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A Digest of Recent Soviet R & D Articles

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## INTRODUCTION

This is a collection of brief abstracts on miscellaneous topics from the current Soviet technical literature. The intent is to supply a quick look at items of possible interest, including topics not necessarily named in the DARPA interest profile, as a supplement to our reportage on specified topics.

It is intended to publish this collection on a monthly basis, to continue to provide prompt coverage of numerous aspects of Soviet R&D. As an added feature, all recently acquired books will be listed as they are received. A list of source abbreviations is appended.

For further information the reader is invited to call Stuart Hibben or Lee Boylan at Informatics on (301)-770-3000.

### Symposium on Nonlinear Acoustics (verbatim)

Abstracts of proceedings have been published of the 6th International Symposium on Nonlinear Acoustics, held at Moscow State University in July, 1975. Problems discussed included nonlinear interaction of waves, interaction of harmonic waves with noise, and questions of shock wave propagation. The question is treated of nonlinear applications in hydroacoustics for developing highly directional parametric radiators; their characteristics and calculation are discussed. Problems of cavitation from propagation of powerful ultrasonic waves are covered, together with dynamics of acoustic cavitation and the nonlinear acoustics of cryogenic liquids.

Nonlinear acoustics of solids is covered in papers on phonon echo, effects of phonon drag in solids, and elastic and electron acoustic nonlinearity. Propagation of nonlinear acoustic waves at phase changes is treated; the interaction of surface and internal waves is also discussed. Applications of the methods and effects of nonlinear acoustics to signal processing are suggested, and methods are offered for measuring nonlinear constants of solids. [VI Mezhdunarodnyy simpozium po nelineynoy akustike, (6th International Symposium on Nonlinear Acoustics; Report Summaries). Moskva, 8-10 yulya 1975 g. Tezisy dokladov. Moskva, Mosk, un-tet, 1975, 522 p. (RZhF, 10/75, no. 10Zh697 K)]

### Status of IR Radiometry (abstract)

Present status of standards for IR radiometry in the USSR and other countries is briefly discussed. The article presents some information on the design features of standard and model devices, which are used in the measurement of radiation in IR spectral range, and ways are outlined for further standardization of such measurements. The author points out that it remains to work out standard specimens of the emissive power of materials and apparatus for spectral investigations of IR detectors, and one of the most important problems among these is to develop a highly sensitive absolute radiometer for the spectral range of 0.7 to 30 microns. [Babushkin, V. V. Status and prospects of developing IR radiometry. IT, no. 9, 1975, 64-67].

### Fast Response Radiometer (verbatim)

A high-speed radiometric system with high spatial resolution, and equipped for recording and treatment of fast-changing processes, is discussed. A description is given of the high-speed scanning radiometer with self-radiation compensation of its objective. Sensitivity in the spectral range of 8-14 $\mu$  is  $10^{-6}$  watt/cm<sup>2</sup> x ster; spatial resolution = 5 x 5 angular min, and scanning speed is 90°/sec. Mention is also made of a wide angle radiometer with sensitivity =  $5 \times 10^{-6}$  watt/cm<sup>2</sup> x ster and spatial resolution = 30° with spectral interval selected by a light filter. A scanning device having a spatial resolution up to 40 angular sec is briefly described. The system described can be operated as either a radiometer or spectrometer because of the use of two radiation

detectors and a wedge shaped filter. Descriptions of auxiliary signal processing equipment are also given. [Allenov, M. I., A. V. Afonin, M. F. Akhmetzyanov, et al. High-speed apparatus for recording and processing measurements of fluctuations in natural radiation fields. Sb. Oblachnost' i radiatsiya. Tartu, 1975, 142-168. (RZhGeofiz, 11/75, #11B60)].

#### Optical Demodulator (abstract)

A patent is sought for an optical demodulation device consisting of an optical element made of transparent material with matte outer and inner surfaces, and a radiation detector. It is constructed in the form of the frustum of a cone with an inverted conical aperture at the smaller end of the frustum. The smaller end is covered by a shading layer.

