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ROYAL AIRCRAFT ESTABLISHMENT

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DEFENCE RESEARCH ABSTRACTS

UNCLASSIFIED ISSUE 68/69-2

Issued by the Research Institute for National Defence, Stockholm

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(FRÖ FÖRSVARS FORSKNINGS REFERAT. ÖPPEN DEL)

Issued by the Research Institute for National Defence, Stockholm

Translated by

F. W. Read

Translation edited by

M. G. B. Weedon

EDITOR'S SUMMARY

The Swedish Research Institute for National Defence issues a quarterly list of unclassified reports published by the Institute. The titles of these reports and informative abstracts have been translated into English. This volume covers the second quarter of 1969. Further volumes will be translated in due course. The main topics covered are, Studies (System Analyses), Nuclear Reaction, Chemical and Biological Warfare, Conventional Warfare, Applied Physics, Teletechniques, Biotechnology, Other Investigations, Military Psychology, Psychological Defence.

I STUDIES

IC Planning of scientific study

(108) FOA index report A0613-10.

Possibilities of improving regular documentation services.

R. Moore October 1968

Following a review of different experiences of direct significance in large scale activities and of different problems in organisation within the field of documentation, an FOA index working party submits its views on the realistic possibilities that exist for improving regular documentation services, mainly with the help of computers. The aim is to put forward recommendations for procedure that will satisfy the most exacting requirements for some years to come while the computer application matures. Proposals are also suggested for such investigations, and for the research activity and the organisation which is required in order to start and accelerate development so that the full benefit is achieved as soon as possible for all the many sections of a documentation service. The treatment of the subject is generally applicable to the Swedish conditions but special finance is required for appropriate returns within the Defence Organisation, in particular within FOA.

(109) FOA index report B0602-10.

Document specification and search strategy using basic intersections and the probability measure of sets.

W. Uhlman

Am. Documentation, Vol.19, pp 240-246, 1968.

FOA reprints 1968:48.

The use of basic intersections and probability measures for sets in order to formulate document specifications and search questions in co-ordinated indexing systems is discussed. It is possible to formulate a probability search equation which represents the comparison operation between the question and the document's specification. In addition to the usual set of descriptive terms, the equation contains a part consisting of a matrix formulation of the probability tables for the specifications. By an operation between these matrix formulations a new table of facts is obtained referring to the part of the set, describing terms which are common to both the questions and the document's specification. From this a quantitative criterion for correlation follows. Certain numerical values of the criterion can be specified by deduction and used for guiding the search operation.

(110) FOA index report C8220-10.

Corsair II - A general purpose computer programme system for handling files.

W. Uhlmann (ed). October 1968

The report consists of the arrangements and lectures for a symposium at FOA on 20 May 1968.

W. Uhlmann - Prefatory remarks.

M. Fehrm - Greetings and acknowledgements.

R. Moore - Introductory remarks.

L. Högberg - CORSAIR II - building the programme.

C. G. Mörner (Swedish Radio) - A system for analysis and planning of Swedish Radio Music programme.

A. Helmar and W. Uhlmann - Swedish music history, index of recorded concerts.

W. Uhlmann - A computer index for the administration of a store of measuring instruments.

R. Moore - Concluding remarks.

(111) FOAP report C8212-10.

On complex systems with human components.

A. Danielsson, H. Törnebohm. September 1968

A summary of lectures given during 1965 to 1967 arranged by the Institution of Economics in Gothenburg and the Institution of Theoretical Science (Gothenburg University).

Main headings:-

General Methodological Studies,

Towards a theory of organisation and administration,

Economic aspects of systems,

Planning aspects of systems,

The individual in the system,

Prospecting in science,

Appendix: Scientific enterprises considered from a biological point of view.

(112) FOA P report C8220-10.

CORCOR - Automatic error correction in CORSAIR data.

J. Palme December 1968

It is a well known fact that errors in punched holes and other mistakes arise in large manually produced data files. CORSAIR is an example of one such programme which deals with large files with alphanumeric text (CORSAIR is a flexible, automatic documentation system which was developed by FOA). The report describes a programme which facilitates the elimination of such errors. The correction is carried out by a special elimination card which carries the track to be corrected. Every correction consists of a reference number, a distinguishing track and a correction track. The programme replaces all copies of the distinguishing track in the reference by the corrected track.

11 Methods of study

(113) FOA 2 report C2275-11(25).

Numerical solution of Abel's integral equation. Application to a Röntgen transmission problem.

B. Einarsson October 1968

Object: To develop and test a method for the numerical solution of a Röntgen transmission problem.

Method: The Röntgen transmission problem is the origin of an integral equation which can be transferred into Abel's integral equation

$$\frac{g(y) = \int_0^y f(x)\,dx}{\sqrt{y-x}}$$

where $g(y)$ is known and $f(x)$ is unknown. The integral equation is solved with the help of spline-interpolation of the known function. The calculations have been programmed in FORTRAN IV and carried out on IBM 7090.

Result: An example is given with two different computing intervals. These give good agreement. The method compares favourably with conventional methods because it only requires a small amount of input data.

(114) FOA 2 report C2276-11(52)

Digital Fourier analysis in two dimensions.

J. Eklundh October 1968

The report contains an abstract of the theory of digital Fourier analysis in two dimensions. Some observations on the numerical calculations

are given. It also describes the programme for calculating finite Fourier-transforms with Cooley-Turkeys algorithm, in one and two dimensions. The programme is written in FORTRAN IV for IBM 7090.

(115) FOA P report C8217-11.

European Conference on Technological Forecasting.

Glasgow, 24 to 26 June 1968, and the National Conference on Technological Forecasting, Harrogate, 4 to 5 July 1968.

N. Lundquist and others October 1968

The report gives some impressions from a European Conference in Glasgow and a National Conference in Harrogate on the subject of technical scientific prognosis. In addition there is a catalogue of the lectures given at the congresses.

(116) FOA P report C8218-11.

On genealogical trees containing quadratic residues.

B. Jansson November 1968

The sequence of numbers generated by $X_{n+1} \equiv X_n^2 \pmod{m}$ is discussed. The condition for the existence of automorphic numbers (i.e. numbers which generate themselves) is given. Some genealogical trees are presented and a number of these extreme points are determined. This process is equivalent to calculating the number of incongruent quadratic residues. This leads on to the number of different trees as a function of the module and some properties are demonstrated which depend on the form of the trees.

(117) FOA P report C8219-11.

The number of incongruent residues of q:th powers modulo an arbitrary number.

B. Jansson November 1968

It is assumed that x, q, a and n are such whole numbers that $q > 2$, $n > 1$ and $0 < X, a < n-1$ and that the congruent $X^q \equiv a \pmod{n}$ is considered. Two problems are dealt with: (1) For how many values of a can the congruent be solved? (2) For $N = m^\alpha$, where m and α are natural numbers, determine the limiting values when $\alpha \to \infty$ for the fraction of a-values for which the congruent is solvable.

