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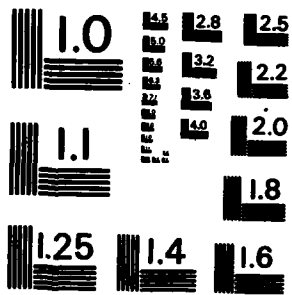
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ROYAL AIRCRAFT ESTABLISHMENT

REPORT NUMBER 207

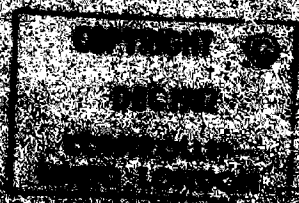
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RESEARCH REPORT ON THE
AIRCRAFT ENGINE

BY

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SWEDISH DEFENCE RESEARCH ABSTRACTS 82/83-1

[FRÖ FÖRSVARS FORSKNINGRS REFERAT 82/83-1]

by

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EDITOR'S SUMMARY

The Swedish National Defence Research Institute issues a quarterly list of unclassified Reports published by the Institute. The titles of these Reports and informative abstracts have been translated in English. This volume is the first issue of 1982/83. Further volumes will be translated in due course. The main topics covered are: protection - atomic, biological, chemical; ammunition and weapons; conduct of war, information and commands; vehicles and spacecraft; reliability and logistics; human factors; associated studies and their solutions; positive methods for limitation and control of armaments; psychology reports.

EDITOR'S NOTE

The Reports are in Swedish unless some other language is indicated (usually English). When requesting Reports it should be appreciated that an English version will not normally be available, and that the prices of the original Swedish documents have not been indicated in this Translation. Reports may be obtained from:

FOA Centralkansliet, Box 27322 S102 54 Stockholm, Sweden



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A PROTECTION - ATOMICA3 Effects of nuclear explosions, and protective measures

- (1) FOA report A40041-A3
 Risk of injury to grazing cows after radioactive fallout from nuclear explosions and reactor accidents. A compilation
 Gunnar Walinder and Leif Svensson September 1982

This report is a collection for practical use, of previous calculations concerning the acceptability of cows grazing in areas exposed to radioactive fallout from nuclear bombs and accidents in reactors (FOA report C40156-A3). It has been compiled in the form of two tables: one for maximum permissible doses (intensities) in pastures after nuclear explosions, and one for corresponding doses after an accident to a reactor.

- (2) FOA report C40154-A3
 Monoclonal antibodies against DNA for analysing radiation injury
 Magnus Malmqvist and others August 1982

This report describes some experiments conducted in FOA 4 for the production of monoclonal antibodies against radiation-impaired DNA, as the first stage in a study to develop rapid-diagnostic methods of biological dosimetry. Development is proceeding simultaneously on measuring techniques in surface physics so that optical and electrical measuring methods can be utilised for the direct measurement of reactions between antigens and antibodies. These methods are dependent on monoclonal antibodies rather than traditional methods, and the development of measuring methods in surface physics is therefore proceeding in parallel with the production of monoclonal antibodies with the object of the rapid and efficient handling of large samples.

- (3) FOA report C40156-A3
 Risk of injury to grazing cows after radioactive fallout from nuclear explosions and reactor accidents
 Gunnar Walinder and Leif Svensson September 1982

The principal text in the present report is an account of methods used to calculate maximum acceptable levels of contamination in areas of radioactive fallout for grazing cows, and the consequences which such contamination levels may entail for food supplies. The detailed calculations have been collected in a concluding chapter. Any reader who is interested only in the results and their practical applications is referred to the separate summary of this report.

The report proposes a uniform method of calculating the biological effects of prolonged irradiation to which animals and humans are exposed in areas of radioactive fallout, or when radioactive substances are taken up by or deposited in the body. The reference to the duration of radiation is based on the fact that prolonged irradiation causes altogether fewer and/or less serious forms of acute injury than if the same radiation doses had taken place over a shorter period. The calculations are based on a connection, which has been observed in radiological clinical practice, between the actual dose, the exposure time and the theoretical short-period dose which would have produced the same biological effect as the actual dose. This short-term dose has been called the "equivalent one-shot dose". The relation was originally formulated by a British scientist J. Kirk, and is here termed Kirk's formula. The use and limitations of this formula have been discussed previously (reference Walinder 1979 and 1981).

