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Informatics, Incorporated

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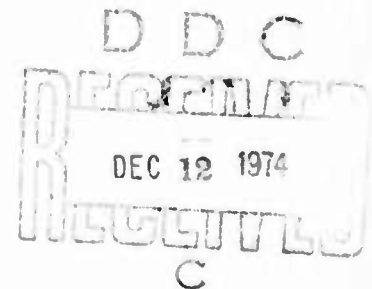
FINAL TECHNICAL REPORT

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Under this contract Informatics Inc. has reviewed open-source Soviet bloc technical literature and regularly reported significant development in the following major fields: laser technology, effects of strong explosions, geosciences, particle beams, material sciences, energy technology, and oceanography. Optional topics also covered at irregular intervals have included atmospheric physics, geomagnetic pulsations, biocybernetics, gravitational radiation, climatology, and satellite geodesy. Any other pertinent material was published under a miscellaneous interest category.		

October 18, 1974

Contract No. F44620-72-C-0053

FINAL TECHNICAL REPORT

Summary

Under this contract Informatics Inc. has reviewed open-source Soviet bloc technical literature and regularly reported significant development in the following major fields: laser technology, effects of strong explosions, geosciences, particle beams, material sciences, energy technology and oceanography. Optional topics also covered at irregular intervals have included: atmospheric physics, geomagnetic pulsations, biocybernetics, gravitational radiation, climatology, and satellite geodesy. Any other pertinent material was published under a miscellaneous interest category.

Reportage has been for the July 1970 through June 1974 interval. The format for reporting included periodic bibliographies, collections of abstracts, and comprehensive analytical reports. A list of all reports submitted under this contract is appended.

FINAL TECHNICAL REPORT

This report covers the contractual period from June 1970 through June 1974.

General Program Objectives

The stated purpose of this contract has been to provide document search and evaluation of Soviet-bloc publications dealing with a list of technical subjects of interest to ARPA and AFOSR. Following the identification and selection of pertinent material, it was then to be reported in forms ranging from bibliographic listing to extended subject studies, depending on topic importance and sponsor interest. Our coverage is summarized as follows:

1. Laser Technology - All articles found in the current Soviet-bloc scientific literature on the topic of laser research were recorded and published in the form of quarterly bibliographies, logically structured by subject. We have, in addition to specific laser subjects, included in the bibliographies all material judged to be of potential relevance to quantum electronics, such as optical propagation in various media, spectroscopy of laser materials, and nonlinear optics in general. By the end of the contract a total of 15 quarterly bibliographies were published, together with a cumulative author index of all Soviet workers in the field.

The sheer bulk of this retrieval has precluded a complete evaluation of all laser material in terms of the state-of-the-art. Instead, selected laser topics of known interest have been more closely monitored and any pertinent findings brought to the attention of the project monitor. Thus for purposes of the monthly reports, coverage was generally limited to high-power laser effects on solids and gas. This included experimental and theoretical studies of laser damage to metals, dielectrics, and various other materials, as well as laser-plasma interaction. A large number of papers are devoted to detailed theoretical studies of the exact nature of the beam-target interaction; the majority of such papers deal with effects on dielectric materials.

In addition to coverage on beam-target effects, a collection of abstracts on Soviet work in laser fusion was published in early 1974. Some 200 articles on laser fusion were found to have been published since 1969. The bulk of this work is being done by the team under N. G. Basov at the Lebedev Institute in Moscow.

The coverage of Soviet quantum electronics work has comprised the single most extensive effort under this contract. With the continuing Soviet laser bibliography series, we feel that we have the most comprehensive data base on this topic currently available.

2. Effects of Strong Explosions - Articles were selected and abstracted on all Soviet material pertinent to strong explosive effects, either directly concerning nuclear detonations or on explosive effects which were judged relevant to nuclear effects. The topics covered included shock wave effects; hypersonic flow around bodies; soil mechanics; exploding wires; equations of state; and miscellaneous explosion effects. Consistent with past practice, the only reference to nuclear explosions in this material has been to non-Soviet tests. Coverage on this subject was discontinued after 1973.

3. Geosciences - Coverage under this topic concentrated on seismology, deep seismic sounding, seismic instrumentation and associated technology relating to detection of underground nuclear detonations. The bulk of the material was abstracted, with the remainder being extended reviews of monographs, several full translations of seismology articles, and an annotated bibliography. Seismology coverage was curtailed from Dec. thru June 1974, per contract.

