp (3/Sqn)	14/Trp x 3 =	42			
17-108E	Air Cav Trp		13			
6-100E	Division Artillery					
6-302E	Hq & Hq Btry	11		1		
6-155E	FA How Bn, 105mm (3/Div)	12 (4/Bn x 3)				
6-156E	Hq, Hq & Svc Btry		1			
6-157E	How Btry, 105mm (3/Bn)	1/Btry x 3 =	3			
6-165E	FA How Bn, 155mm 8-in.	5				
6-166E	Hq, Hq & Svc Btry		1			
6-167E	How Btry, 155mm (3/Bn)	1 Btry x 3 =	3			
6-168E	How Btry, 8-in.		1			
6-175E	FA Mal Bn, HJ	5				
6-176E	Hq & Hq Btry		1			
6-177E	FA Mal Btry, HJ (2/Bn)	2/Btry x 2 =	4			
29-1E	Division Spt Comd					
29-2E	Hq & Hq Co & Band	2				
12-37E	Admin Co	1				
29-5E	Sup & Trans Bn	6		6		
29-6E	Hq & Hq Co		4		1	
10-7E	Sup & Svc Co		1		5	
55-88E	Trans Mtr Tnspt Co		1			
8-35E	Med Bn	5		11		
8-36E	Hq & Spt Co		2		5	
8-37E	Med Co (3/Bn)	1/Co x 3 =	3	2/Co x 3 =	6	
29-15E	Maint Bn	5		3		
29-16E	Hq & Main Spt Co		1			
29-17E	Fwd Spt Co (3/Bn)	1/Co x 3 =	3	1/Co x 3 =	3	
55-89E	Trans Acft Maint Co		1			
17-35E	Tank Bn (2/Div)	52 (26/Bn x 2)		2 (1/Bn x 2)		
17-36E	Hq & Hq Co		11		1	
17-37E	Tank Co (3/Bn)	5/Co x 3 =	15			
7-15E	Inf Bn (8/Div)	216 (27/Bn x 8)				
7-16E	Hq & Hq Co		12			
7-18E	Rifle Co (3/Bn)	5/Co x 3 =	15			

TABLE C-I-3

CURRENT DISTRIBUTION OF RADIAC EQUIPMENT IN THE INFANTRY DIVISION

DA-APPROVED TOE's - 15 JULY 1963

TOE	UNIT	IM-174/PD		AN/PDR-27J		AN/PDR-60
37E	MECHANIZED DIVISION	459		35		1
37-4E	Hq & Hq Co	3		2		1
19-27E	MP Co	5				
1-75E	Avn Bn	16				
1-76E	Hq & Hq Det					
1-77E	Air Mbl Co (Lt)		1			
1-78E	Avn GS Co		15			
11-35E	Sig Bn	7				
11-36E	Hq & Hq Co		1			
11-37E	Comd Op Co		1			
11-38E	Fwd Comm Co		4			
11-39E	Sig Spt Op Co		1			
5-145E	Engr Bn	38		2		
5-146E	Hq & Hq Co		18		2	
5-147E	Combt Engr Co (4/Bn)	4/Co x 4 =	16			
5-148E	Bridge Co		4			
37-42E	Brigade Hq & Hq Co (3/Div)	9 (3/Co x 3)		3(1/Co x 3)		
17-105E	Armd Cav Sqn	61		1		
17-106E	Hq & Hq Trp		6		1	
17-107E	Armd Cav Trp (3/Sqn)	14/Trp x 3 =	42			
17-108E	Air Cav Trp		13			
6-300E	Division Artillery					
6-302E	Hq & Hq Btry	11		1		
6-345E	FA How Bn, 105mm (3/Div)	12 (4/Bn x 3)				
6-346E	Hq, Hq & Svc Btry		1			
6-347E	How Btry, 105mm (3/Bn)	1/Btry x 3 =	3			
6-355E	FA How Bn, 155mm, 8-in.	6				
6-356E	Hq, Hq & Svc Btry		1			
6-357E	How Btry, 155mm (3/Bn)	1/Btry x 3 =	3			
6-358E	How Btry, 8-in.		2			
6-175E	FA Msl Bn, HJ	5				
6-176E	Hq & Hq Btry		1			
6-177E	FA Msl Btry, HJ (2/Bn)	2/Btry x 2 =	4			
29-11E	Division Spt Comd					
29-2E	Hq & Hq Co & Band	2				
12-37E	Admin Co	1				
29-65E	Sup & Trans Bn	6				
29-6E	Hq & Hq Co		4		1	
10-7E	Sup & Svc Co		1		5	
55-87E	Trans Mtr Taspt Co		1			
8-35E	Med Bn	5		11		
8-36E	Hq & Spt Co		2		5	
8-37E	Med Co (3/Bn)	1/Co x 3 =	3	2/Co x 3 =	6	
29-25E	Maint Bn	5		6		
29-26E	Hq & Main Spt Co		1			
29-27E	Fwd Spt Co (3/Bn)	1/Co x 3 =	3	2/Co x 3 =	6	
55-89E	Trans Acft Maint Co		1			
17-35E	Tank Bn (3/Div)	78 (26/Bn x 3)		3(1/Bn x 3)		
17-36E	Hq & Hq Co		11		1	
17-37E	Tank Co (3/Bn)	5/Co x 3 =	15			
7-45E	Inf Bn (7/Div)	189 (27/Bn x 7)				
7-46E	Hq & Hq Co		12			
7-47E	Rifle Co (3/Bn)	5/Co x 3 =	15			