The risks of constructing a single formula for various types of radiation injury as functions of exposure time are naturally very high, although its uniformity and the fact that it is not contradicted by experience as regards the types of injury covered in this report mean that Kirk's expression would seem to meet any reasonable demands for reliability better than the methods hitherto employed. It should however be emphasised that Kirk's formula cannot be 'scientifically explained', and is based purely on direct observations.

B PROTECTION - BIOLOGICAL

B4 Microbiology in overall defence

(4) FOA report D40095-B4

Microbial problems during long-term storage of jetfuel in rock caverns. Part 5
(in English)
Roger Roffey

September 1982

This report is a summary of investigations carried out from 1.1.1982 and 30.6.1982 into microbiological problems during the long-term storage of jetfuel in rock caverns, on the instructions of the Directorate of Economic Defence.

The results in this interim report are a continuation of the work earlier performed and reported in interim reports numbers 1, 2, 3 and 4. This interim report can therefore be said to constitute an informal account of the current state of the project and of the last six months' work.

A method of determining the rate of conversion of sulphate to hydrogen sulphide in the ground water and mud of rock caverns has been developed, using a radiological technique. The method has a high sensitivity and it can detect at an early stage whether and to what extent hydrogen sulphide is produced in ground water. The method can also be used to study the inhibiting effect of various substances on sulphate-reducing bacteria. The inhibiting effect of copper nitrate, silver nitrate and sodium molybdate on sulphate-reducing bacteria has been studied by this method. Sodium molybdate yielded the most satisfactory inhibition for 1 mg/g of mud.

Studies of inhibition have been continued with the addition of oxygen to ground water.

Work has also been continued on developing methods of chemical analysis based on polarography. Besides the measurement of elementary sulphur, development is in hand to adapt this method of analysis so that it will also be possible to determine the amount of mercaptans in fuel.

Development has continued on an alternative silver corrosion test. It should be possible by this method to achieve a greater sensitivity and to obtain an objective evaluation of corrosiveness compared with standard procedures. The method ought to make it possible to detect at an early stage whether the fuel is beginning to become corrosive, and at what rate.

Studies have been conducted to evaluate the capacity to purify corrosive fuel, by means of several solid adsorbents, including silver (in various forms), copper, activated charcoal and molecular sieves. It is necessary for this capacity to be known before test on a pilot scale can be undertaken. Purification tests have demonstrated

that silver is more suitable than copper as an adsorbent. In order to obtain satisfactory purification it is necessary for the fuel to be heated to accelerate the reaction. Molecular sieves have not proved satisfactory in the purification of fuel.

C PROTECTION - CHEMICAL

C1 Threat scenario

(5) FOA report C40155-C1

Fog. A computer program for predicting fog formation
Hans Renström and Edvard Karlsson

August 1982

A manual method previously developed for fog prediction has been computerised. The program is capable of performing calculations to predict two types of fog, radiation fog, and mixing fog which is formed when two masses or quantities of air meet, and the air of these masses is mixed at the boundary layer. The program exists in two FORTRAN versions. One is on the VAX computer in FOA 4, and the other is on the HP computer forming part of the test terminal in the Air Force's Weather 70 system.

(6) FOA report C40157-C1, A3, B1

Computerised information retrieval in FOA 4.
Agneta Gerghem

June 1982

The purpose of this introductory report is to give both new and old users a brief general description of the computerised information retrieval system which is being provided in FOA 4.

It begins by describing what is meant by computerised information retrieval, with an explanation of some central concepts.

This is followed by a description of the *NIMER/IR* information retrieval system which has been procured for the FOA 4 computer VAX 11/780.

The report concludes with a summary of some external computerised information services, presenting some generally accessible databases which are suitable for such fields of activity in FOA 4 as: chemistry, biochemistry, biomedicine, microbiology and radiation biology.