(118) FOA P report C8221-11.

IFIP Congress 1968 in Edinburgh.

B. Arvén and others November 1968

A short review of the IFIP-congress (International Federation of Information Processing) in Edinburgh 1968.

(119) FOA 1 report C8122-11.

System analysis and long term planning

I. Ståhl, B. Ysander May 1968

Revised edition of FOA 1 report C122, November 1964.

The report discusses a serial system-analysis problem formulation which arises in long term planning. The report is the first of a series of studies and the main emphasis is in a summary of general problem situations which are relevant for continuing the study of long term planning in total defence and its different parts.

In this second edition, issued in May 1968, only small revisions and re-working of parameters of the main formula have been carried out. The lists of literature references have been completed to a limited extent, by the work carried out after the first edition was published.

2 NUCLEAR REACTIONS

23 Physical investigations (nuclear)

(120) FOA 4 report B4024-23.

Effect of pressure on the D-character of the elements K to V.

K. Berggren.

Phys. Letters, Vol.27A, pp 125-126, 1968.

FOA reprint 1968:29.

'The number of d-electrons' in the elements K to V has been analysed as a function of the pressure starting with the statistical model of compressed material.

(121) FOA 4 report B4021-23.

A possible generalised instability criterion applied to the one dimensioned δ-function interacting Fermi gas.

B. Johansson.

Nuovo. Cim. Ser. X. Vol.55B, pp 305-314, 1968.

FOA reprint 1968:30.

On approaching the transformation point from the normal phase a collective excitation takes place before the complete condition of instability and in so doing signals the beginning of the change to the new phase in the system. On studying the collective excitations around the normal condition beyond the transformation point one finds however, that a whole series

of different collective movements (all with the same character) are unstable. From this source of instability one looks for the 'most unstable', which it is then suggested, gives information about the character of the new condition. These ideas apply to a single dimensional Fermi gas with repulsive δ function interaction effects between the particles.

(122) FOA 4 report B4022-23.

A field theoretical description of states with different orbitals for different spins.

K. Berggren, B. Johansson

Intern. J. Quantum Chem., Vol.2, pp 485-508, 1968.

FOA reprint 1968:31.

A field theoretical formula is given for the condition 'different orbitals for different spins' (DODS). For an infinite system DODS describes an anti-ferromagnetic condition, and to respond to the spin order Gorkov factorisation is introduced. The corresponding gap equation is deduced and its non vanishing solutions indicate the presence of macroscopic order at the systems' spin frequency. In itself, the work of formulation is sufficiently general for DODS to become a special case. Consequently a ferromagnetic condition can also be obtained as well as a density wave condition, as solutions to the gap equation depending on the special conditions in the actual system.

A similar type of anti-ferromagnetism is described by Overhauser's spin density wave (SDW) condition and this theory is also formulated in theoretical field terms. Similarities and differences between DODS and SDW are discussed. The energy expression for the two conditions is given in the Hartree-Fock approximation. It assumes that the SDW condition can be used partially to answer the correlation problem in molecules just as well as the DODS method which has been used earlier for this purpose.

(123) FOA 4 report B4023-23.

Paramagnetic susceptibility and stability of the electron gas in a modified Hartree-Fock approximation.

B. Johansson, K. Berggren.

Nuovo Cim., Vol.50, pp 362-366, 1967.

FOA reprint 1968:34.

The Fermi-Thomas screening distance λ is deduced from a self consistent requirement. The screening distance obtained in this way is used in a reciprocal interaction of the Yukawa type, $e^{-r/\lambda}/r$. With this reciprocal

interaction the Hartree-Fock expression is calculated for the energy in a weak spin polarised condition. The spin susceptibility follows from this and is calculated for different densities of electrons. The correction from the requirement on a self consistent [illegible] is found to be small. Finally, the stability of the paramagnetic condition in relation to the completely polarised ferromagnetic condition is studied.

(124) FOA 4 report B4024-23.

Geometrical model of relativistic xtv space.

A. Bergström

Am. J. Phys., Vol.36, pp 3[illegible]-3[illegible], 1968.

FOA reprint 1968:40.

A model in general Euclidian geometry is presented to illustrate the Lorentz-transformation in the special theory of relativity. In one version of the model, the space co-ordinate x in the direction of movement, the time co-ordinate $\tau = ct$, and the velocity co-ordinate $\beta = v/c$, are represented in a cylindrical co-ordinate system r, φ, z with $r = \tau$, $\varphi = \arcsin \beta$ and $z = x$. An alternative version is given where $r = x$, $\varphi = \arcsin \beta$ and $z = \tau$.

In both versions an occurrence is represented as a generator to a single hyperboloid with axis in the z direction. An analogy between the event lines in the xtv space and beams of light in ordinary space/time is discussed, and it is shown that from the model and Huygens principle it follows that it is possible to perform Lorentz invariant observations despite Euclidian metrics.

25 Description of nuclear weapons and their functions, see reference (113)

26 Mechanical and thermal effects of nuclear explosions

(125) FOA 4 report C4376-26.

Seismic records from the U.S. nuclear explosion 'Faultless' in Nevada 19 January 1968, obtained at Hagfors temporary Seismological Station, Sweden.

O. Dahlman November 1968

The report gives an account of the long and short periodic recordings made at the temporary seismological station in Hagfors, from the large nuclear explosion 'Faultless' in Nevada, 19 January 1968. A dispersion curve for the group velocity of Rayleigh waves from Nevada to Hagfors has been determined.

The magnitude of P and Rayleigh waves were found to be 6.5 and 4.9 respectively.

(126) FOA 4 report C4377-26.

Criteria for the recognition of air waves from nuclear explosions and data for such waves from Novaya Zemlya.

H. Wägner November 1968

The object of the report is to describe a reliable method by which the atmospheric gravitation waves from nuclear weapon explosions can be identified in microbarographic recordings, when other information indicates that a nuclear explosion has taken place. The method has been used for establishing a basic table of such recordings from 36 nuclear weapon explosions during the years 1958, 1961 and 1962 in the atmosphere over the Novaya Zemlya district. Also presented is a corresponding list of the wave parameters and also a list of the microbarographical stations.

The problem discussed is separate from the inverse and more general problem which infers the occurrence of nuclear weapon explosions from microbarographical recordings.

27 Effects of nuclear explosions on man.

See also reference (135).

(127) FOA P report A1449-27.

A survey of the effect of nuclear explosions on man.

A. Nelson and others October 1968

The report deals with the state of knowledge and additional investigations needed concerning damage by radiation (acute and chronic), damage by burns (direct and indirect), shock wave damage and damage by a combination of these.