TABLE C-I-4

CURRENT DISTRIBUTION OF RADIAC EQUIPMENT IN THE MECHANIZED DIVISION

DA-APPROVED TOE's - 15 JULY 1963

APPENDIX II

SUMMARY OF RECOMMENDED TOE CHANGES

1. Summary of Recommended Changes to ROAD TOE's
(PRIORITY I - Additions and Deletions)

TOE	UNIT	RECOMMENDED CHANGE	
1-56E	Det Hq, Hq & Hq Det, Avn Bn (Abn)	Delete 1	IM-174/PD
1-57E	Co Hq, Air Mbl Co (Lt) (Abn)	Delete 1	"
1-58E	Tac Spt Sec, Avn GS Co (Abn)	Delete 5	"
1-76E	Det Hq, Hq & Hq Det, Avn Bn (Armd, Inf, Mech)	Add 1	"
1-78E	Tac Spt Sec, Avn GS Co (Armd, Inf, Mech)	Delete 5	"
1-78E	Aerial Radar Sec, Avn GS Co, (Armd, Inf, Mech)	Delete 1	"
1-78E	Aerial IR Sec, Avn GS Co, (Armd, Inf, Mech)	Delete 1	"
5-26E	Med Sec, Hq & Hq Co, Engr Bn (Abn)	Delete 1	"
5-146E	Intel Sec, Hq & Hq Co, Engr Bn (Armd, Mech)	Delete 1	"
5-146E	Admin Sec, Hq & Hq Co, Engr Bn (Armd, Mech)	Delete 1	"
5-146E	Div Engr Sec, Hq & Hq Co, Engr Bn (Armd, Mech)	Delete 1	"
5-146E	Bn Maint Sec, Hq & Hq Co, Engr Bn (Armd, Mech)	Delete 2	"
5-146E	Op Sec, Hq & Hq Co, Engr Bn (Armd, Mech)	Delete 1	"
5-156E	Intel Sec, Hq & Hq Co, Engr Bn (Inf)	Delete 1	"
5-156E	Admin Sec, Hq & Hq Co, Engr Bn (Inf)	Delete 1	"
5-156E	Div Engr Sec, Hq & Hq Co, Engr Bn (Inf)	Delete 1	"
5-156E	Bn Maint Sec, Hq & Hq Co, Engr Bn (Inf)	Delete 2	"
5-156E	Op Sec, Hq & Hq Co, Engr Bn (Inf)	Delete 1	"
6-177E	Btry Hq, Fld Arty HJ Btry (Armd, Inf, Mech)	Delete 1	"
6-201E	Avn Sec, Hq & Hq Btry, Div Arty (Abn)	Add 4	"
6-302E	Avn Sec, Hq & Hq Btry, Div Arty (Armd, Inf, Mech)	Delete 5	"
6-358E	Btry Hq, Fld Arty 8-in How Btry (Armd, Inf, Mech)	Delete 1	"
7-16E	Bn Hq Sec, Hq & Hq Co, Inf Bn (Inf)	Delete 2	"
7-36E	Bn Hq Sec, Hq & Hq Co, Inf Bn (Abn)	Delete 2	"
7-36E	Bn Spt Plat Hq, Hq & Hq Co, Inf Bn (Abn)	Delete 1	"
7-42E	Avn Sec, Bde Hq & Hq Co (Inf)	Add 3	"
7-46E	Bn Hq Sec, Hq & Hq Co, Inf Bn (Armd, Mech)	Delete 2	"
10-37E	Co Hq, Sup & Svc Co (Abn)	Add 1	"
11-218E	3 Fwd Area Sigcen Plat Hq, Fwd Comm Co (Abn)	Add 3	"