(7) FOA report C40158-C1

1-methoxycycloheptatriene (CHT), its synthesis, and a general investigation of its ability to irritate and penetrate skin
Per Alm and others

September 1982

1-methoxycycloheptatriene (CHT) is produced with 18% total yield via a 3-stage synthesis with cyclohexanone as the initial substance. In its gaseous form CHT was irritant to mucous membrane, while in the liquid form it produced strong skin irritation within a few minutes, which was evident as smarting with local reddening of the skin. The skin-penetrating ability of pure CHT was slight, so that the symptoms which occurred on the skin were probably caused by a small amount of CHT which passed through the follicles and not by transepidermal diffusion. CHT would appear not to reduce the diffusion barrier in the stratum corneum, and is therefore unlikely to be a general vehicle for increasing penetration. It may be assumed however that as a lipophilic solvent, CHT may have the ability to assist penetration by increasing when in solution the diffusion potential for some inherently penetrable substances.

D AMMUNITION AND WEAPON TECHNOLOGYD4 Technical aspects of warheads

- (8) FOA report C20467-D4
 Plasticity of metals. Stress, strain and structure (in English)
 Torbjörn Svensson September 1982

The report gives a general review of the effect of the strength of a material on the generation of dislocations. Special attention is paid to the development of cellular structures for different ranges of states in the deformation. Coupling between cell dimensions and mean free path length of the movement of a dislocation is discussed. The mean free path is of great importance for the generation of new dislocations, and some methods are described for estimating its value. Analysis of data on a wide range of stresses demonstrates that cell dimensions are functions both of material and geometrical factors.

D8 System studies

- (9) FOA report C20459-D8 (E3)
 ADA in control applications - a case study (in English)
 Sven Erik Mattsson (LTH) July 1982

The report deals with the characteristics of the programming language ADA in a control-engineering application. A wind power generating station was chosen as an example.

The bulk of the article is devoted to studying how, in a control-engineering application, ADA affects and supports the design and layout of the system.

- (10) FOA report C20461-D8
 Visit report from Eurographics 1981 in Darmstadt
 Ulf Rozén August 1982

Eurographics is the principal annual conference on computer graphics in Europe. The report gives a number of impressions from the 1981 congress in Darmstadt, with some evaluations and brief summaries of the papers read.

E CONDUCT OF WAR - INFORMATION AND COMMAND TECHNIQUE

- (11) FOA report C30280-E
 Calibration programs for measuring S-parameters on a semi-automatic network analyser
 Manfred Marchner March 1982

The report is an account of an examination study which discusses the calibration programs for measuring S-parameters on a semi-automatic network analyser. The work was performed at FOA 3 in Linköping.

In the measurement of S-parameters in microwave components, measuring errors occur because of imperfections in the measuring system. Because of present-day strict demands for speed and high measuring accuracy, there is a serious need for simple methods of automatic error correction.

The purpose of this article was to make a study of the literature in order to identify various error-correcting procedures. One routine which ought to produce a better measuring result than a 4-term model currently being implemented was to be run on a modified Hewlett-Packard 8409A system.

The work resulted in a 6-term error model which when tested yielded a better result than 4-term models when the transmission factor was measured for a component having a high level of signal transmission. The new routine was found to be more sensitive than the old one for low signal levels. It was not possible to determine any unambiguous differences. However, calibration using the new model also proved to be time-consuming.

E1 Reconnaissance, target location and fire control

- (12) FOA report C30273-E1
An image processing method for position estimation - a maximum likelihood approach (in English)
Dan Andr e and Ake Wernersson April 1982

The problem under consideration is how to determine the position of a noisy partial image relative to a larger reference image. The object of the study is to find methods of synthesising image-feedback control systems and navigation systems.

Position estimation is based on a maximum-likelihood (ML) method. The stochastic variables in the ML method are the estimated edge co-ordinates for each scan. An analytical maximisation in one direction yields a substantial reduction of the amount of computation. The position estimator can be analysed, and the estimate is robust, or can be made so.

E2 Communications

- (13) FOA report C30282-E2
Preliminary evaluation of the model measuring plane at the FOA 3 Experimental Station L at G ra
J rgen Lor n July 1982

This report is an initial evaluation of the quality of the FOA 3 model measuring plane L at G ra. As part of this evaluation radiation measurements were performed in the horizontal plane for two actual HF and VHF aerial installations for a Spica-type TB.