4. Particle Beams - Selections under this topic were concentrated on the generation and propagation of high-current pulsed electron beams. A substantial volume of Soviet reportage is appearing on this subject, particularly on techniques for high voltage or explosive field emission from needle-form cathodes, yielding nanosecond pulses on the order of kiloamperes. The coverage included relevant aspects of linear induction accelerators, plasmotrons and related generating hardware. Treatment of this topic was broadened during 1973 to include all material relating to beam current propagation in various media, particularly on factors limiting beam stability.

Coverage on particle beams was discontinued after 1973.

5. Material Sciences - Items selected here were from advanced studies of material properties with emphasis on extremal conditions. Coverage has concentrated on high pressure, high temperature and superconductivity research. The growing volume of articles on superconductivity is noteworthy; in the last quarter of 1973 over 90 such articles appeared.

While the general topic was dropped after 1973, studies were continued on superconductivity and on ultra high pressure technology.

6. Energy Technology - In 1973 energy conversion techniques were added as a major topic. Coverage included solar and geothermal energy, fuel cells, thermoelectric and thermionic conversion, magnetohydrodynamics, storage batteries and miscellaneous other types. Reportage was in the form of bibliographies of current Soviet articles on these topics, plus two analytical reports on Soviet geothermal development and a worldwide survey on solar engineering. The survey articles show a high level of Soviet activity in both solar and geothermal engineering.

7. Oceanography - This was included as a major topic beginning in 1974. Emphasis has been on Soviet research vessels, man-in-the-sea activities, and internal wave studies. Reports have included one of survey data on all known Soviet research vessels, a bibliography of recent material on internal wave effects, and selected abstracts on internal wave generation and detection. A review of the literature for the past several years shows a substantial volume of theoretical and experimental work in this area. Theoretical studies of internal waves at the Marine Hydrophysical Institute in Sevastopol and studies of radar returns from the sea surface have proved of special interest.

8. Optional Topics - A secondary list of topics was assigned for reporting in a less frequent and more informal way. Reports were submitted on these topics as bibliographies, collections of abstracts or analytical reports, including the following: biocybernetics, climatology, geomagnetic pulsations, gravitational radiation, magnetic treatment of water, satellite geodesy, and tunneling rockets. A survey of Soviet developments in air cushion vehicles was in progress at the end of the contract period; however, extensive efforts to obtain highly pertinent sources of information this subject known to have been published, have been relatively unsuccessful. Any continued source acquisition efforts should be attempted outside the U.S.

The report on satellite geodesy resulted from a two year compilation of information on laser geodesy and long baseline interferometry. The data include an updated comprehensive list of Soviet satellite tracking stations, which we believe to be the most complete available from the open literature. Operational data on all known Soviet satellite tracking cameras are also included.

9. Miscellaneous Interest - Items of possible interest in Soviet R&D effort, but not covered in the above categories, were routinely included in regular reports or passed along informally to the sponsor. This coverage also included scientific items in the daily and semipopular press in response to our general current awareness responsibility.

10. Translations - The intent of this program was to limit translations only to items of vital interest. Accordingly the annual translation effort was limited to a few articles which totaled well below the yearly 100,000 word maximum specified by contract.

11. Literature Acquisition - Under the acquisitions funding of this contract we have been able to purchase all relevant source material through European book dealers. Delivery has been arranged so that most periodicals are received by us approximately one month after publication; newspapers are generally not over 5 days old on arrival. Acquisition of some irregular publications, mainly conference proceedings, special collections of articles, institute proceedings and the like, is more difficult, mainly owing to the very small printings of such issues in the USSR. We therefore have had a standing order on certain vital topics placed with several dealers, and have in this way accumulated a substantial collection of pertinent irregular material. Under this contract we subscribed to a total of over 600 sources.

Additional aid has come with the establishment of our Soviet-bloc holdings as a bona fide library. This has enabled a fruitful exchange with other libraries such as Battelle, MIT and NASA of wanted material. There also have been several personal exchanges of information directly with scientists within the Soviet Union.

12. Project Staff - The effort under this contract has been provided by eight analysts, one research assistant, and associated clerical and administrative assistance. All of the literature accession, review and evaluation is done by this staff, as well as the bulk of the reporting. A small percentage of selected material has been abstracted by outside consultants.

13. Conclusions - We conclude that the described reporting system has demonstrated a timely and complete way of exploiting Soviet technical topics of current interest. The most useful method appears to be (a) reports devoted to specific topics, published as often as material warrants, and (b) frequent regular reports covering a wide range of topics for current awareness.