(128) FOA P report B1065-27.

Cytoplasmic ultraviolet extinction of Strontium 90 induced fibroblastic osteosarcomas correlated to histologic appearances and ultra structure.

P. Sundelin, A. Nilsson

Acta Radiol. Therapy Phys. Biol, Vol.7, pp 161-170, 1968.

FOA reprint 1968:28.

Strontium 90 induced osteosarcomas in different states of development have been studied with UV microphotometry and the electron microscope. The

gradually increased UV absorption could be correlated with more advanced morphological studies into the development of the tumours.

(129) FOA P report B1066-27.

Experimental and clinical aspects of combined injuries.

B. Schildt (FOA), L. Thoren (Uppsala University)

Intermedes Proceedings 1968. Combined injuries and shock, Research Institute for National Defence, Stockholm, 1968, pp 3 to 15.

FOA reprint 1968:35.

The report proposes and explains an extension of the concept of combined injuries concerning a complex injury caused by an almost simultaneous exposure to two or more forms of energy or powerful physical effects. According to this definition therefore, ionising radiation is not a necessary component for combined injuries.

It is suggested that the LD concept is used for quantifying traumatic components in combined injuries.

As regards the effect of combined injuries, there are three factors of vital significance as follows: (1) the different traumatic intensity (2) the order in which they happen, and (3) the time delay between them. These factors are discussed. The principles for treatment of combined injuries are dealt with.

(130) FOA P report B1067-27.

Combined effect of ionizing radiation and bacterial toxin in mice.

B. Schildt and others.

Intermedes Proceedings 1968: Combined injuries and shock, Research Institute for National Defence, Stockholm, 1968, pp 75-81.

FOA reprint 1968:36.

The combined effect of Pasteurella pseudo-tuberculosis-toxin and acute radiation of the whole body by röntgen radiation has been examined on mice. Toxin and radiation doses were from about 0.5 LD_{50} to LD_{70}, both separately and in different combinations and at different intervals of time.

(131) FOA P report B 1068-27.

The effect of different types of injuries on the methylcarbylamine level in mice.

K. Lindstrand, B. Schildt.

Intermedes Proceedings 1968. Combined injuries and shock.

FOA reprint 1968:37.

The relationship of methylcarbylamine to the amount of B_{12} derived in extracted B_{12} from mouse liver is shown to be very much reduced by injuries different kinds (mechanical trauma, burn injuries or ionising radiation, separately or in different combinations). The change in the relationship runs parallel with the degree of severity of the injuries.

Possible explanations of the phenomenon are discussed.

(132) FOA F report B1069-72.

Radiolysis of 4-thiouracil and of the 4-thiouracil moieties of 4-thiouridine and transfer ribonucleic acid from escherichia coli in aqueous solution.

B. Sörbo, B. Lundberg

Biochem. Biophys. Acta. Vol.157, pp 445-454; 1968.

FOA reprint 1968:38.

4-thiouracil, 4 thiouridine and transfer ribonueleic acid (RNA) from escherichia coli irradiated by röntgen rays in air saturated solution, were subsequently radiolysised and the remainder of the 4-thiouracil was determined by spectrophotometric means. The exponential curves for dose effect were obtained. The remainder of thio pyrimidine was found to be more sensitive to radiation than the corresponding oxygen analogues.

28 Radiation, the effect of, and protection against nuclear explosions

(133) FOA 4 report C4378-28.

Studies on plant accumulation of fission products under Swedish conditions IX. Absorption of Strontium 90 and Calcium 45 and its dependence on the chemical properties of the soil.

L. Fredriksson and others December 1968

The uptake of strontium 90 and alcium 45 by red clover has been studied in trials with 169 soils representing the most important types of Swedish arable land. By means of multiple regression analysis connections were established which should be useful in quantitative calculations of the take-up by vegetation of both the nuclei where they are added in known or calculable amounts, to arable land of different types.

3 CHEMICAL AND BIOLOGICAL WARFARE

30 Chemical and biological warfare-general

See also reference (147).

(134) FOA P report A1453-30.

Biological and chemical warfare.

S. Jacksén and others November 1968

Strategisk Bulletin, Vol.4, No.3, pp 1-32, June 1968.

Biological and chemical warfare are often mentioned in general summaries together with atomic warfare under the heading ABC warfare. In contrast with the situation for nuclear weapons, biological and chemical weapons have never before become the subject of deeper or broader debate outside expert circles. Within the limited space available, the authors give a representative picture of the equipment situation as it applies to B and C warfare, technically conceivable attacks with such weapons and the protection against such attacks, political obstacles to attack, the history of B and C weapons, etc. (Obtainable from U.P.I., price 4.50 kr)

(135) FOA P report A1453-30(36, 27).

An account of a study journey to Japan to participate in the Seventh International Biochemistry Congress in Tokyo 1967.

J. Lundin and others December 1968

During the period 15 August to 4 September 1967, the authors undertook a study journey to Japan to participate in the Seventh International Biochemistry Congress. In connection with the Congress the Universities of Tokyo, Kyoto, Osaka and Nagoya were visited. Some national research institutions and some scientific laboratories connected with industry were also visited. The study journey was intended to obtain more information of a basically scientific character for investigations in progress at FOA in connection with protection against B and C warfare.

(136) FOA P report C1288-30.

Warm air decontamination of the material for uniforms under experimental laboratory conditions.

A. Bovallius and others October 1968

The purpose of the investigations reported on was to determine the connection between time and temperature for sterilising contaminated uniform material with warm air. The main part of the experiment has been devoted to killing bacteria and bacteria spores in both summer and winter uniform material. There is also an appendix which gives an account of experiments on the mechanical properties of uniform material after heat treatment at different temperatures and the soaking time of the summer uniform after different sterilising and washing procedure.

31 Examination of chemical warfare

(137) FOA P report B1070-31.

Relationship between drug-induced changes in blood pressure and cerebral oxygen availability.

S. M. Aquilonius and others

By means of open polarographic electrodes it has been possible to show reproduceable measured changes in the supply of oxygen to the brain (aO_2). The authors have established with this method a connection between blood pressure changes and the brain's aO_2 by the effect of noradrenalin, acetycholine and hexamethane on anesthetised cats and rabbits. In the case of acetycholine and hexamethane, the effect evoked on aO_2 was clear however long before the blood pressure returned to normal. The increase in aO_2 by adrenalin was always less than the increase evoked by (equivalent) blood pressure increase i.e. by noradrenalin, a condition that can depend on the fact that adrenalin also increases the brain's oxygen consumption.

(138) FOA P report C1290-31

Fifth International Symposium on the chemistry of natural products. London, July 1968.