E3 Guidance, navigation and target identification

- (14) FOA report C30287-E3
Tests with the General Electric CID camera TN 2500
Bertil Adolfsson and Thomas Gundmark August 1982

With the financial support of FMV-F:VT a CID camera has been purchased to enable FOA 3 to gain familiarity with CTD sensing technique. This report contains a brief technical description, gives the structural requirements for the camera, and account of measurements and field tests.

The camera exhibits a good noise-free image quality down to relatively low light intensities.

In due course it will be possible to use it as a sensor in experiments with image-generating target-seeking apparatus.

E4 Countermeasures, including signal interception and technical intelligence

- (15) FOA report C20466-E4
Documentation of *SKIPSE*, a computer program for plotting seismic signals
Tord Tengstrand August 1982

This is the final documentation of a programming system written for a PDP 11 mini-computer under the operating system RSX-11M and for a Versatek plotter. The

program is used for read-out of magnetic tape in continuous operation, containing seismic signals, and for plotting these signals for later analysis. There is automatic selection of channels of interest and signal correction.

- (16) FOA report C30268-E4
Various measurements on a SAW convolver and description of a code generator
Olle Gillstedt and others March 1982

The report covers some measurements which were made in Branch 390 on a loaned example of a SAW convolver lent by Walmore Electronics AB.

The first chapter describes what a convolver is and what it can be used for, in brief terms. The information is also contained in Signal Technology, "SAW Convolver, Advanced Product Information" which is attached as an Appendix. Data on the measured object have been copied into the Appendix.

A pre-condition for performing most of the measurements was access to a code generator, known as a PRBS generator (pseudo-random binary sequence generator), capable of generating two maximum-length codes, one of which is the time-inverse of the other. One of these generators has recently been completed in the Branch, and a description and operating instructions are included in the report, which concludes with some published references.

- (17) FOA report C30279-E4
Multi-path propagation - measurements with a surface-acoustic convolver
Gunnar Hedby June 1982

In the transmission of high-speed digital data over a channel in which multipath propagation takes place, problems arise with interference owing to selective fading. In the spectral plane this appears as a notch in the spectrum transmitted. This has long been known but it has become acute only in recent years, with the increasing use of digital signal transmission. The problem usually encountered in the literature concerns transmission for communication purposes. It is also present however in radar applications with pulse-compression radar, where degrading of the received signal means that the radar becomes blind to certain targets.

The report describes some measurements made with multipath propagation involving a convolver constructed on the surface-acoustic principle. A phase-coded carrier is transmitted over a channel which exhibits selective fading, and the measurements are treated as a function of the parameters of the channel.

F VEHICULAR AND SPACECRAFT TECHNOLOGY

F9 Materials

- (18) FOA report B20041-F9
Microstructural evaluation of sintered boron carbides with different compositions
(in English)
Lars Ekbon and Carl-Olof Amundin

Boron carbide has a serious potential for light armoured vehicles (FOA report A2578-D6). In earlier reports (Science of Ceramics (1977) Vol 9 and (1979) Vol 10) the effects were demonstrated of variations in the composition of boron carbide within the solubility limits of carbon on various parameters such as microstructure, behaviour under sintering and its mechanical properties. A modification of the state diagram was proposed in order to explain the difference in solubility of carbon in boron

carbide when produced by sintering and by the CVD technique respectively. Our continued investigations concerned the conditions for equilibrium in terms of the suggested state diagram. The limits of composition for the existence of $B_{13}C_{2+x}$ were investigated over the range of temperatures from 2100°C to 1900°C. We studied the tendency towards twinning and also dislocation structures in boron carbide with different carbon contents. The strength of boron carbide having these compositions was also determined.