TOE	UNIT	RECOMMENDED CHANGE	
17-36E	Bn Spt Plat Hq, Hq & Hq Co, Tk Bn (Armd, Inf, Mech)	Delete 1	IM-174/PD
17-36E	Bn Maint Plat, Hq & Hq Co, Tk Bn (Armd, Inf, Mech)	Delete 1	"
17-42E	Avn Sec, Bde Hq & Hq Co (Armd)	Add 3	"
17-76E	Sup Sec, Hq & Hq Trp, Armd Cav Sqdn (Abn)	Delete 2	"
17-78E	2 Aero Sct Sec (Lt), Air Cav Trp (Abn)	Delete 4	"
17-78E	Aero Sct Sec (Hv), Air Cav Trp (Abn)	Delete 2	"
17-108E	2 Aero Sct Sec (Lt), Air Cav Trp (Armd, Inf, Mech)	Delete 4	"
17-108E	Aero Sct Sec (Hv), Air Cav Trp (Armd, Inf, Mech)	Add 2	"
29-2E	Co Hq, Hq & Hq Co & Bd, Spt Comd (Armd, Inf, Mech)	Add 1	"
29-6E	Bn Hq Sec, Hq & Hq Co, Sup & Trans Bn (Armd, Inf, Mech)	Delete 2	"
37-42E	Avn Sec, Bde Hq & Hq Co (Mech)	Add 3	"
55-89E	Co Hq, Trans Acft Maint Co, (Armd, Inf, Mech)	Add 1	"
57-42E	Avn Sec, Bde Hq & Hq Co (Abn)	Delete 3	"

1-56E	Med Sec, Hq & Hq Det, Avn Bn (Abn)	Add 1	AN/PDR-27J
1-57E	Co Hq, Air Mbl Co (Lt) Avn Bn (Abn)	Add 1	"
1-58E	Co Hq, Avn GS Co, Avn Bn (Abn)	Add 1	"
1-76E	Med Sec, Hq & Hq Det, Avn Bn (Armd, Inf, Mech)	Add 1	"
1-77E	Co Hq, Air Mbl Co (Lt) Avn Bn (Armd, Inf, Mech)	Add 1	"
1-78E	Co Hq, Avn GS Co, Avn Bn (Armd, Inf, Mech)	Add 1	"
5-26E	Sup Sec, Hq & Hq Co, Engr Bn (Abn)	Add 5	"
5-26E	Med Sec, Hq & Hq Co, Engr Bn (Abn)	Add 1	"
5-26E	Bn Maint Sec, Hq & Hq Co, Engr Bn(Abn)	Add 1	"
5-27E	Co Hq, Engr Co, Engr Bn (Abn)	Add 1	"
5-146E	Sup Sec, Hq & Hq Co, Engr Bn(Armd,Mech)	Add 5	"
5-146E	Med Sec, Hq & Hq Co, Engr Bn(Armd,Mech)	Add 1	"
5-146E	Bn Maint Sec, Hq & Hq Co, Engr Bn (Armd, Inf, Mech)	Add 1	"
5-147E	Co Hq, Cmbt Engr Co, Engr Bn (Armd, Mech)	Add 1	"
5-148E	Co Hq, Bridge Co, Engr Bn (Armd, Inf, Mech)	Add 1	"
5-156E	Sup Sec, Hq & Hq Co, Engr Bn (Inf)	Add 5	"
5-156E	Med Sec, Hq & Hq Co, Engr Bn (Inf)	Add 1	"