A second variant of the design is constructed with a layer of optically reflecting material on the shading layer surface, which increases the intensity of light flux falling on the sensing element. A sectional view of the design is included. [Medvedev, G. A., M. A. Markovich, and V. I. Shlyakhov. Optical light flux demodulation device for optical probes. Author's Certificate, USSR, #485397, published August 7, 1973. (Otkr. izobr, 35/75, 124)].

#### Liquid Crystal for Thermal Imaging (abstract)

An author's certificate (patent disclosure) has been granted to a research team for development of an improved liquid crystal imager. The composition is listed as a surface layer of cholesteric liquid crystal, a substrate, an absorptive layer, a heat diffusing layer, electrical insulation, and heater layer with regulated current source. For increased sensitivity and response time, the absorptive layer is made of a conductor such as graphite. [Bauman, A. P., L. Ya. Zysina, et al. Device for visualizing thermal radiation. Otkr izobr, 40/75, no. 489967].

#### Plans for Damming the Sea of Azov (abstract)

In an attempt to preserve the valuable fisheries assets of the Sea of Azov, the Soviet Union is making plans to the dam the Azov in the Kerch' Strait, which has a span of 5.5 km. The highly productive Azov fisheries effort is threatened by the increasing salinization due to decreased freshwater inflow, primarily from the Don and Kuban' Rivers. Thirty-four 14-m wide passages each with two sets of gates will be used to pass migrating fish to and from the Black Sea. Two special locks will be available for the transit of large ocean-going vessels. Since the dam is intended only to control the incursion of saline Black Sea water into the Azov, no difference in water levels is envisaged.

It is felt that this dam is a cheaper alternative to river diversion projects which have been under consideration. The estimated cost of the structure is 400 million rubles which is expected to be recouped in five years



through improved Azov catches. Construction is expected to begin "in the near future." [Pavlov, D. Dam for the Sea of Azov. Pravda Ukrainy, 15 January 1976, p. 4, cols. 7-8].

#### High Pressure Phase Transition (abstract)

A recent brief paper has appeared on the high pressure transition studies being reported by Vereshchagin et al. The present work again makes use of the hysteresis effects of electric conductivity, which is identified with the presence of metastable state, for identifying type I phase transition of dielectric to metal under high pressures. The method is illustrated with an  $\text{Al}_2\text{O}_3$  dielectric specimen. A hysteresis loop is plotted of the electric resistance of  $\text{Al}_2\text{O}_3$  as a function of both anvil pressure and temperature at transition pressure. When anvil pressure is increased,  $\text{Al}_2\text{O}_3$  resistance drops and a jump is noted at certain point. After that, the pressure is lowered to a certain fixed value  $F_B$  and the specimen is heated. Increase of temperature by only  $30^\circ$  leads to a sudden reversion of resistance back to its original value. This may be interpreted as the "melting" of the metastable conducting phase of  $\text{Al}_2\text{O}_3$  back to its stable dielectric state. [Vereshchagin, L. F., Ye. N. Yakovlev, B. V. Vinogradov, and V. P. Sakun. Recording dielectric-metal phase transitions at high pressures. PTE, no. 5, 1975, 205-206].

#### Theory of Ultra-high Compression Press (abstract)

A theoretical paper discusses the problem of stress conditions in a sphere of volume-hardened material, corresponding to the extremely fast rise of pressure at the center of a press. At  $r \rightarrow 0$ , the asymptotic relation  $p \sim r^{-\mu}$  holds true. Theoretical estimates and experimental results show that at high pressures,  $0.15 \leq \mu \leq 0.75$  for typical materials, although for certain materials,  $\mu$  may be 1 or more. Proper sequences of layers of selected materials should make it possible to sustain megabar pressures in a spherical press in technically significant volumes. [Fadeyenko, Yu. I. Ultrahigh compression press. ZhPMTF, no. 5, 1975, 159-162.]

#### Characteristics of Composite Superconductors (abstract)

Various static thermal, electrical and magnetic characteristics of composite superconductors are investigated, using an "average field method" Two types of composite superconductors are considered: multicore conductor and layered conductor. The conductors are assumed to consist of three zones: 1) normal phase of stabilizing material; 2) superconducting phase; and 3) normal zone in the region of superconducting phase, which could form as a result of different processes, e.g. magnetic flux jumps. The Hall effect is significant in the third phase, because the superconducting zone is made up of materials which in the normal state are semiconducting.