Offprint from Science of Ceramics (1981) 11, 237-243;
FOA reprints 1981/82:25

H HUMAN ENVIRONMENT

H1 Investigations, future projections

- (19) FOA report B54026-H1
Changes in onset of blood lactate accumulation (OBLA) and muscle enzymes after training at OBLA (in English)
B. Sjödin and others

Eight well-trained male medium and long-distance runners, once a week in addition to their regular training programme, performed a 20 minute run on a rolling belt at a speed which was calculated to produce a concentration of blood lactate of $4 \text{ mmol} \times \text{l}^{-1}$. Maximum oxygen intake, running speed for $4 \text{ mmol} \times \text{l}^{-1}$ blood lactate (OBLA) and the enzyme activities for citrate synthase (CS), phosphofructokinase (PFK), lactate dehydrogenase (LDH) and LDH isozymes in m. vastus lateralis were determined before and after 14 weeks of the above training. A significant increase in OBLA and the percentage of heart-specific LDH isozymes were noted, whereas PFK activity and the PFK/CS ratio dropped after training. The variation in OBLA was negatively correlated with individual rates of blood lactate accumulation during the last 15 minutes of the training run on the roller, and positively correlated with the percentage of slow muscle fibre in m. vastus lateralis. These data support the hypothesis that an intensity of training which approaches OBLA, when the concentration of blood lactate can be held at a steady-state level, increases OBLA and results in measurable local metabolic adaptation by the active skeletal muscles in well-trained runners, without the occurrence of significant changes in the maximum oxygen intake. The composition of muscle fibre may be an indicator of the trainability of the muscular system.

Offprint from Eur J. Appl Physiol (1982), 49, 45-57;
FOA reprints 1982/83:1

- (20) FOA report C50003-H1
Physical efficiency. An account of evaluation methods, their physiological background, predictive value and usefulness
Jan Karlsson June 1982

- (21) FOA report C50004-H1
Defence medicine research in the USA. Report on a visit to the USA in Spring 1982
B. Ch. R. Strömbled and I. Widgren September 1982

The report contains some experiences and opinions gained from a fortnight's study visit to authorities and research institutes engaged on defence medicine in the USA. Attention was chiefly devoted to planning, conduct and organisation of research.

Since the beginning of the 1970s efforts have been directed in the USA towards an inter-service co-ordination of research in defence medicine. Although this tendency

is found to be reflected as a more pronounced specialisation by the institutes, redirection of effort etc, nevertheless the main impression is that the arms of the service have considerable influence on their 'own' institutions.

The contacts between research and the consumer are relatively limited and the need is felt for improvement. The majority of fresh proposals for research projects originate with the research workers themselves. Various measures are being tried out or are planned for trial to improve the relevance of research to its applications, including involving military personnel in project evaluation groups and offering research staff attractive careers as qualified investigators.

Documentation received is being held in FOA 5.

- (22) FOA report C54042-H1
Thermal effects of heat radiation and microwaves on rats
Olle Criborn and others July 1982

The experiments here reported with microwaves of 2450 MHz in the range of thermal intensity on rats have demonstrated that a sensory (auditory) reaction is momentarily affected, and this is not primarily connected with the heating. The thermal effect of microwaves was about 10 times greater than at the corresponding intensity with a heat lamp when the radiation intensities are calculated by means of values from measurements of the heating of water in a plastic vessel. The increase of body temperature in anaesthetised animals compared with the controls is only about twice as great with microwave radiation as with thermal radiation.

This is of great importance in evaluating the injurious effects on persons in winter clothing from the possible hostile effect of microwaves. It was not possible to demonstrate any appreciable increase of brain temperature compared with body temperature. Both in anaesthetised and non-anaesthetised rats the respiration frequency increases with increasing body temperature. At microwave intensities of 30 mW/cm² and above, the rat cannot compensate for the thermal effect, and its body temperature increases.

- (23) IAM report 607
Possible use of heat pipes for aircrew personal conditioning (in English)
M.J. Graveney and L.E. Larsson November 1981

The purpose of this activity was to study and develop a NASA-developed technique based on the principle of the heat pipe for temperature control in space suits. Development was directed towards applying the same principle to the conditioning of service pilots' flying suits.

The results showed that a suit-conditioning system, in which steam and liquid were transported by pressure differences and capillary forces respectively, are hardly realistic. However, systems involving the active pumping of steam and liquid are considered to afford advantages compared with systems using air and liquid conditioning.

(Refer to No. 59 Branch.)