TOE	UNIT	RECOMMENDED CHANGE	
5-156E	Bn Maint Sec, Hq & Hq Co, Engr Bn (Inf)	Add 1	AN/PRC-27J
5-157E	Co Hq, Cmbt Engr Co, Engr Bn (Inf)	Add 1	"
6-156E	Med Sec, Hq, Hq & Svc Btry, Fld Arty 105mm How Bn (Inf)	Add 1	"
6-157E	Btry Hq, Fld Arty 105mm How Btry (Inf)	Add 1	"
6-166E	Med Sec, Hq, Hq & Svc Btry, Fld Arty 155mm 8-in How Bn (Inf)	Add 1	"
6-167E	Btry Hq, Fld Arty 155mm How Btry (Inf)	Add 1	"
6-168E	Btry Hq, Fld Arty 8-in How Btry (Inf)	Add 1	"
6-176E	Med Sec, Hq & Hq Btry, Fld Arty LJ Bn (Armd, Inf, Mech)	Add 1	"
6-177E	Btry Hq, Fld Arty LJ Btry (Armd, Inf, Mech)	Add 1	"
6-201E	Med Sec, Hq & Hq Btry, Div Arty (Abn)	Add 1	"
6-201E	Btry Hq, Hq & Hq Btry, Div Arty (Abn)	Add 1	"
6-216E	Med Sec, Hq, Hq & Svc Btry, Fld Arty 105mm How Bn (Abn)	Add 1	"
6-217E	Btry Hq, Fld Arty 105mm How Btry(Abn)	Add 1	"
6-228E	Btry Hq, Fld Arty LJ Btry (Abn)	Add 1	"
6-302E	Med Sec, Hq & Hq Btry, Div Arty (Armd, Inf, Mech)	Add 1	"
6-346E	Med Sec, Hq, Hq & Svc Btry, Fld Arty 105mm How Bn (Armd, Mech)	Add 1	"
6-347E	Btry Hq, Fld Arty 105mm How Btry (Armd, Mech)	Add 1	"
6-356E	Med Sec, Hq, Hq & Svc Btry, Fld Arty 155mm 8-in How Bn (Armd. Mech)	Add 1	"
6-357E	Btry Hq, Fld Arty 155mm How Btry (Armd, Mech)	Add 1	
6-358E	Btry Hq, Fld Arty 8-in How Btry (Armd, Mech)	Add 1	"
7-16E	Bn Med Plat Hq, Hq & Hq Co,Inf Bn(Inf)	Add 1	"
7-18E	Hq Sec, Rifle Co (Inf)	Add 1	"
7-37E	Hq Sec, Rifle Co (Abn)	Add 1	"
7-46E	Bn Med Plat Hq, Hq & Hq Co, Inf Bn (Armd, Mech)	Add 1	"
7-47E	Hq Sec, Rifle Co (Armd, Mech)	Add 1	"
8-36E	Bn Hq Sec, Hq & Spt Co, Med Bn (Armd, Inf, Mech)	Delete 2	"
8-66E	Maint Sec, Hq & Spt Co, Med Bn (Abn)	Add 1	"
10-7E	Main Sup Plat Hq, Sup & Svc Co (Armd, Inf, Mech)	Add 1	"
10-37E	Co Hq, Sup & Svc Co (Abn)	Delete 2	"
11-36E	Det Hq, Hq & Hq Det, Sig Bn (Armd, Inf, Mech)	Add 1	"
11-37E	Co Hq, Comd Op Co (Armd, Inf, Mech)	Add 1	"
11-38E	Co Hq, Fwd Comm Co (Armd, Inf, Mech)	Add 1	"
11-39E	Co Hq, Sig Spt Op Co (Armd, Inf, Mech)	Add 1	"
11-216E	Co Hq, Hq & Hq Co, Sig Bn (Abn)	Add 1	"
11-217E	Co Hq, Comd Op Co (Abn)	Add 1	"

TOE	UNIT	RECOMMENDED CHANGE	
11-218E	Co Hq, Fwd Comm Co (Abn)	Add 1	AN/PDR-27J
17-18E	Hq Sec, Tank Co (Abn)	Add 1	"
17-37E	Hq Sec, Tank Co (Armd, Inf, Mech)	Add 1	"
17-77E	Hq Sec, Armd Cav Trp (Abn)	Add 1	"
17-78E	Trp Hq, Air Cav Trp (Abn)	Add 1	"
17-107E	Hq Sec, Armd Cav Trp (Armd, Inf, Mech)	Add 1	"
17-108E	Trp Hq, Air Cav Trp (Armd, Inf, Mech)	Add 1	"
29-2E	Hq Sec, Hq & Hq Co & Bd, Spt Comd (Armd, Inf, Mech)	Add 1	"
29-27E	Co Hq, Fwd Spt Co (Mech)	Delete 1	"
29-37E	Maint Plat, Fwd Spt Co (Armd)	Add 1	"
29-52E	Hq Sec, Hq & Hq Co & Bd, Spt Comd(Abn)	Add 1	"
29-57E	Maint Plat, Fwd Spt Det (Abn)	Add 1	"
17-16E	Bn Mort Plat Hq, Hq & Hq Co, Tk Bn(Abn)	Delete 1	AN/PDR-60

The additions and deletions listed above are for company-size unit TOE's only. Larger unit TOE's, which recapitulate equipment in the above units, must also be changed. Proposed radiac equipment totals are presented in tabular form in Appendix III to Annex C.

2. Summary of Recommended Changes to ROAD TOE's
(PRIORITY II - Relocations)

TOE	UNIT	RECOMMENDED RELOCATION		FROM	TO
7-16E	Hq & Hq Co, Inf Bn (Inf)	1	IM-174/PD	Bn Armd Cav Plat Hq	Bn Hv Mort Plat Hq
7-16E	Hq & Hq Co, Inf Bn (Inf)	1	"	Bn Spt Plat Hq	Bn Med Plat Hq
7-16E	Hq & Hq Co, Inf Bn (Inf)	1	"	Sup Sec	Bn AT Plat Hq
7-36E	Hq & Hq Co, Inf Bn (Abn)	1	"	Bn Recon Plat Hq	Bn Mort Plat Hq
7-36E	Hq & Hq Co, Inf Bn (Abn)	1	"	Sup Sec	Bn AT Plat Hq
7-46E	Hq & Hq Co, Inf Bn (Armd, Mech)	1	"	Bn Maint Plat	Bn Hv Mort Plat Hq
7-46E	Hq & Hq Co, Inf Bn (Armd, Mech)	1	"	Bn Spt Plat Hq	Bn Med Plat Hq
7-46E	Hq & Hq Co, Inf Bn (Armd, Mech)	1	"	Sup Sec	Bn AT Plat Hq