M. Kowalska October 1968

The author attended the fifth International Symposium on the Chemistry of Natural Products which was held in London. Some 1000 people attended including M. Shemyakin, D. Arigoni, E. Lederer, and R. B. Woodward. The congress lectures were mainly concerned with bio-synthesis and nearly as much with terpenes and steroids. Due to the numerous lectures there was only a short time for discussions which many considered to be a great loss.

(139) FOA P report C1291-31.

The conditions for hydrogen bonds in a group of psychotomimetic active benzyl-acid-esters.

L. Larsson and others October 1968

The structural factors which are thought to contribute to the psychotomimetic activity of a benzylacid ester series are discussed. In the range 3500 to 3600 cm^{-1}, the infra red spectrum of the subjects studied showed two absorption bands of which those in 3510 to 3520 cm^{-1} band come from a hydroxyl group with intra molecular bonds to carbonyl oxygen. The other absorption band at about 3600 cm^{-1} can be credited to a hydroxyl group which is probably

the weak hydrogen bond to the π system. Whether a full hydroxyl group also exists in these benzylates can only be decided after a detailed band analysis.

The investigation further shows that the benzyls strongly associate when the concentration exceeds 0.2 mol/l. An approximate method for calculating equilibrium constants for the inter and intra molecular hydrogen bonds has been worked out.

33 Spreading and propagation (B and C warfare)

See also reference (147).

(140) FOA P report C1289-33.
Aerosol generators, the spinning disc.
N. Ekman October 1968

An aerosol generator has been constructed on the principle of the spinning disc. It is driven by compressed air and has a maximum speed of 70000 to 75000 rev/min. Various types of liquid sprays can be used. Particles with a volume of median diameter up to 5 to 6 μm can be generated. The particle spectrum becomes very broad.

35 Decontamination (B and C warfare).

(141) FOA P report C1297-35.
Tests on DS2 as a B-decontaminant.
Å. Bovallius, E. Brannkarr December 1968

The possibility of using chemical warfare (C) decontaminant DS2 as a means of B (Bacteriological) decontamination of war vehicles has been examined. The method has a limited effect against gram-negative test bacteria but no effect against gram-positive test bacteria or against bacteria spores within the recommended effective time for C-warfare material. Addition of some conventional disinfectants gave some, but not enough, increase in bacteriocidal effectiveness. DS2 therefore cannot be considered effective as a means of B-decontamination.

36 Treatment and medical antidotes. (B and C warfare.)

See also reference (135).

37 Personal protective material (B and C warfare)

(142) FOA P report A1456-37.

Protecting mask for the civil population. Prototypes for under and over sizes.

G. Persson, H. Ronge December 1968

During the period 9 to 13 September 1968, FOA co-operated with the Institution for Hygiene, Gothenburg University, to plan and carry out tests on protection masks for the civil population in order to judge the prototypes of over and under sizes respectively, as delivered from Trelleborgs Rubber Corp. Ltd., of Trelleborg.

Suitable sizes were studied on 141 experimental people representing a statistical selection of the civil population in wartime and were found to be in full agreement with the experimental interpretation as derived from the three so-called normal heads. The success rate with the present material has been considerably over the rates set up by the Civil Defence Authority.

Both prototypes can be used as a basis for future makes. The over-size ought possibly to be modified so that the bulge which exists in the packing braid in the part over the temples, is increased in thickness by 0.5 to 1.0 mm. By this change an easier and more adequate seal against the face is obtained. The securing band was the same as for normal sizes. It can be used for both the over and undersizes without difficulty or inconvenience.

38 Collective protective material (B and C warfare).

(143) FOA P report A1450-38.

Functional tests and check of air cleaning arrangements etc. in the design of 'Myran'.

A. Åström, B. Sandlin October 1968

A report on the results of tests for gas tightness and functioning of the air cleaning arrangements etc., with regard to protection against airborne ABC-warfare. The observations made have been added to proposals for helping to overcome shortcomings.

(144) FOA P report A1451-38.

Final report on air cleaning arrangements in the 'Tumlaren' installation.

B. Sandlin, G. Hansson September 1968

The installation "Tumlaren" has been tested previously by FOA with unacceptable results as regards the gas tightness and air cleansing arrangements.

An account is given of continued tests which mainly consisted of checking gas tightness and arrangements for regeneration. Remaining observations have been combined with proposals for procedure that remedy the shortcomings.

(145) FOA P report A1454-38.

Functional tests and check on air cleaning arrangements etc., in 'Sparven' installation.

G. Hansson, B. Sandlin December 1968.

An account is given of tests which included the effectiveness of the installations gas tightness, a functional test and a check of the air cleaning arrangements. Provided that observations are carried out in a satisfactory way the air cleaning arrangements can be considered fully satisfactory under load conditions and dangerous gases.

(146) FOA P report A1455-38.

Functional tests and check of the air cleaning arrangements in the protection installation 'Kronet'.

B. Sandlin, G. Hansson December 1968

An account is presented of the results of gas tightness tests and functional tests of air cleaning arrangements etc., with respect to protection against ABC-warfare. The observations made have been combined with proposals which when carried out, will remedy shortcomings.

(147) FOA P report C1296-38(33, 30).

Leakage ingress studies. Preliminary trials on pill box type SK10 and housing for troops type 20.

G. Persson, K. Wassholm December 1968

Trials have been made to study how an aerosol cloud finds ingress into a field fortification and into housing for troops type 20. The method for carrying out the trials was found to be suitable. The aerosol forced its way into the entrance part of the protecting room after a delay of about 1 minute. The SK10 box was gas tight. On leaving the pill box the quantity inside was at maximum 1/15 of the quantity in the entrance part of the box. The leakage-in factor for the entrance part was measured as 3×10^{-3}.

The aerosol forced its way in after 1 to 2 minutes delay in the test on the protecting room type 20. The leakage-in factor was measured as an order of size of 3×10^{-2}. The curves for concentration/time and dose/time outside and inside the tent give a good illustration of how simple, relatively leaky space can be protected against clouds of aerosol gas.

4 CONVENTIONAL WARFARE

40 Conventional warfare - general

(148) FOA P report A1452-40.

The effect of igniting small amounts of explosive material in a laboratory container of glass and polythene.

S. Lamnevik, A. Boström November 1968

The dispersion and density of splinters have been examined with some simulated narrow escapes and with small quantities of explosive material in laboratory containers of glass and polythene. Injuries have been studied on the hands of dummies. The work has resulted in some simple rules for working with explosive materials in a laboratory environment.

(149) FOA P report C1267-40(46, 48).

Reproduction of oscillograph recordings for report purposes.

S. Thorén October 1968

Sensitive oscillograph paper recording traces have proved difficult to reproduce simply for report purposes. Tests have accordingly been made with different oscillograph papers with respect to the time for lighting and chemical development together with possibilities of reproducing results with Xerox, electric stencil and offset. The effect of the spray solution for stabilisation and development of light recordings is explained as well as the influence of sun light before chemical stabilizing of recordings.