The method proposed is simple and provides an understanding of the role of geometric anisotropy, resulting from the similar orientation of superconducting and normal states. It makes it possible to relate the

behavior of effective characteristics with those of field distributions, determined from accurate analytical solutions. The method may be generalized when it is necessary to take into account nonstationary, crossed and nonlinear effects, as well as boundary effects of the medium. [Golubenko, Yu. G., and V. F. Reztsov. Effective static thermal, electrical and magnetic characteristics of a composite superconductor. ZhTF P, v. 1, no. 17, 1975, 788-791].

#### New Piezoceramic Material (verbatim)

Pyroelectric properties of a series of piezoceramic materials based on lead zirconate-titanate have been investigated. Some piezoceramics are indicated as being promising for use as thermal sensors and for making pyroelectric power generators. [Chechkin, V. V., A. I. Leychenko, O. S. Didkovskaya, G. Ye. Savenkova, V. V. Klimov, and Yu. N. Venevtsev. Pyroelectric properties of new lead zirconate-titanate-based piezoceramics. IAN Fiz, no. 6, 1975, 1323-1326. (RZhF, 11/75, #111390)].

#### Properties of Metallides (abstract)

Properties of various metallides, most of them recently discovered, and which are of scientific and practical interest are briefly summarized. The article focuses on the following topics:

- o Heat-resistant and refractory metallides
- o Superconducting metallides
- o Semiconductor compounds
- o Rare-earth metal compounds
- o Corrosion resistance of metallides
- o 'Memory' of metallides.

Metallides discussed in the paper exhibit some unique properties, notably the memory effect which is found in alloys based on titanium nickelides and similar compounds with a body-centered cubic lattice. Developments in the study of their structures, phase diagrams and systems by plotting constituent-property diagrams are of great scientific and practical value, according to author I. Kornilov, who has received a gold medal from the Academy for his work in metallides. [Kornilov, I. I. Metallides with unique properties. MiTOM, no. 10, 1975, 19-22].

#### Nontoxic Cement (abstract)

Bulgarian professor V. Kabaivanov has discovered a nontoxic cyanoacrylic cement, which is used to treat burns, prevent tooth decay and to arrest external bleeding. Surgeons are reported using it during complex operations on lungs and liver. The cement is now also being used in instrument manufacture, optical plants, electronics labs, etc. It may be used with glass, ceramics, rubber, semiconductor and other materials. [Sverkhuniversal'-nyy kley (All-purpose cement). Tekhn. nauka, no. 11, 1975, 45].



### Correlation of Geomagnetic Pulsations with Proton Activity (abstract)

A current hypothesis holds that excessive proton activity in the radiation belts is directly responsible for the formation of type Pcl geomagnetic pulsations, or pearls, observed on Earth as virtually monochromatic hydromagnetic wave trains with a carrier frequency around 1 Hz. Recent tests are described to confirm this relationship, by matching proton data from the Molniya-1 satellite with pearl data recorded at the Borok station.

Data shown is from test intervals in March and April of 1973, in which proton energies in the 100-650 kev range were registered by Molniya. They show that pearls begin to appear when proton flux exceeds some critical level and proton anisotropy becomes sufficiently great. The results are suggestive but not entirely conclusive, owing to the necessarily periodic nature of the satellite transmission. The authors nevertheless conclude that pearls originate primarily in the plasmasphere, near maxima of protons with energies around 100 kev. [Kovtyukh, A. S., E. T. Matveyeva et al. Comparison of flux and anisotropy variations of protons, measured by Molniya-1, with ground measurements of Pcl (pearl) pulsations. Kosmicheskiye issledovaniya, no. 6, 1975, 942-945].

### New Method for Calculating Long Radio Lines (verbatim)

A method is described for calculating the principal parameters of very long range radio lines, using an adiabatic approximation, for the shortwave band. Factors covered include minimum and maximum trajectory height, capture and transmission angles, periods and numbers of beam oscillations, and average absorption. The method is illustrated with some examples of calculating round-the-world paths. [Fishchuk, D. I., and Ye. Ye. Tsedilina. New method for calculating very long radio lines. IN: Sb. Issled. Sverkhdal'n. rasprostr. korotk. radiovoln. Moskva, 1975, 42-53. (RZhF, 10/25, no. 10Zh162)].