An obvious further step would be to make all such reported material machine storable. A start was made under this contract with the Cumulative Author Index to the laser bibliographies; it is our hope that subject and affiliations indexes will eventually be added as well. Being preponderantly in the software business, Informatics has a built-in capacity for computer handling of this kind of information program.

Cumulative List of Informatics ARPA Reports through June 1974

- The Theory of Wave Propagation in a Randomly Inhomogeneous Medium. Uspekhi Fizicheskikh Nauk, 1970, v. 102, no. 1, 3-42. n.d. (translation)
- Soviet Seismology: An Annotated Bibliography. December 1970. (bib.)
- Bibliography of Soviet Laser Developments, No. 1. January 1971. (bib.)
- Bibliography of Soviet Laser Developments, No. 3. April 1971. (bib.)
- Bibliography of Soviet Laser Developments, No. 2. July 1971. (bib.)
- Bibliography of Soviet Laser Developments, No. 4. August 1971. (bib.)
- Bibliography of Soviet Laser Developments, No. 5. December 1971. (bib.)
- Effects of High Power Lasers, No. 1. December 1971. (abstracts)
- Selected Material from Soviet Technical Literature. January 1972-December 1973 (monthly). (bib. and/or abstracts)
- Information Support from Foreign Scientific Literature. Final Technical Report. January 1972. (technical report)
- Bibliography of Soviet Laser Developments, No. 6. March 1972. (bib.)
- Soviet Biocybernetics Bibliography. May 1972. (bib.)
- Recent Soviet Investigations in Geothermy, Report 1. May 1972 (bib. and abstracts)
- Bibliography of Soviet Laser Developments, No. 7. May 1972. (bib.)
- Bibliography of Soviet Laser Developments, No. 8. August 1972. (bib.)
- Bibliography of Soviet Laser Developments, No. 9. November 1972. (bib.)
- Soviet Geothermal Electric Power Engineering. Report 2. December 1972. (survey article)
- Soviet Developments in Climatology (Preliminary Draft Report), No. 1. December 1972. (abstracts)
- Effects of High Power Lasers, No. 2. January 1973. (abstracts)
- Magnetic Treatment of Water. January 1973. (survey article)
- Lasers in the Armed Forces of the United States (Material from the Foreign Press). January 1973. (translation)

Bibliography of Soviet Laser Developments, No. 10. February 1973. (bib.)

Information Support from Foreign Scientific Literature. Final Technical Report. February 1973. (technical report)

Soviet Tunneling Rockets. May 1973. (survey article)

Summary Data on Selected Soviet Research Vessels: Parts 1 and 2. May 1973. (survey article)

Bibliography of Works by V. A. Troitskaya and Ya. I. Likhter, 1963-1973. June 1973. (bib.)

Bibliography of Soviet Laser Developments, No. 11. June 1973. (bib.)

Soviet View of Laser Weapons, No. 1. July 1973. (translation)

Soviet Research on Gravitational Radiation. August 1973. (survey article with annotated bib.)

Bibliography of Soviet Laser Developments, No. 12. September 1973. (bib.)

Soviet Studies on PC 1 Geomagnetic Pulsations, No. 1. September 1973. (abstracts)

Soviet Studies on Geomagnetic Pulsations, No. 2. December 1973. (abstracts)

Bibliography of Soviet Laser Developments, No. 13. January 1974. (bib.)

Bibliography of Soviet Material on Internal Waves, No. 1. January 1974. (bib.)

Solar Energy. March 1974. (survey article)

Soviet Developments in Climatology, No. 2. March 1974. (abstracts)

Soviet Developments in Laser Fusion. March 1974. (abstracts)

Information Support from Foreign Scientific Literature. Final Technical Report. March 1974. (technical report)

Cumulative Author Index for Soviet Laser Bibliographies Nos. 1-12, January 1969-June 1973. April 1974. (index)

Soviet View of Laser Weapons, No. 2. April 1974. (translation)

Bibliography of Soviet Laser Developments, No. 14. April 1974. (bib.)

Soviet Material on Internal Wave Effects. April 1974. (abstracts)

Soviet Satellite Geodesy: Basis and Status of Soviet Laser Geodesy and Long-Base Interferometry. May 1974. (survey article)

Effects of High Power Lasers, No. 3. June 1974. (abstracts)

Bibliography of Soviet Material on Internal Waves, No. 2. June 1974. (bib.)

Recent Trends in Soviet Research. June 1974. (abstracts)

Bibliography of Soviet Laser Developments, No. 15. August 1974. (bib.)