TOE	UNIT		RECOMMENDED RELOCATION		
				FROM	TO
5-146E	Hq & Hq Co, Engr Bn (Armd, Mech)	1	AN/PDR-27J	Op Sec	Co Hq
5-156E	Hq & Hq Co, Engr Bn(Inf)	1	"	Op Sec	Co Hq
7-4E	Hq & Hq Co, Div (Inf)	1	"	Co Hq	Med Sec
10-7E	Sup & Svc Co (Armd, Inf, Mech)	2	"	Co Hq	Main Sup Plat Hq
17-4E	Hq & Hq Co, Div (Armd)	1	"	Co Hq	Med Sec
29-27E	Fwd Spt Co (Mech)	1	"	Co Hq	Maint Plat
37-4E	Hq & Hq Co, Div (Mech)	1	"	Co Hq	Med Sec
57-4E	Hq & Hq Co, Div (Abn)	1	"	Co Hq	Med Sec

APPENDIX III

PROPOSED DISTRIBUTION OF RADIAC EQUIPMENT IN ROAD DIVISIONS

TOE	UNIT	IM-174/PD	AN/PDR-27J	AN/PDR-60
57E	AIRBORNE DIVISION	400	101	1
57-4E	Hq & Hq Co	3	2	1
19-67E	MP Co	4		
1-55E	Avn Bn	12	3	
1-56E	Hq & Hq Det	1	1	
1-57E	Air Mbl Co (Lt)	1	1	
1-58E	Avn GS Co	10	1	
11-215E	Sig Bn	6	3	
11-216E	Hq & Hq Co	1	1	
11-217E	Comd Op Co	1	1	
11-218E	Fwd Comm Co	4	1	
5-25E	Engr Bn	25	12	
5-26E	Hq & Hq Co	13	9	
5-27E	Engr Co (3/Bn)	4/Co x 3 = 12	1/Co x 3 = 3	
57-42E	Brigade Hq & Hq Co (3/Div)	18 (6/Co x 3)	3 (1/Co x 3)	
17-75E	Armd Cav Sqn	45	4	
17-76E	Hq & Hq Trp	6	1	
17-77E	Armd Cav Trp (2/Sqn)	14/Trp x 2 = 28	1/Trp x 2 = 2	
17-78E	Air Cav Trp	11	1	
6-200E	Division Artillery			
6-201E	Hq & Hq Btry	6	2	
6-215E	FA How Bn 105mm (3/Div)	12 (4/Bn x 3)	12 (4/Bn x 3)	
6-216E	Hq, Hq & Svc Btry	1	1	
6-217E	How Btry, 105mm (3/Bn)	1/Btry x 3 = 3	1/Btry x 3 = 3	
6-228E	FA Btry, LJ	1	1	
29-51E	Division Spt Comd			
29-52E	Hq & Hq Co & Band	3	1	
12-157E	Admin Co	1		
29-45E	Sup & Trans Bn	4	6	
29-46E	Hq & Hq Det	2	1	
10-37E	Sup & Svc Co	1	5	
10-337E	QM Air Equip Spt Co	1		
8-65E	Med Bn	5	9	
8-66E	Hq & Spt Co	2	3	
8-67E	Med Co (3/Bn)	1/Co x 3 = 3	2/Co x 3 = 6	
29-55E	Maint Bn	6	3	
29-56E	Hq & Main Spt Co	1		
29-57E	Fwd Spt Det (3/Bn)	1/Det x 3 = 3	1/Det x 3 = 3	
55-99E	Trans Acft Maint Co	2		
17-15E	Tank Bn	24	4	
17-16E	Hq & Hq Co	9	1	
17-18E	Tank Co (3/Bn)	5/Co x 3 = 15	1/Co x 3 = 3	
7-35E	Inf Bn (9/Div)	225 (25/Bn x 9)	36 (4/Bn x 9)	
7-36E	Hq & Hq Co	10	1	
7-37E	Rifle Co (3/Bn)	5/Co x 3 = 15	1/Co x 3 = 3	