The tests show that acceptable reproduction in offset or an electric stencil can be obtained if the original recording has been Xerox copied beforehand. Photographic reproduction gives good results but demands more time.

41 Explosives

(150) FOA P report A1457-41.

Programme for calculating the hydrodynamic effects following detonation of a spherical charge in water.

B. Hellgren December 1968

A FORTRAN programme for calculating the hydrodynamic effects following the detonation of spherical charges under water is described. The input data to the programme requires the explosive charges Chapman-Joguet conditions as well as the p-V-E condition equation for the products of detonation. The programme can easily be modified for detonations in other media than water,

because the routines for the surrounding mediums condition equation and the local speed of sound are interchangeable.

Starting conditions (the detonation wave) can either be calculated with the programme, in which case no regard is taken of differences from ideal detonation, or prescribed by the user through data cards. After that the differential approximations of the hydrodynamic partial differential equations are integrated to a previously selected point in time. The discontinuities of the shock wave fronts are treated with von Neumann-Richtmyers q-method.

As a result tables can be made and/or curves plotted for the pressure, density, particle velocity, specific inner energy etc., both as a function of the distance from origin with prescribed points in time, and as a function of the time for prescribed distances from the origin. Likewise tables and/or curves can be made for the position of the outer limit and the position of the front of the main shock wave, together with the pressure at the front and the speed of propagation of the front as a function of its position.

44 Ammunition-warheads - external ballistics

(151) FOA 2 report C2286-44.
Cylindrical and spherical symmetric wave propagation in rock.
C. Asklöf, Å. Hylander December 1968

By request of the Swedish Institute for Explosives Research (Stiftelsen Svensk Betonikforskning) work has been carried out on numerical calculations of cylindrical and spherical symmetric wave propagation. These calculations are intended to explain the mechanical strains which take place in the surrounding rock when an explosive charge is detonated in a bore hole. Modified criteria according to Coulomb and von Mises have been applied to describe the properties of the rock material. The numerical values in the criteria have been obtained from measurements carried out at the Swedish Institute for Explosives Research. The cost for calculations of this sort on a computer are very modest, about 200 kronor per set of calculations.

The programme which is used allows constituent equations for the material of considerable arbitrariness but suffers from the limitation that it can only handle such a course of events as can be described by a single spatial variable. Expansion of the programme to two spatial variables is however, progressing. A general programme with three spatial variables is for the present not of current interest because of insufficient computer capacity.

45 Weapon system, effect and protection

(152) FOA 2 report C2279-45.

Experiments for comparison of 'Miniman' versions 1967 and 1968 with reference to accuracy of sighting.

K. Edman October 1968

At the request of FMV-A two versions of the sights for close combat anti-tank weapon 'Miniman' (M-67 and M-68) have been compared with reference to accuracy of sighting at the moment of firing.

The trials were carried out as camera shots indoors by sixteen aimers. Within the framework of the object of the trial and its accomplishment, the results show the M-68 weapon as the better even though there are few significant differences. It is probable that the sighting device on M-68 can be further improved.

46 Drives for guided weapons and rockets

See also reference (149).

48 Measuring technique (high speed) See reference (149)

(153) FOA 2 report B2005-48.

A compact and flexible X-ray flash system.

L. Gylden and others.

Proc. Eighth Intern. Congr., high speed photography. Stockholm, 1968.

Paper No. 63. FOA reprint 1968:32.

An X-ray flash apparatus is described in which the X-ray tubes geometry (and consequently its impedance) can easily be adapted for different requirements.

The source of energy is a coaxial cascade generator which gives a noise-free discharge with short rise time (2 to 5 ns) and about 20 ns pulse length.

The generators' characteristic impedance is 30 to 150 ohm, according to the number of stages used. The generator can however, run with load impedances from some ohms up to several hundred ohms.

The generator is totally enclosed in a cylindrical housing of steel. The supply voltage can be varied between 20 and 60 kV, which is obtained by variation of the gas pressure. Generators with 10, 15, 20 and 40 stages have been built; the voltage range is 150 to 1500 kV.

The X-ray tube can be dismantled and is provided with an easily changed electrode system. A small ion-pump is used for evacuating the tube.

With a 15 stage generator (loaded voltage 60 kV) and a single stage conical tantalum anode (focus spot < 2 mm diameter) 8 mm of lead or 30 mm of steel can be penetrated (with a fast film and reinforced shields; 0.5 mm distance between the focus spot and film).

5 APPLIED PHYSICS

51 Fundamental optical techniques

(154) FOA 2 report B2008-51.
Ultraviolet source with repetitive sub-nanosecond kilowatt pulses.
G. Ericsson, R. Lidholt
Applied Optics, Vol.7, P 211, 1968.
FOA reprint 1968:43.

Description of a nitrogen laser (3371 Å) with radiating pulses at 1 to 2 kw, half value breadth 0.7 ns, repetition frequency 200 p/s.

(155) FOA 2 report B2009-51.
On the origin of water vapour laser lines.
B. Hartmann, B. Kleman
App. Phys. Letters., Vol.12, pp 168-170, 1968.
FOA reprint 1968:44.

The main part of the water vapour spectrum is interpreted as coming from transitions in the levels $2v_2$, v_3 and v_1 in H_2O. The transitions in question are mainly pure rotational transitions. Nineteen of the known laser lines have been tentatively identified.

(156) FOA 2 report B2010-51.
Water vapour laser lines in the 7-μm region.
B. Hartmann and others.
IEEE J. Quantum Electronics, Vol.QE-4, p 296, 1968.
FOA reprint 1968:45.

The water vapour laser spectrum has three lines in the 7-μm region which have been measured and identified as $2v_2-v_2$-transitions in the H_2O molecule.

(157) FOA 2 report B2011-51.
Decay times of the ultraviolet and green emission lines in ZnO.
T. Skettrup, L. Lidholt

Solid state commun., Vol.6, pp 589-592, 1968.
FOA reprint 1968:46.

A pulsed nitrogen laser was used for excitation. For ultraviolet lines the decay times measured were in the range 2 to 7 ns, whilst with the green luminescence, it was about 50 times slower.

52 Applied optical techniques

See also reference (114)

(158) FOA 2 report A2519-52.
Model for analysis of information collection.
T. Orhaug, J. Eklundh October 1968

The report contains a discussion on a possible model for studying the problem of information collection (search). The model presented is built up as a quantitative representation, where the elements correspond to the situations which can happen in reality. By biasing methods a basis is also obtained for deciding for example, choice of search parameter. Eventual application of the model is shown by an example in connection with information concerning aviation.