- (24) Report XLVII, 1982, H1 (KAMEDO)
Emergency medical studies in Nevada USA. The fire at the MGM Grand Hotel in Las Vegas on 21 November 1980
Nils Fröman and Carl-Evert Jonsson

H2 Man and technical systems

- (25) FOA report C53007-H2
 Long-range target identification of vehicle silhouettes (in English)
 Björn Modéer August 1982

The identification of five vehicles at long range was studied in a laboratory experiment. High-contrast silhouette images were viewed at simulated distances corresponding to 3000 to 7200 metres. Eleven test subjects made 160 observations each.

The proportion of correct identifications for all vehicles averaged over 50% up to 5000 metres. At greater distances the differences in ratios of correct identifications increased for the various vehicles, and the interaction between 'vehicle' and 'distance' was significant. At distances over 5000 metres a distinct tendency emerged to underestimate the size of the target. It was found that the choice of types of target is of great importance to performance in identification, and the methodological consequences of this are discussed.

- (26) FOA report C53008-H2
 Factor analytical description of night vision tests (in English)
 Lars Persson and others August 1982

The object of the present study was to identify the fundamental components in functional night vision ability. A theoretical analysis into components of correlations between individuals among different night vision tests demonstrated that four independent factors accounted for 74% of the total variance. These factors were identified as light-sensitivity, contrast sensitivity, adaptation to the dark and recovery time after dazzling. An experiment for reliability and validity further showed that, taking these factors as a starting-point, it is possible to predict functional night vision ability.

- (27) FOA report C53009-H2
 Identification of target silhouettes at long distance with varying numbers of alternative answers and varying similarity among targets
 Björn Modéer August 1982

The object of the experiment was to study the way in which the identification of vehicles was affected by the number of alternative answers and the similarity among the targets.

The test material, consisting of black-and-white diapositives, was divided into 6 blocks of 80 silhouettes equally divided into 2 distances and 2, 3 or 4 types of vehicle and alternative answers. The images were shown with a slide projector on to a back-projection screen.

The results showed that the number of alternative targets and the similarity among them had a large effect on identification performance. The proportion of correct identifications considerably decreased with an increasing number of alternatives. The effect of an increased number of alternatives was greater at the longer range. With an increasing number of alternatives the similarity between vehicles also increased. At the shorter range this increased similarity among vehicles was the principal reason for identification performance becoming poorer with increasing number of alternatives. At the longer range identification performance was impaired both by the greater number of targets and because of the greater similarity among them.

- (28) FOA report C56032-H2
The role of ergonomics in the development of technical systems: some
experiences
Hans Furustig

September 1982

A knowledge of ergonomics is important for comfort, safety and performance.

Fewer mistakes and accidents at the individual level produce consequences at the system level for operational efficiency and safety which probably influence cost-benefit ratios and service life costs. Ergonomists should therefore be given some influence in the development and design of manned systems with which people spend a great deal of their time. What is the actual situation, and what is the experience of applying ergonomics?

Technical systems development is purpose-oriented. Both the development process and the final product therefore can and should be the subjects of evaluation. The level of effectiveness in the transfer of ergonomic knowledge however is relatively unknown. To supply an answer to the question of experience, general reviews of the literature have been carried out on research into decision-making and judgment-forming, investigations into the implementation of changes and into how designers use information. More specific inspections of the literature have been made for both military and civil experience of the use of ergonomics in the development of technical systems. The results and conclusions in this account are based mainly on overseas reports.

The results take on the nature of an indirect demonstration. One consequence of neglecting a knowledge of ergonomics for example is increased costs. However despite this ergonomics does not enjoy the necessary impact. It may be due to the practice of economy by reduced investment in ergonomic activity during an early stage of system development. But what can be the reason for ergonomic recommendations not being followed, even though economic conditions do not constitute a critical obstacle?

It would appear that ergonomic data could be better presented. It may be particularly difficult for a designer to modify data to suit a given operational environment, to apply ergonomic working methods and to follow ergonomic advice if that involves some technical risk-taking. The principles for weighing-up various alternative courses of action may be unclear. The methods of work of organisations and the dominant labour force may represent an obstacle to the transmission of ergonomic knowledge, and they may offer a challenge to its effective realisation.

There is much to be said in favour of ergonomists working in a close consultative relation to designers or decision-makers to reduce such problems of communication or actions from inadequate decision-making information. There are sound reasons for devoting greater resources to the problems surrounding the transmission or ergonomic knowledge.