TABLE C-III-1

PROPOSED DISTRIBUTION OF RADIAC EQUIPMENT IN THE AIRBORNE DIVISION

TOE	UNIT	JM-174/PD	AN/PDR-27J	AN/PDR-60
17E	ARMORED DIVISION	448	117	1
17-4E	Hq & Hq Co	3	2	1
19-27E	MP Co	5		
1-75E	Avn Bn	10	3	
1-76E	Hq & Hq Det	1	1	
1-77E	Air Mbl Co (Lt)	1	1	
1-78E	Avn GS Co	8	1	
11-35E	Sig Bn	7	4	
11-36E	Hq & Hq Det	1	1	
11-37E	Comd Op Co	1	1	
11-38E	Fwd Comm Co	4	1	
11-39E	Sig Spt Op Co	1	1	
5-145E	Engr Bn	32	14	
5-146E	Hq & Hq Co	12	9	
5-147E	Cmbt Engr Co (4/Bn)	4/Co x 4 = 16	1/Co x 4 = 4	
5-148E	Bridge Co	4	1	
17-42E	Brigade Hq & Hq Co (3/Div)	18 (6/Co x 3)	3 (1/Co x 3)	
17-105E	Armd Cav Sqn	59	5	
17-106E	Hq & Hq Trp	6	1	
17-107E	Armd Cav Trp (3/Sqn)	14/Trp x 3 = 42	1/Trp x 3 = 3	
17-108E	Air Cav Trp	11	1	
6-300E	Division Artillery			
6-302E	Hq & Hq Btry	6	2	
6-345E	FA How Bn, 105mm, (3/Div)	12 (4/Bn x 3)	12 (4/Bn x 3)	
6-346E	Hq, Hq & Svc Btry	1	1	
6-347E	How Btry, 105mm (3/Bn)	1/Btry x 3 = 3	1/Btry x 3 = 3	
6-355E	FA How Bn, 155mm, 8-in.	5	5	
6-356E	Hq, Hq & Svc Btry	1	1	
6-357E	How Btry, 155mm (3/Bn)	1/Btry x 3 = 3	1/Btry x 3 = 3	
6-358E	How Btry, 8-in.	1	1	
6-175E	FA Msl Bn, HJ	3	3	
6-176E	Hq & Hq Btry	1	1	
6-177E	FA Msl Btry HJ (2/Bn)	1/Btry x 2 = 2	1/Btry x 2 = 2	
29-21E	Division Spt Comd			
29-2E	Hq & Hq Co & Band	3	1	
12-37E	Admin Co	1		
29-65E	Sup & Trans Bn	4	7	
29-6E	Hq & Hq Co	2	1	
10-7E	Sup & Svc Co	1	6	
55-87E	Trans Mtr Tnspt Co	1		
8-35E	Med Bn	5	9	
8-36E	Hq & Spt Co	2	3	
8-37E	Med Co (3/Bn)	1/Co x 3 = 3	2/Co x 3 = 6	
29-35E	Maint Bn	6	3	
29-36E	Hq & Main Spt Co	1		
29-37E	Fwd Spt Co (3/Bn)	1/Co x 3 = 3	1/Co x 3 = 3	
55-89E	Trans Acft Maint Co	2		
17-35E	Tank Bn (6/Div)	144 (24/Bn x 6)	24 (4/Bn x 6)	
17-36E	Hq & Hq Co	9	1	
17-37E	Tank Co (3/Bn)	5/Co x 3 = 15	1/Co x 3 = 3	
7-45E	Mech Inf Bn (5/Div)	125 (25/Bn x 5)	20 (4/Bn x 5)	
7-46E	Hq & Hq Co	10	1	
7-47E	Rifle Co (3/Bn)	5/Co x 3 = 15	1/Co x 3 = 3	