(159) FOA 2 report B2007-52.
A prism line-scanner for high speed thermography.
P. Lindberg
Optica Acta, Vol.15, pp 305-316, 1968.
FOA reprint 1968:42.

Thermographic apparatus which use single element line scanning usually have a very low line frequency by comparison with television. The author describes a line scanner with an InSb-detector and a rotating Ge prism, which makes higher frequency line scanning possible. The scanner gives a flicker free heat picture of 100 lines per frame on a television type of tube. The sweep duty cycle of the scanning system is practically 100%. Optical aberrations caused by the scanning prism have been analysed and found to be least when the refractive index of the prism is between 3 and 4.

An example shows heat pictures taken with the scanning system (which is used in AGA thermovision).

(160) FOA 2 report C2277-52.
The correlation of picture information by means of coherent optical technique.
S. Nyberg October 1968

The report shows how two pictures or other two-dimensional information can be correlated by coherent optical techniques. Under certain circumstances correlation is the optimal method for detecting a signal in noise. Recording of complex filters intended for correlation analysis, is described and discussed. The report shows examples of how different parameters influence recording. Also shown are examples of correlations between different signals, which are commented on.

(161) FOA 2 report C2278-52.

Detection of signals in pictures.

T. Orhaug October 1968

The report summarises statistical detection theory and applies this to detection of two dimensional signals in a two-dimensional background consisting of normally distributed, statistically homogeneous noise. Two problems are considered: (1) detection of a specific signal against an additive background and (2) identification (discrimination) of one signal against another signal. Two cases of detection are considered: (1) detection by correlation of the total observed signal in noise background with a reference signal and (2) detection by correlation of the gradient of the observed signal with the gradient of the reference signal. The effect of general filtration of signals is discussed. Also, the result of detecting two isolated forms of signal, circular and quadratic areas respectively, are presented and discussed.

(162) FOA 2 report C2280-52.

On the preprocessing of signals to be discriminated by correlation methods.

J. Eklundh, T. Orhaug November 1968

Linear filtration of two signals which will be detected or separated by correlation methods, are dealt with. The search for maximum difference between auto and cross-correlation under suitable conditions, leads to a problem of self evaluation. The general solution to the maximisation problem is briefly discussed. The solution shows in a special case, the answer by derivation in the signal domain.

(163) FOA 2 report C2282-52.

Report of a Symposium in Florence, Italy, in September 1968 concerning application of coherent optical radiation.

T. Orhaug November 1968

The report gives an account of a lecture presented at a Symposium in Florence during 22 to 29 September 1968.

The symposium paid special attention to holography and treatment of optical signals. Contribution of special interest for the activity in section 201 is commented on in considerable detail.

(164) FOA 2 report C2285-52.

Studies on the treatment of optical signals in connection with a journey to the U.S.A.

S. Nyberg December 1968

During the period 22 July to 12 August a journey was made to U.S.A. to study coherent optics and its applications. The greater part of the time was spent at a course on the treatment of optical signals at the University of Michigan. The main emphasis was put on fundamental optics, space filtration, holography, recording and ultrasonic modulators. After the course six firms and institutions were visited that worked on optics. In this connection a project was studied which concerned problems in picture production especially those where optics are used.

(165) FOA 2 report C2287-52.

Optical link with GaAs radiation diode.

L. Holm, S. Nordlander December 1968

An optical link with GaAs diode as transmitter and a silicon diode as receiver has been examined. The radiation was modulated with 1100 Hz. The width of the lobe for the transmitter was 10 mrad and the radiating power in the lobe was about 0.7 mW. The radiation which reached the receiver was filtered optically with a small band interference filter.

A series of studies gave the result that a signal-noise ratio of 10 was achieved when the distance between sender and receiver was 4 km.

54 Guidance-navigation and control technique

(166) FOA 2 report A2518-54.

On measuring gyroscope drift.

F. Wolff October 1968

In an inertial navigation system the gyro and accelerometers are key components from which very great accuracy is demanded. The mathematics for appraising and evaluating these components has accordingly been further developed and refined during the last 10 to 15 years. In order to follow this development a technical background is required which gives the necessary theoretical and practical understanding of this form of measurement technique.

Having in mind an eventual Swedish IN application, FOA has been working on the problem and certain methods of measurement have been developed. The report gives a short account of some actual methods of measurement which mainly concern single axis gyros of IN quality, and to a certain extent, can be applied to two axis of which one is the 'rate device'.

A separate section contains a description of the measuring equipment.

(167) FOA 2 report C2281-54.

Transistor power amplifiers.

E. Aström November 1968

The first part of the report gives a resumé of some normal transistor power amplifier circuits. The following section describes a low power amplifier of maximum indicated 2 W output. The amplifier is provided with an electronically regulated current limiter which allows short circuits on the output even with a high input signal.

Then follows a presentation of a low power amplifier for 1 W sinusoidal output. The amplifier is characterised by its high efficiency due to low standing current and the fact that maximum line output voltage differs from the measuring voltage by only some volts. Amplifiers of this type have been manufactured for outputs up to 70 W (sinusoidal output). They are dealt with in a later section. The report discusses proposals for improving these amplifiers especially with respect to the highest possible distortion free output for a given load impedance. The last part of the report shows a special application, where the amplifier is used as an analogue pulse frequency changer.

(168) FOA 2 report C2284-54.

Control of large systems. Report on a seminar in Yugoslavia 12 to 23 September 1968.

S. Jahnberg, J. Åkerlind November 1968

The authors took part in 'Seminar on large systems in the mathematical biosciences', a course arranged by the 'Centre for Advanced Studies' in Yugoslavia. The course dealt with analysis and control of large systems with special reference to applications in biology and medicine. The report reviews briefly the contents of the course and in more detail, some of the lectures which were of special interest.

57 <u>Accoustics</u>

(169) FOA 3 report A3709-57.

The effect of geometrical defects in measuring sound.

A. Gjärdman October 1968

In acoustics, location influences the accuracy of speech recognition in several ways: for example, the grouping of the measuring system from a geometrical standpoint.

The report examines the geometrical parameters that effect the accuracy. The influence of error in positioning the microphone is studied. Also how error in certain input values effect the accuracy with different dimensioning of the measuring system. These errors can be caused by other factors than pure geometry, for example metereological factors. Minimisation of errors in the speech parameters leads to recommendations for the choice of microphone configuration. Some examples illustrate the magnitude of errors for different dimensions of the measuring system.

The distance between two microphones should be chosen with respect to the error in input measurements, so that the ratio ρ/c is a minimum. ρ is the error in the input measurement and 2C is the distance between the microphones. As regards the remaining errors however, the value of c should be large. The angle subtended should be a right angle.