- (29) H2
The mediated reading process of the partially sighted (in English)
Hans Marmolin and others
Visible Language (1979), XIII, 2, pp 168-183.

M INTERDISCIPLINARY STUDIES AND INVESTIGATIONS

M2 Environment and social studies

- (30) FOA report C10202-M2
 Running hot water. A systems approach to energy conservation (in English)
 Peter Wulff March 1982

The present-day running hot water system was designed in the society of yesterday, when a high consumption of hot water was an expression of high standards. It has resulted in quite large-scale solutions where the running hot water system is coupled to space heating. Inefficient energy production in the summer and relatively high energy losses in the piping all the way to the taps have been some disadvantages of this system which it was once possible to tolerate.

There is now a different situation. New water-economising techniques together with reduced temperatures and an increased awareness of energy saving among the users can be estimated to halve the previous consumption of hot water.

At such low consumption figures a new systems concept may prove to be competitive. It means producing hot water as near as possible to the taps. One drawback of this decentralised production of hot water however is that it requires access either to electricity or some other form of high-quality energy.

The contents of the report were presented to a seminar in The Hague on innovations and systems approaches. This study forms part of the Branch 140 project "Future Energy Projections".

M3 Security aspects of environmental studies

- (31) FOA report C10209-M3
 Soviet policy in North East Asia and Indochina (in English)
 Mette Skak May 1982

After some summarised opinions on earlier Soviet actions in this area, this study discusses the main outlines of Moscow's policies as they are delineated today. In this context a number of future scenarios are considered, both of a conflict and a cooperation-oriented character.

This study forms part of the "Eastern Project".

M5 Economic studies

- (32) FOA report C10200-M5
 The Swedish defence industry. Its structure, efficiency and conditions for development.
 Social Economics Section February 1982

The question of the defence industries should be one of the major subjects in defence policy during the 1980s. Technical development, the escalation of costs for advanced defence material, changes in the volume of orders placed by the Swedish defence services, together with continual international specialisation in defence equipment are progressively modifying the conditions under which Swedish defence industry operates.

Analyses of the conditions under which the defence industries develop and the consequences of various trends in development are of importance for evaluating the long-term strategy of the defence system. One should also take account of industrial development overall and its importance for material procurement. Correspondingly, defence

orders have a general industrial significance, partly through the accumulation of knowledge which occurs in the central areas of technology.

The purpose of this report is to provide an account of the facts surrounding these problems and to illustrate the conditions under which the activities of the defence industries are carried on.

M7 Follow-up and monitoring of research outside FOA

- (33) FOA report B60003-M7
The importance of satisfactory positioning, diving and mapping systems, suitable for exploration and transportation in ice-covered sea areas (in English)
Ragnar Thorén

In an introductory chapter (1) the author supplies a general review of the remarkable development during recent decades of remote sensing, of particular importance for operations in more or less icebound sea areas, especially in the exploitation of natural resources such as oil, gas and minerals, and for the navigation both of surface and underwater craft. The best possible position-finding and an accurate knowledge both of the ice situation and the prevailing bottom conditions are necessary in all these cases. Chapter 2, concerning exploration of the Arctic Ocean, describes in chronological order some particularly significant expeditions and their results, together with some interdisciplinary projects of special value for Arctic operations. In the next chapter (3) the author deals with "underwater spingos" (pointed ice hummocks on the seabed), with a permanently-frozen offshore sea bottom, termed "offshore permafrost", and ice under the seabed (ground ice).

Chapter 4, entitled "Underwater Technology", considers activities by the Swedish Defence Research Establishment in hydro-optics, hydroscoustics and navigation systems, the cable-controlled underwater craft FOA-SUB, and also diving research and underwater communications. This is followed by KOCKUMS offshore activities and "SUTEC" (Scandinavian Underwater Technology).

The subsequent sections describe a remotely-piloted underwater vehicle used for reconnaissance of shipwrecks in the Canadian High Arctic and "Operation Greyhound". The author then gives a brief account of "France's Comex Industries", "I.S.E." (the Canadian International Submarine Engineering Ltd, Port Moody, B.C.), "The French Society ECA", "Amatek-Straza", the Soviet underwater vehicles "Argus" and "Akademik", the West German unmanned "Ocean Explorer" named Pinguin B 3", technology for Deep Ocean Mining, the underwater transport of LNG (Liquefied natural gas), Soviet submarine schools and underwater orientation, the British Special Boat Service (SBS), in conclusion mentioning a diving suit developed in Canada for the High Arctic.