### Theory on Periodic Radio Reflection (verbatim)

Studies have shown that under certain upper atmospheric conditions an acoustic wave may transform to a quasi-sawtooth form. At a sharp gradient of electron density, moving with an acoustic wavefront, a gradient-drift instability can arise, resulting in generation of large-amplitude ion-acoustic waves. Under certain conditions the latter may in turn generate secondary waves of smaller amplitude and period. A comparison with observations shows that basic characteristics of periodic radio reflections can be explained by scattering of shortwave and ultrashortwave signals on the described system of ion-acoustic waves. [Ponomarev, Ye. A., and V. A. Shaftan. On the nature of periodic radio reflections. IN: Sb. Issled. po geomagnetizmu, aeron. i fiz. Solntsa, no. 36, Moskva, Nauka, 1975, 114-123 (RZhF, 10/75, no. 10Zh127)].

### Ball Lightning Theory (abstract)

It is suggested that ball lightning consists of positive and negative ions, surrounded by fully charged gradient shells consisting of water molecules. Mean temperature of the ball is low, in the 500-1500° K range. Lightning emission occurs during recombination of gradient ions or clusters. Two different mechanisms of cluster recombination are shown possible, depending on conditions of heat exchange. One of these has an explosive character while the other occurs more slowly. It is also shown that the lightning can convert from a low-temperature to high-temperature regime at comparatively small changes in heat exchange coefficient. These transitions are followed by sharp changes in intensity of its emission within seconds. [Stakhanov, I. P. Plasma cluster and emission of ball lightning. ZhTF, no. 1, 1976, 82-89].

### Low-Temperature Separation of Isotopes (abstract)

A low-temperature photolysis method is suggested for separation of isotopes, by using excitation energy differences of isotope-displaced molecules. Conditions necessary for this method are as follows: 1) the temperature at which photolysis occurs should satisfy the relation  $kT < \Delta E$ , where  $\Delta E$  = trap depth; 2) excitation energy transfer between isotope molecules takes place faster than photochemical transformations; and 3) quantum yield of dissociation is close to unity.

The method suggested was experimentally verified by separating H and D isotopes in acetaldehyde mixtures of  $\text{CH}_3\text{COH}$  and  $\text{CD}_3\text{COD}$ , using mercury lamp excitation. This showed that isotope effects in the transfer of electron excitation energy develop into photochemical reactions and thus could be used for separating isotopes. Separation factors were determined, amounting to 8 for H and D isotopes in  $\text{H}_4$ - and  $\text{D}_4$ - acetaldehyde at 4.2 K. The authors see the method as useful for other isotope separation such as  $\text{B}^{10}$  and  $\text{B}^{11}$ , at liquid helium temperatures. [Sagdeyev, R. Z., S. V. Kamyshan, A. A. Obynochnyy, and Yu. N. Molin. Photochemical separation of isotopes by a method of isotope traps. ZhETF P, v. 22, no. 11, 1975, 584-586].

### Soviet Linac Accelerates Carbon Nuclei (abstract)

The Joint Institute for Nuclear Research at Dubna has succeeded in accelerating carbon atom nuclei to the speed of light. A laser ion source has been developed at the Institute which makes it possible to generate fully stripped nuclei, which are fed into the linac and are subsequently accelerated in a synphasotron ring, impinging on a nuclear photoemulsion. In the first attempt, characteristic decay tracks were recorded, with the liberation of several dozen charged particles. [TASS. Nuclei move with the speed of light. Leningradskaya pravda, 30 Jan. 1976, p. 1, col. 4].