The measuring system base should be arranged according to the requirement $d \approx r_s$ where 2d is the base required and r_s is the distance to the voice relative to the mid point of the base. Here again, the angle subtended should be a right angle.

(170) FOA 3 report C3565-57.

Detection of radiated ship noise under incompletely known conditions.

L. Götherström September 1968

The report is a summary of a lecture given at the 'Advanced Study Institute on signal processing with emphasis on underwater accoustics'. Twente Institute of Technology, August 1968.

The aim of the report is to show some methods of dealing with the problem of detection when detection conditions are not entirely known.

The report is divided into three parts. The first describes the Neyman-Pearson and quadratic detection of a normally distributed signal in normally distributed noise for which the spectra are not fully known. The

second part describes a computer simulated adaptive liklihood ratio detector, which operates on non stationary, non gaussian signals in disturbed sea noises.

The third part considers sub-optimal detection in the form of quadratic detection and correlation detection of a normally distributed signal in a normally distributed, isotropic field of noise with special stress on (fluctuating) multi wave diffusion and multi target conditions. A simplified model of an isotropic noise field gives a simple description of the detector signal - interference characteristics expressed in an equivalent number of hydrophone elements in array.

6 TELETECHNIQUE

60 Wave propagation, tropospheric-ionospheric physics

(171) FOA 3 report B3006-60.

Radar Angel activity and its correlation with metereological parameters.

H. Ottersten, F. Eklund

Proc. Intern., Colloq., Atmospheric turbulence and radio-wave propagation, Moscow 1965, pp 269-277, 1967.

FOA reprint 1968:33.

Radar echoes from a clear sky ('radar angels') have been studied over one year with a vertical 10 cm pulse radar. The echo intensity is recorded during 5 hours around midday for 5 days in every week.

The report includes an analysis of echo-days and time variation through the year and correlations between echo activities and air temperature, dewpoint, wind velocity, temperature gradient and dewpoint gradient.

The origin of these radar echos is discussed.

(172) FOA 3 report C3576-60.

Experimental investigation of elevation angle errors due to refraction in the troposphere.

Å. Blomqvist November 1968

Difficulties in the exact measurement of direction by means of radar arise from variations in the air refractive index. Measurements of the size and variation in the error of the elevation angle were made in August 1965 with the object of creating better understanding of radar ray refraction in the troposphere. For these measurements an X band radar was used. For targets, an aeroplane and a radar reflector mounted on a balloon, were used.

Meterological observations were made simultaneously with radar measurements. The possibility was studied of making reliable corrections of the measured radar signals by means of meterological data.

The report is the contents of a lecture to NATO - Advanced Study Institute in Aberystwyth in September 1967.

(173) FOA 3 report C3778-60.
AGARD symposium on the propagation of radio waves.
F. Aklund, W. Stoffregen October 1968

During the period 19 to 22 August 1968 a symposium on 'scatter propagation of radio waves' was held in Sandefjord, Norway and arranged by NATO-AGARD, Electromagnetic Wave Propagation Committee. The symposium, in which the authors took part, had three main themes (a) ground propagation (b) tropospheric propagation and (c) ionospheric propagation and partial reflections.

The ground propagation section dealt mainly with the propagation of HF radio waves which, reach the surface of the earth after one or more reflections from the ionosphere.

In the troposphere propagation section most attention was given to the question of the deduction of conclusions upon the structure of the troposphere from the propagation of signals.

The ionosphere part was devoted to auroral or northern lights and different problems in connection with F-layer propagation.

61 Teletechnical components and material

(174) FOA 3 report A3707-61.
Measurements of Gunn-diodes 1.
B. Peterson October 1968

After a general survey of the development of Gunn diodes a description is given of the way a Gunn-oscillator functions. Finally the results are presented of measurements on Gunn diodes as manufactured by Hafo from GaAs material supplied by Monsanto.

(175) FOA 3 report C3571-61.
Measurements of the radiation diagram for antennae on missile type 04E.
H. Bengtsson September 1968

The report gives measurements for the radiation diagram on model missiles to a scale of 1:5. The work refers to antennae for telemetry installations and command links and consists of an examination of the effect of alternative missile designs on the radiation from the antennae and also a presentation of the basis for siting and designing antennae.

63 Information transmission

(176) FOA 3 report A37.0-63.

Data transmission between U.K. stations of type Ra 140.

T. Ericson, U. Teght September 1968

The report reviews the theoretical and practical investigations of conditions for data transmission between Ra 140 stations. The work has been carried out at the request of FMV-A (tele-agency) and was originally initiated by a special problem in connection with data transmission for pursuit and fire brigade purposes. In order to give a basis for estimating the possibilities of using Ra 140 or similar radio equipment, for data transmission and for other connections, the report gives the character of a general estimate of Ra 140 from a data transmission point of view.

In the theoretical investigation the connections between error content, rate of data transmission and signal-noise rates have been studied. In addition, a simplified information theoretical analysis has been worked out. Practical measurements have then been made, both to show that the theoretical investigation is verified at certain points and also as a general illustration of transmission conditions in a realistic application.

The report concludes with some general conclusions and recommendations concerning the design of additional equipment for data transmission between Ra 140 stations together with some comments concerning the design of future radio material.

(177) FOA 3 report A3711-63.

Method for plotting the protected region for airborne radio installations within the ICAO band 118 to 136 MHz.

L. Bergman September 1968

By means of a computer programme (IBM 360) constructed for every frequency recorded in the ICAO frequency list for the communication band 118 to 136 MHz a graph has been drawn showing the protected region unsuitable for respective transmitters. The size of the protected area has been calcu-

lated using the guidance of the separation distance stated in Annex 10 of the 'Convention on International Civil Aviation' volume 1.

The trace or graph is adapted to a reduced FIR region map to a scale of $1:15 \times 10^6$. The original map was obtained from ICAO 'Air Navigation - European - Mediterranean Region' Doc. 7754/11 1966 (scale $1:12\ 5 \times 10^6$).

The graph will give a picture of both the prevailing interference situation on respective frequencies and the degree of usefulness of the frequency. The graph is intended to be a basis for planning frequencies mainly within Sweden and neighbouring countries, and later, within central Europe.

For administration purposes the graph has been drawn on 40 × 26 cm paper and uses the chosen scale for an area between 35° and 71° North. The area can easily be increased to include the whole of Region 1 and the Mediterranean if desired.

(178) FOA 3 report A3712-63.

Method for plotting the guard area for assisting navigation within ICAO band 108-118 MHz and 960-1215 MHz.

L. Bergman October 1968

By means of an IBM 360 computer programme prepared for each frequency recorded in ICAO frequency list for the navigation band 108 to 118 MHz and 960 to 1215 MHz a graph has been drawn showing the guard area which takes into account respective navigation beacons. Only the 'Co-channel' case is dealt with.