TABLE C-III-2

PROPOSED DISTRIBUTION OF RADIAC EQUIPMENT IN THE ARMORED DIVISION

TOE	UNIT	IM-174/PD	AN/PDR-27J	AN/PDR-60
7E	INFANTRY DIVISION	427	113	1
7-4E	Hq & Hq Co	3	2	1
19-27E	MP Co	5		
1-75E	Avn Bn	10	3	
1-76E	Hq & Hq Det	1	1	
1-77E	Air Mbl Co (Lt)	1	1	
1-78E	Avn GS Co	8	1	
11-35E	Sig Bn	7	4	
11-36E	Hq & Hq Det	1	1	
11-37E	Comd Op Co	1	1	
11-38E	Fwd Comm Co	4	1	
11-39E	Sig Spt Op Co	1	1	
5-155E	Engr Bn	32	14	
5-156E	Hq & Hq Co	12	9	
5-157E	Cmbt Engr Co (4/Bn)	4/Co x 4 = 16	1/Co x 4 = 4	
5-148E	Bridge Co	4	1	
7-42E	Brigade Hq & Hq Co (3/Div)	18 (6/Co x 3)	3 (1/Co x 3)	
17-105E	Armd Cav Sqn	59	5	
17-106E	Hq & Hq Trp	6	1	
17-107E	Armd Cav Trp (3/Sqn)	14/Trp x 3 = 42	1/Trp x 3 = 3	
17-108E	Air Cav Trp	11	1	
6-100E	Division Artillery			
6-302E	Hq & Hq Btry	6	2	
6-155E	FA How Bn, 105mm (3/Div)	12 (4/Bn x 3)	12 (4/Bn x 3)	
6-156E	Hq, Hq & Svc Btry	1	1	
6-157E	How Btry, 105mm (3/Bn)	1/Btry x 3 = 3	1/Btry x 3 = 3	
6-165E	FA How Bn, 155mm, 8-in.	5	5	
6-166E	Hq, Hq & Svc Btry	1	1	
6-167E	How, Btry, 155mm (3/Bn)	1/Btry x 3 = 3	1/Btry x 3 = 3	
6-168E	How Btry, 8-in.	1	1	
6-175E	FA Msl Bn, HJ	5	3	
6-176E	Hq & Hq Btry	1	1	
6-177E	FA Msl Btry, HJ (2/Bn)	1/Btry x 2 = 2	1/Btry x 2 = 2	
29-1E	Division Spt Comd			
29-2E	Hq & Hq Co & Band	3	1	
12-37E	Admin Co	1		
29-5E	Sup & Trans Bn	4	7	
29-6E	Hq & Hq Co	2	1	
10-7E	Sup & Svc Co	1	6	
55-88E	Trans Mtr Tnspt Co	1		
8-35E	Med Bn	5	9	
8-36E	Hq & Spt Co	2	3	
8-37E	Med Co (3/Bn)	1/Co x 3 = 3	2/Co x 3 = 6	
29-15E	Maint Bn	6	3	
29-16E	Hq & Main Spt Co	1		
29-17E	Fwd Spt Co (3/Bn)	1/Co x 3 = 3	1/Co x 3 = 3	
55-89E	Trans Acft Maint Co	2		
17-35E	Tank Bn (2/Div)	48 (24/Bn x 2)	8 (4/Bn x 2)	
17-36E	Hq & Hq Co	9	1	
17-37E	Tank Co (3/Bn)	5/Co x 3 = 15	1/Co x 3 = 3	
7-15E	Inf Bn (8/Div)	200 (25/Bn x 8)	32 (4/Bn x 8)	
7-16E	Hq & Hq Co	10	1	
7-18E	Rifle Co (3/Bn)	5/Co x 3 = 15	1/Co x 3 = 3	

TABLE C-III-3

PROPOSED DISTRIBUTION OF RADIAC EQUIPMENT IN THE INFANTRY DIVISION

USACDCCBRA 64-8

TOE	UNIT	IM-174/PD	AN/PDR-27J	AN/PDR-60
37E	MECHANIZED DIVISION	426	113	1
37-4E	Hq & Hq Co	3	2	1
19-27E	MP Co	5		
1-75E	Avn Bn	10	3	
1-76E	Hq & Hq Det	1	1	
1-77E	Air Mbl Co (Lt)	1	1	
1-78E	Avn GS Co	8	1	
11-35E	Sig Bn	7	4	
11-36E	Hq & Hq Det	1	1	
11-37E	Comd Op Co	1	1	
11-38E	Fwd Comm Co	4	1	
11-39E	Sig Spt Op Co	1	1	
5-145E	Engr Bn	32	14	
5-146E	Hq & Hq Co	12	9	
5-147E	Cmbt Engr Co (4/Bn)	4/Co x 4 = 16	1/Co x 4 = 4	
5-148E	Bridge Co	4	1	
37-42E	Brigade Hq & Hq Co (3/Div)	18 (6/Co x 3)	3 (1/Co x 3)	
17-105E	Armd Cav Sqn	59	5	
17-106E	Hq & Hq Trp	6	1	
17-107E	Armd Cav Trp (3/Sqn)	14/Trp x 3 = 42	1/Trp x 3 = 3	
17-108E	Air Cav Trp	11	1	
6-300E	Division Artillery			
6-302E	Hq & Hq Btry	6	2	
6-345E	FA How Bn, 105mm (3/Div)	12 (4/Bn x 3)	12 (4/Bn x 3)	
6-346E	Hq, Hq & Svc Btry	1	1	
6-347E	How Btry, 105mm (3/Bn)	1/Btry x 3 = 3	1/Btry x 3 = 3	
6-355E	FA How Bn, 155mm, 8-in.	5	5	
6-356E	Hq, Hq & Svc Btry	1	1	
6-357E	How Btry, 155mm (3/Bn)	1/Btry x 3 = 3	1/Btry x 3 = 3	
6-358E	How Btry, 8-in.	1	1	
6-175E	FA Msl Bn, HJ	3	3	
6-176E	Hq & Hq Btry	1	1	
6-177E	FA Msl Btry, HJ (2/Bn)	1/Btry x 2 = 2	1/Btry x 2 = 2	
29-11E	Division Spt Comd			
29-2E	Hq & Hq Co & Band	3	1	
12-37E	Admin Co	1		
29-65E	Sup & Trans Bn	4	7	
29-6E	Hq & Hq Co	2	1	
10-7E	Sup & Svc Co	1	6	
55-87E	Trans Mtr Tnspt Co	1		
8-35E	Med Bn	5	9	
8-36E	Hq & Spt Co	2	3	
8-37E	Med Co (3/Bn)	1/Co x 3 = 3	2/Co x 3 = 6	
29-25E	Maint Bn	6	3	
29-26E	Hq & Main Spt Co	1		
29-27E	Fwd Spt Co (3/Bn)	1/Co x 3 = 3	1/Co x 3 = 3	
55-89E	Trans Acft Maint Co	2		
17-35E	Tank Bn (3/Div)	72 (24/Bn x 3)	12 (4/Bn x 3)	
17-36E	Hq & Hq Co	9	1	
17-37E	Tank Co (3/Bn)	5/Co x 3 = 15	1/Co x 3 = 3	
7-45E	Inf Bn (7/Div)	175 (25/Bn x 7)	28 (4/Bn x 7)	
7-46E	Hq & Hq Co	10	1	
7-47E	Rifle Co (3/Bn)	5/Co x 3 = 15	1/Co x 3 = 3	