### Radioastronomy Conference (abstract)

Proceedings have appeared of the 8th All-Union Conference on Radioastronomy, issued in Pushchino, 1975. The latest astronomical apparatus and test results are discussed, including a number of papers on detection techniques. These involved with the millimeter range include the following:

- o Radiometers and radiotelescopes for exoatmospheric submillimeter research (Salomonovich et al.)
- o Balloon-borne submillimeter radio spectrometer (Lapshin et al.)
- o Superhet radiometer in the 120-140 GHz range, with frequency conversion in a GaAs Schottky barrier diode (Bordonskiy et al.)
- o Millimeter radiation sensors based on granular superconductors (Kurdyumov et al.)
- o Video receivers of 8 mm radiation using superconducting point contacts (Kurdyumov)
- o Modulated radiometer for simultaneous observation at 6 and 8 mm (Pelyushenko et al.)
- o Experimental characteristics of millimeter r-f fluctuations in radiation from clouds. (Kaydanovskiy et al.)
- o Six-channel radiospectroscope for observing interstellar molecular lines in the 3-3.8 mm range (Burov et al.)
- o Multichannel spectrum analyzer for the 1.1-1.7 mm range (Kalikov et al.)
- o Highly sensitive 3-mm radiometer with a wideband parametric amplifier (Militskiy et al)

[VIII Vsesoyuznaya konferentsiya po radioastronomii, Tezisy dokladov. (Eighth All-Union Conference on Radioastronomy. Summary of Papers). Pushchino, 1975, 204 p. (RZhF, 10/75, no. 10Zh438K - 10Zh540)].

### Theory of Thermonuclear Plasma Stability (abstract)

Studies of plasma stability reported during last three years are summarized. The author notes that the energy crisis has expedited the development of thermonuclear programs in many countries, and that a new stage in the development of plasma stability theory began with the growing demand for tokamak-type devices. This has called increased attention to the problem of thermonuclear instability, which could be caused by the charged products of nuclear reactions.

Various problems on the theory of plasma instability, such as instability due to fast ion beams, lateral current instability, drift instability, hydromagnetic instability and others are outlined. In connection with the recently predicted possibility of the self-stabilization of tokamak plasma owing to the decreased effect of channel instability at high pressures, the use of the Spitzer octupole type trap is considered for confining the high pressure plasma. In conclusion, the need is stressed for further theoretical study on the problem of collective effects, which are due to (1) fast alpha particles resulting from thermonuclear reactions, (2) fast ions, formed during injection of fast neutrals in the tokamak, and (3) fast electrons, formed during joule and SHF heating of the plasma. [Mikhaylovskiy, A. B. New developments in the theory of plasma stability. Fiz. plazmy, v. 1, no. 2, 1975, 324-327. (RZhF, 9/75, no. 9G55)].

#### Correction of Night Viewing Devices (abstract)

Night viewing devices have considerable image distortions, several times greater than in other optical devices. It is vital to evaluate these distortion values for proper data gathering by night viewers. Measurements of distortions based on square test objects, as widely used at present, are tedious and do not give suitable accuracy. A new [unspecified] method has been developed for measuring these aberrations in night viewers, which could also be applied to controlling devices of daylight optics. An optical sketch of the device is illustrated in the original article. [Pizyuta, B. A. Measurement of distortions in night-time viewing devices. Sb. Nauch. tr. aspirantov Leningr. in-t tochnoy mekh.i optiki. Leningrad, 1974, 8-11. (RZhMetrol, 4/75, #4.32.1401)].

#### Flux Compression Study (abstract)

Experiments on compression of magnetic flux between flat or coaxial conductors are described. When initial current  $I_0$  is increased, the limit current, obtained as a result of flux compression, first increases in proportion to  $I_0$ , reaches a limiting value and then remains constant. Analysis shows that in coaxial configurations with small explosive charge energies of the accelerating conductor, limit current is determined by the maximum work done by the conductor during magnetic field compression. In the case of flat conductors and heavy explosive charges, limit current is determined by the loss of flux in short-circuited gaps, formed during joining of uneven conductor surfaces. The theoretical assumptions appear to be in good qualitative agreement with experimental results. [Bichenkov, Ye. I., and V. A. Lobanov. Limiting currents during compression of magnetic flux between flat and coaxial conductors. ZhPMTF, no. 5, 1975, 115-120].