Calculation of the necessary separation distances has been carried out by an approximate method using only the data for the station itself. The results are suitable for use not only in estimating the prevailing interference situation but also in planning new stations.

The graph is adapted to a FIR region map to a scale $1:15 \times 10^6$ and drawn on sheets 400 × 260 mm. There is space on this size of paper for an area on the selected scale, between 35° and 71° North that is, from North Africa to the northernmost point of Norway.

(179) FOA 3 report A3713-63.

Method for plotting protection areas for aeronautical stations in the ICAO band 118 to 136 Mc/s.

L. Bergman November 1968

English edition issued by FOA 3 of report A3711-63.

See FRO 67/68-2 reference (177).

(180) FOA F report C8216-63.

ALGPRESS, a programme to compress source programmes in ALGOL-like languages.

J. Palme. October 1968

ALGPRESS has an input source programme written in an ALGOL type language, for example ALGOL, SIMULA, ALGOLW, PL/I or PL360. The output delivers a new source programme in which all comments and unnecessary blanks are eliminated.

ALGPRESS results in a considerable reduction in the cost of compiling the work. For example, when ALGPRESS is applied by itself the source programme is reduced in length from 184 to 39 punched cards and the cost of compilation reduced from 9 kronor to 5 kronor.

ALGPRESS is written in PL360 for the IBM 360 computer but can be applied as source programme for other computers, for example the IBM 7090.

64 Handling of data-presentation

(181) FOA 3 report B 3008-64

Running-in a computer programme by means of screen presentation. (On-line programme debugging.)

S. Jönsson

BIT., Vol.8, pp 122 to 127, 1968.

FOA reprint 1968:49.

The report describes a system which allows editing, a search for errors, and correction of a computer programme in a conversation mode. A direct screen display with tangent board and light pen is used and the language is in symbolic computer code. The programme which carried out these functions has a volume of about 8000 machine instructions. The gain expected is a factor of $\frac{1}{2}$ to $\frac{1}{4}$ of the total programme production time.

65 Radio guidance-navigation

(182) FOA 3 report C3573-65.

Radar signatures - doppler spectra from different sorts of aerial targets.

L. Ericson October 1968

Rotors, propellers and turbines have a decisive effect on the doppler spectra of aerial targets which can be used for identification purposes because of the characteristic peculiarities that exist; thus helicopters, propeller aircraft and jet aircraft can easily be distinguished. The report explains the factors which are basic to the origin and character of the spectrum.

68 Measuring technique (teletechnique)

(183) FOA 3 report C3572-68.
Coaxial micro-calorimeter - part report-construction.
R. Bostrom October 1968

The coaxial micro-calorimeter is intended to be a primary standard for measuring the power of microwaves in the S band (2.60 to 3.95 GHz) with a power level of 2 to 500 mW. It is used in the FOA 3 section for measuring techniques and standards and is complementary to an earlier constructed calorimeter for the X band (8.2 to 12.5 GHz) based on wave guides. The report is part of the author's licentiate task financed by the State Technical Research Authority.

7 BIOTECHNOLOGY

75 Extreme outer environment (biotechnology)

(184) FOA F report C1292-75.
Research into a hand covering (glove) system.
H. Carlsson

The manual effectiveness and heat insulating characteristics of a hand covering system have been investigated. The system is arranged so that the fingers when working, can move out through two special openings in the outer hand covering. The latter is made of nylon with fibre fur lining and is made in two designs, one with and one without laced overlay on the flat of the hand side. They have been combined with woollen gloves or with flash protection gloves of cotton.

In order to measure changes in manual dexterity a test was used consisting of simple hand movements. The gloves were examined, in use, under normal room temperature conditions. The outer coverings without the inner gloves resulted in insignificant interference. Variation with the lacing had a tendency to give less power of manipulation than gloves without laces. This also applied when the outer covering was combined with inner gloves

but the gloves were the main cause of interference. As regards the use of the finger openings the results showed that both the thumb and remaining fingers must be pushed out to obtain satisfactory results. On the other hand it did not matter much if the thumb moved out through the special opening or with the other fingers through an opening on the flat hand side of the glove. Limitation of opening to one end has great advantage from the point of view of protection from cold and means little disadvantage in manipulation.

The capacity of the outer coverings (without the glove) for protection against cold, coupled with manual dexterity, was demonstrated in a test by local cooling of the hand and forearm. The heat insulating capacity of the covering was investigated by a simple apparatus for measuring heat transference through the covering. The laced overcovering was a better heat insulator than the fur lined covering. Both gave the same protection against cold when worn without inner gloves, as the conventional woollen-thembed-gloves.

The actual design of the gloves was not satisfactory from the point of view of military use but the various types had considerable interest. Finally a more or less modified form is discussed for a system of hand coverings.

9 REMAINING INVESTIGATIONS

91 Material investigations

(185) FOA M report A0227-91.

Identification of plastic laminates with ATR and FMIR (an introduction).

P. Löfgren October 1968

The two methods of intra-red spectroscopy - ATR (attenuated total reflectance) and FMIR (frustrated multiple internal reflectance) for qualitative analysis and identification of plastic laminates are briefly described.

A study of literature has been made to ascertain the areas best suited to these methods. Finally, some tests are described in which ATR and FMIR units are used, for a qualitative analysis of laminate of ester-plastics and epoxyplastics.

98 Reliability

(186) FTL A report A02-1.

RADUND - A programme suite for calculating the probability of functioning of a system with in-built redundancy.

Y. Nybäck August 1968

The aim of the programme suite REDUND is to create a series of data programmes for use in the confidence analysis of systems which can be described by a reliability block layout. The report presents two recently developed programmes in the series.

The REDUND I programme is primarily intended for use with constant time dependent function probabilities, with the least number function unit M and total number unit N as variables.

The REDUND II programme is intended for calculating the variation in time of the time dependent function probability. In this programme the least number function unit M and total number unit N are constant whilst time is a variable.

12 PSYCHOLOGICAL DEFENCE

120 Formation and measurement of opinion

(187) BN report No. 40.
Defence attitudes and defence knowledge, Autumn 1968.
K. Törnqvist December 1968

The report is a summary of investigations from interviews with a representative selection of the population concerning their attitude to defence and knowledge of defence. The records this time included the population's will for defence, estimate of war risks, attitude to the cost of defence and its guidance and functioning and finally knowledge of total defence and its different parts.

The results show a certain decrease in the will for defence and an increased concern about war. The Soviet occupation of Czechoslovakia is assumed to be part of the reason for these changes. The attitude to the costs and control of defence remained practically unchanged. The population's attitude to the peaceful function of defence is preponderantly positive. The same is valid for the attitude to the capacity of total defence to function in the event of war. On the other hand a general knowledge about total war and its different parts was not so good.

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