TABLE C-III-4

PROPOSED DISTRIBUTION OF RADIAC EQUIPMENT IN THE MECHANIZED DIVISION

ANNEX D

SURVEY OF ENEMY-HELD TERRITORY

1. The requirement for radiological survey of enemy-held territory is based on the requirement for radiological intelligence outlined in Annex B, paragraph 3.

2. For the purpose of this study, the division will be assumed to have immediate concern with an area approximately thirty miles deep into enemy territory. This figure is flexible since the division zone of influence will depend upon the range of its weapons, but its zone of interest will depend upon the action or operation planned.

3. The following possibilities for radiological survey of enemy-controlled territory will be discussed briefly:

Foot patrols
Vehicular patrols
Manned aircraft reconnaissance
Drone reconnaissance
Remote control monitoring

a. Foot patrols would involve all the disadvantages of ground radiological survey discussed in Annex B with the additional disadvantage of a much higher probability of capture or destruction. In special circumstances they could be employed as a clandestine means for determining radiation readings at a particular point or over a particular route in enemy-controlled territory. Foot patrols will not be capable of large-area survey in enemy-held territory.

b. Vehicular surveys have the advantage of providing partial radiation shielding and more speed than foot patrols. Opportunities for clandestine survey of enemy-controlled territory by vehicle will be highly improbable. This method will probably find its only application as a part of a "reconnaissance in force."

c. The present doctrine for aerial survey is applicable to enemy as well as friendly territory. 4/ The fact that an altitude of two hundred feet (or less) is considered optimum for radiological survey should help prolong the life of aerial survey craft over enemy-controlled territory. The slow speed considered optimum for the radiac instrument now used for aerial survey (IM-174/PD), however, is a distinct disadvantage; the employment of the forthcoming rapid-response AN/ADR-6 will greatly improve this situation. With the advent of automatic position-locating devices, the difficulty of position finding over unfamiliar territory during both day and night will be greatly eased. Manned aerial survey

is entirely within the capabilities of Army aircraft with the risk, of course, of losing highly-trained personnel and equipment through enemy action.

d. Once the navigational and flight control problems associated with drones have been solved, radiological survey of enemy-controlled territory by drones would seem to be the optimum method. Using terrain avoidance radar, drones could fly fast and low, offering only a small, short-duration target and thereby minimizing loss. In the event of loss through enemy action, no highly-trained personnel will be lost, and the data collected to that time will have been telemetered to the ground control station.

e. Radiation telemetering devices rocketed, dropped, or planted in enemy-held territory present limited promise. Although significant information could be obtained on a continuing basis concerning dose rates and rate of decay in enemy-controlled territory without risking friendly personnel, it would take a great number of devices to present a complete picture of the radiological contamination. Further, unless the devices were planted by hand, it would be difficult to determine whether readings were taken at the bottom of an abandoned foxhole, on top of a tree, or on a representative surface of the ground.

ANNEX E

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ANNEX F

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