#### TV for Underwater Prospecting (abstract)

A brief review is given of TV systems being used for underwater prospecting in the USSR and other countries. The PTU-5 underwater TV developed in the USSR has a depth capability of only 150 m. The IOAN-4 and IOAN-6 TV cameras have also been developed by the Soviets and can operate down to depths of 500 and 1000 m, respectively. Most of the domestic equipment in the USSR can be used for investigations within the depth limits of the continental shelf only, whereas in France and the US, such equipment now has ranges down to 6000 m. [Levin, B. A. Underwater TV for auxiliary vessels. Sudostroyeniye, no. 10, 1975, p. 50].

#### Sea State Determined from Aerial Photos (abstract)

Measurements are reported of sea surface parameters in the southern part of the Barents Sea, 100 to 300 km off shore. Aerial photographs were taken from an altitude of 100 m by two synchronized AFA-TE cameras ( $f = 100$  mm) 25 m apart. Measurements of wave heights were made by the straight line method, which allowed measuring wave heights up to 4 m at the edges or up to 3 m in the corners of the stereomodel. The method did not require rigorous alignment in the overlap area. For an altitude of 100 m and wave heights of 0-4 m, calculated r.m.s. error in height measurements equalled  $\pm 0.15$  m.

The presence of surface swell with wind waves is briefly discussed. The authors note that the application of the straight line method in determining mean surface wave heights requires consideration of the direction of swell waves, if present. Mean wave heights measured from stereophotographs are compared with the calculated values of average wind wave heights. Maximum slope of the secondary structure along the zone of sun glitter in aerial photos is determined (which varied from  $15^\circ$  to  $26^\circ$ ), as is the relationship of slope to surface wind speed. Estimated sea state (Beaufort) generally exceeded the measured state of mixed waves by 1-2 gradations. The mixed state is said to be characteristic of the Barents Sea in summer months. [Korchagin, Ye. K., and R. N. Semenov. Results of measuring parameters of the sea surface based on aerial photographs. IVUZ Geod., no. 6, 1974, 67-71].

#### Assessment of Laser Fusion (abstract)

N. G. Basov and coworkers have assessed the laser fusion picture at length in an article in the December 1975 issue of Energetika i transport. In reviewing the mechanics of the laser-induced thermonuclear reaction, Basov emphasizes one inherent advantage, which is that the rapid generation of neutrons in the order of a nanosecond or less reduces the confinement interval substantially, which is a critical problem in most fusion studies.

Assuming that laser fusion technology is at hand, Basov postulates several types of fusion power plant. The one favored by him would be a hybrid type in which the fusion energy is used for fission of a second fuel, as this would yield more efficient energy conversion. Such a plant could be "clean" without undue difficulties, and could operate profitably even with a laser of the presently low efficiency of Nd glass, which the Soviets favor.

Recent work in the US and USSR shows that laser fusion is now a proven technology, according to Basov, and it requires only a proper application of engineering effort to reduce it to economic practice. [Basov, N. G., V. B. Rozanov, and N. M. Sobolevskiy. Laser thermonuclear synthesis and energy of the future. IAN Energetika i transport, no. 6, 1975, 3-17].

#### 500 Joule CO<sub>2</sub> Laser (vorbattim)

A CO<sub>2</sub> laser operating with a CO<sub>2</sub>:N<sub>2</sub>:He (1:1:3) mixture at atmospheric pressure is described. Ionization of the active volume was by pulsed electron beams of 1  $\mu$ sec duration. Energetic characteristics of the laser were investigated as a function of the duration and density of e-beam current and capacitance of the condenser battery. Optimization of all above parameters with a 10-liter active volume resulted in achieving an output energy of 500 joules at an efficiency of 33%. [Bugayev, S. P., Yu. I. Bychkov, Ye. K. Karlova, et al. A 500-joule pulsed CO<sub>2</sub> laser. ZhTF P, v. 1, no. 10, 1975, 492-496. (RZhF, 10/75, #10D1144)]

#### Laser-Generated Sound in Water (abstract)

A theoretical analysis is given of the mechanism by which sonic waves are generated in a liquid absorbing an intensity-modulated laser beam. Calculations indicate that for a YAG laser operated at 1 kw and modulated at 25 kHz, the sonic pressure at a depth of 100 meters will be  $3.4 \times 10^{-2}$  bar. Experiments using an Nd glass laser verified that the sonic level was within an order of the predicted value. [Bozhkov, A. I., and F. V. Bunkin. Sound generation in liquids from surface irradiation by an intensity-modulated laser. ZhTF P, v. 1, no. 9, 1975, 435-439. (RZhF, 10/75, no. 10Zh673)].