FOA reports (1982), Vol 16, No.1.

T CERTAIN MEASURES FOR LIMITATION AND CONTROL OF ARMAMENTS

T1 Seismological multiple stations

- (34) FOA report C20460-T1
Seismology 1981. Nuclear test ban verification. Earthquake and earth resource investigation (in English)
Harriet Ohlsson

July 1982

This annual report for 1981 outlines seismological activities at the Defence Research Establishment (FOA).

The principal activity of the FOA seismological unit concerns the seismological detection and monitoring of underground nuclear explosions. Particular study during the year was devoted to the way International Data Centres should be designed as part of a worldwide seismological monitoring system.

A long-term study has also been conducted at the FOA of the risks of earthquake damage to Swedish nuclear power stations. Under this project a special network of seismological stations is being operated in southern and central Sweden.

Two prospecting projects are also being studied at the FOA. One concerns the development of seismic methods of oil exploration, while the other involves studies of crystalline rocks by means of seismic measurements between boreholes.

- (35) FOA report C20462-T1
Common data base experiment - long-period surface wave signals (in English)
Peder Johansson August 1982

The purpose of a Common Data Base Experiment (CDBE), which was inaugurated at the meeting of the seismic experts' group in Geneva in July 1980, was to create a seismic database from a worldwide network of seismic stations. The database will be used in developing and testing various functions in connection with the institution of an international verification system for a CTB, particularly functions at international data centres. Data from the first two weeks in October 1980 are used, and include both bulletins, termed level I data, from 59 stations in 21 countries, and waveform data, termed level II data both analogue and digital, from 38 stations in 20 countries.

Continuous digital recordings of long-period signals from 23 stations (93 seismometers) worldwide were analysed. Of the 162 seismic events as defined in the short-period analysis, 114 (70%) have been allocated a surface-wave magnitude M_s . The M_s has also been determined for a further 27 events included in the USGS PDE list. Surface waves have also been used to define events in cases where the short-period station networks did not succeed in doing so. Fifty-seven "LP events" have been collected in this report, most of them on ocean ridges.

- (36) FOA report C20463-T1
Computation and compilation of short period identification data (in English)
Ingrid Nordstrand August 1982

A temporary seismological data centre has been created in Sweden and is operated by the FOA Seismological Observatory. During the period 1-15 October 1980 the data centre (CDBE) received recorded seismological data from about 60 stations distributed worldwide.

This report contains some results derived from computations of short-period identification data.

The computations of identification data were performed on two selected groups of events from the CDBE. The parameters being studied are waveform complexity and third moment. The second parameter is an expression of the spectral characteristic of a seismic signal.

Analysis of the computed values shows that it is necessary to introduce station corrections when compiling data for an event. Because of the limited amount of available data it was not possible here to produce these corrections.

- (37) FOA report C20464-T1
Common data base experiment - compilation of waveform data (in English)
Gunnel Barkeby August 1982

The purpose of a Common Data Base Experiment (CDBE), which was inaugurated at the meeting of the seismic experts' group in Geneva in July 1980, was to create a seismic database from a worldwide network of seismic stations. The database will be used in developing and testing various functions in connection with the institution of an international verification system for a CTB, particularly functions at international data centres. Data from the first two weeks in October 1980 are used, and include both bulletins, termed level I data, from 59 stations in 21 countries, and waveform data, termed level II data both analogue and digital, from 38 stations in 20 countries.

This report describes the waveform data which were obtained, and how they have been included in the analysis.

- (38) FOA report C20465-T1
Documentation of *SSYS*, a computer program for interactive seismic research
(in English)
Tord Tengstrand August 1982

This is the final documentation on a programming system written for a PDP 15 minicomputer. The purpose of this system, known as *SSYS*, is to serve as a tool in seismological research. Signals and spectra can be manipulated, and measurements can be made interactively on a graphic display.

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