#### Laser Treatment Improves Steel (abstract)

Tests have shown that laser processing of some metals can increase their wear resistance in an aggressive medium by 2 or 3 times. A recent study to systematically establish the effect has been reported, based on laser-treated type 45 steel in sliding contact with other steel, cast iron and bronze specimens. The authors detail the conditions for which the laser-treated steel shows enhanced wear properties, and in some cases not, such as when paired with bronze specimens. Test data were recorded in both acid and alkali media. No details of the laser treatment are given, however. [Plyatsko, G. V., A. I. Porter, G. A. Preys, and M. I. Moysa. Effect of the laser treatment of steel on its durability in a corrosive medium. FiKhMM, no. 5, 1975, 91-94].



### Soviets Review US Electronic Countermeasures (abstract)

A. I. Paliy, writing for the military publishing house Voenizdat, has written several monographs on electronic warfare techniques in the past several years. The most recent of these, appearing in early 1975, purports to review current practice in electronic surveillance, countermeasures and counter-countermeasures as carried out by the US and its NATO partners.

The book is broadly divided into three sections: electronic surveillance apparatus, electronic countermeasures, and ECCM tactics. The first section describes the theory and operation of various types of radar receivers, display systems and analyzers, signal recording methods, and direction finders. The second section reviews several kinds of active and passive noise generators, including types of dummy targets (dipole chaff, corner reflectors, lens reflectors), scattering and absorptive coatings, and local ionization. IR and hydroacoustic counter-measures are also briefly covered here. The final section examines some counter-countermeasure techniques of ground-based, airborne and spaceborne systems in use since World War II, with several equipments illustrated. The involvement of CIA and NSA in these operations, including phone bugging, is emphasized.

The bulk of the material is cited as being from "open foreign sources", although about half of the 42 references are Soviet. Equipments specifically identified or illustrated include the AN/MLQ-7 mobile noise generator, the ALE-28, -29A and -32 chaff dispensers, the ARD-8A rocket dispenser and others. ECM missiles mentioned are the US Shrike, the Anglo-French Martel and the West German Cormorant. ECM pod deployment is shown for some USAF planes including the B-52 and B-66E; an ALQ-72 pod is shown as well. Radar decoys shown are identified as the GAM-72 Green Quail and Firebee drones.

The treatment tends to become somewhat garbled, and seems to be curiously dated, with most cited sources being published in the 1960's. The book has been translated by FTD. [Paliy, A. I. Radioelektronnaya bor'ba (Electronic warfare). Moskva, Voenizdat, 1974, 272 p. (LC)].

### Possible Trends in Soviet High-Speed Ground Transport (abstract)

The two-year-old All-Union Scientific Research and Design Institute for Advanced Modes of Transportation (VNIPI transprogress) is studying an evacuated (1/10 atm) tube system in which passenger "cars" could travel at speeds up to 1500 km/hr. The 2.5-m dia. tube would be made of metal-reinforced plastic, with the car/tube combination forming a linear electric motor. An experimental test site has been built near Ramenskoye, not far from Moscow. Another large test site is to be built near Tyumen'. The Tyumen' site will concentrate on developing a car-and-tube system for transporting liquified gas as a hydrate in blocks. The author states that modern gas pipelines have reached the limit of their carrying capacity and pumping rate, and that at least ten major lines would be necessary to handle the Tyumen' output alone. An estimate of 10-12 hours transport time between Tyumen' and Khar'kov is cited for tube transport. A return line would send the cars back in 5-6 hours.

By 1980, plans call for the development of 30 tube transport lines carrying coal, ore, construction materials, and farm products. The cities of Kuybyshev and Alma-Ata have requested the development of circumferential tube/car transport systems, each car carrying up to 10 passengers. A feasibility study for a Moscow-Leningrad high-speed tube/car transport system has already been initiated. [Spiridonov, A. Flight in a tube. Sotsialisticheskaya industriya, 7 Feb 1976, p. 4, cols. 1-4].

Institute of Oceanology Launches New Undersea Research Vehicle (abstract)

In late 1975, the USSR Academy of Sciences' Institute of Oceanology launched a 3-man, 10-ton undersea research vehicle called Argus. Most of the construction of this vehicle was done by a river fleet shipyard at Belyy Gorodok. The steel pressure hull is 2 m in diameter, and the depth capability is cited as 600 m. The test of the partially outfitted Argus took place in Golubaya Bukhta, near Gelendzhik on the Black Sea. Some problems were encountered in getting the vehicle into the water prior to manned tests. In the tests, Argus was lowered into the water while still attached to the ballasted four-wheel transporter. Argus is the first Soviet-built undersea vehicle built and operated by an oceanographic (as opposed to fisheries oriented) institution. [Rost, Yu. A beautiful day for launching Argus. Komsomol'skaya pravda, 11 Dec 1975, p. 4, cols. 2-5].

### Recent Publications

Droblenkov, V. F., A. I. Yermolayev, N. P. Muru, et al. Teoriya podvodnoy lodki. Uchebnik dlya ofitserov-podvodnikov VMF (Theory of the submarine. Textbook for fleet submarine officers). Moskva, Izd-vo Voenizdat, 1975, 542 p. (KL, 44/75, #39547)

Glushkov, V. M., Yu. V. Kapitonova, and A. A. Letichevskiy. Avtomatizatsiya proyektirovaniya vychislitel'nykh mashin (Automation of computer design). Kiyev, Nauk. dumka, 1975, 231 p. (KL, 38/75, #34072)

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Kossov, S. S., Yu. M. Leonov, and L. N. Litvinenko. Metodika i apparatura dlya provedeniya avtomatizirovannogo eksperimental'nogo issledovaniya elektromagnitnykh poley v otkrytykh rezonatorakh millimetrovogo diapazona voln. (Procedure and apparatus for conducting automated experimental studies of e-m fields in open resonators in the millimeter wave range). Khar'kov, IRE, 1974, 47 p. (KLDV, 9/75, #15773).

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Leonov, A. A., and V. I. Lebedev. Psikhologicheskiye problemy mezhplanetnogo poleta (Psychological problems of interplanetary flight). Moskva, Nauka, 1975, 248 p. (KL, 43/75, #38516).

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Nazarevskiy, V. A. Organizatsiya NIOKR v elektrotekhnicheskikh kontsernakh SShA (Organization of R&D in electrical engineering concerns in the US). Moskva, 1975, 33 p. (KLDV, 10/75, #17498).

Novitskas, Yu. M. Robots: from scientific fantasy to the production line. SShA. Ekonomika, politika, ideologiya, no. 3, 1975, 98-109. (LZhS, 31/75, #102251)

Novyye vidy polimernykh plenok (New types of polymer films). Kiyev, 1974, 5 p. (KLDV, 9/75, #15979)

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## SOURCE IDENTIFICATION

FiKhMM	-	Fizika i khimiya obrabotka materialov
IVUZ Geod	-	Izvestiya vysshikh uchebnykh zavedeniy. Geodeziya i aerofotos'yemka
IT	-	Izmeritel'naya tekhnika
MiTOM	-	Metallovedeniye i termicheskaya obrabotka materialov
Otkr izobr	-	Otkrytiya, izobreteniya, promyshlennyye obraztsy, tovarnyye znaki
PTE	-	Pribory i tekhnika eksperimenta
RZhF	-	Referativnyy zhurnal. Fizika
RZhGeofiz	-	Referativnyy zhurnal. Geofizika
RZhMetrolog	-	Referativnyy zhurnal. Metrologiya i izmeritel'naya tekhnika
ZhETF P	-	Pis'ma v Zhurnal eksperimental'noy i teoreticheskoy fiziki
ZhPMTF	-	Zhurnal prikladnoy mekhaniki i tekhnicheskoy fiziki
ZhTF	-	Zhurnal tekhnicheskoy fiziki
ZhTF P	-	Pis'ma v Zhurnal tekhnicheskoy fiziki