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16 March 1977

TRANSLATIONS ON EASTERN EUROPE  
SCIENTIFIC AFFAIRS  
No. 538

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STUDY OF THE EARTH WITH SATELLITES DESCRIBED

Sofia SPISANIE NA BULGARSKATA AKADEMIYA NA NAUKITE in Bulgarian Vol 22  
No 2, 1976 pp 48-55

[Article by Dr Kiril B. Serafimov: "Distance Probing, International Cooperation, and Global Control"]

[Text] In the past 10 years the range of scientific and technical accomplishments has revolutionized both a number of basic scientific directions as well as major areas in practical scientific applications of substantial socio-political significance. The creation and operation of the initial remote control probing of outer space created new unlimited possibilities for the development of geology, geomorphology, geography, geodesy, geophysics, cartography, hydrology, meteorology, soil science, oceanography, ecology, plant growing, control of forests, roads, and transportation, and all-around anthropogenic activities. Remote control methods led to almost sensational discoveries of new mineral deposits, including deposits in areas considered excellently studied through earth methods (such as, for example, in the Altay, in Texas, around the Caspian Sea, Mangishlak Peninsula, in particular, and others). The oil-bearing areas in the North Sea, Alaska, between the Island of Tasos and the Aegean shore, and others, were developed thanks to the directing and guiding information provided by satellites. Satellite cartographic measures proved that the Alaska pipeline (one of the biggest, longest and most difficult to build in the world) was being laid on the wrong tracks and corrections resulted in considerable savings. Such measurements made possible the optimized designing of Baykal-Amur Main Line. The full and global control of the condition and the development of wheat, rice, corn, soybeans and other food crops with the help of satellites provided the trade organizations a reliable planetary picture on the basis of which currently the respective prices change and the merchants direct themselves to different producers and make exceptionally favorable deals. During the October 1973 Middle East conflict the special satellites of the USSR and the United States provided constant operative information on the warring forces, reaching the level of controlling the movement and condition of an individual tank or even an individual soldier. Therefore, from the discovery of new mineral resources to signalling a forest fire, and from information on the distribution of chlorophyll in the world's oceans to universal strategic control remote control space methods proved their

exceptional suitability to renovate basic scientific and applied sectors and create new scientific and technical directions, and act as powerful means for global control over and production of conflicts and wars.

In order to imagine the importance of remote control measurements let us mention that in the United States alone, in 1974, the economic results of such activities reached the impressive figure of \$22 billion. A certain idea of the applied direction of remote control studies and of the respective importance of the various practical areas may be provided by a study of the aid given by PROON [expansion unknown] fund for the development and utilization of satellite observations and detection in the developing countries. Thus, according to United Nations Document No A/AS. 105/157, dated 5 March 1976, the absolute expenditures of PROON funds on the use of remote control satellite probing may be broken down as follows: agriculture, \$67.6 million; fishing, \$54.7 million; forest resources, \$42.1 million; geology and geomorphology, \$41.1 million; soil studies and land regulation, \$21.6 million; hydrology, \$52.3 million; internal transportation, \$31 million; mapping and topic mapping, \$5 million; struggle against locusts, \$4.2 million; oceanography, \$2.8 million; environmental studies, \$1.7 million; environmental hygiene, \$8.8 million; satellite photographs of specific territories, \$1.8 million. All in all, the PROON has invested in the utilization of remote control methods in the developing countries the impressive amount of \$334.7 million or 16 percent of the budget for this program. According to the study of the needs of a number of countries (Indonesia, Canada, United States, and others) and the corresponding views of the United Nations Scientific and Technical Subcommittee for Study and Peaceful Utilization of Outer Space, the classification in terms of applicability of the remote control methods in various economic areas is as follows: 1) agriculture; 2) geological studies, geology, and geomorphology; 3) hydrology and water resources; 4) forestry resources; 5) fishing; 6) internal transportation; 7) oceanography; 8) ecology; 9) cartography and geodesy; 10) control of harmful or economically important natural phenomena -- volcanoes, glaciers, destructive sea waves, typhoons, and others; 11) control over economic-geographic and demographic processes. This does not include the purely scientific use of remote control methods in the earth's sciences (in particular, geophysics, meteorology, and others), for the study of planets, and for reconnaissance purposes. Furthermore, we shall not deal here with the exceptionally effective satellite methods used in applied meteorology. This classification may change in accordance with the needs of a given country, area or entire civilization. However, we must emphatically stress that such classification reflects, at the given stage, the factual economic results obtained in various economic sectors the world over.

In connection with this analysis of the possible benefits from remote control methods, we must draw three essential conclusions concerning their utilization by Bulgaria. Above all, the great effectiveness of such methods is the result of their comprehensive utilization. In other words, they must not be focused on a single national economic sector. The second conclusion is that remote control probing is of great importance to agriculture, forestry, fishing, ecology control and other areas we underestimate. Let us emphasize that the lasting trend of such studies in our country was

geological and that even the geomorphological principles were underestimated. Thirdly, we must conclude that our scientific public is hardly familiar with, hardly develops, at least almost unused remote control methods which today are a powerful auxiliary and, occasionally, basic research tool for scientists, agricultural specialists, economists, biologists, geologists, geographers, geophysicists, geodesists, hydrologists, meteorologists, and other specialists. Remote control methods are also used in local studies and are irreplaceable in regional or planetary studies. This drastically raises the responsibility of the Remote Control Methods Council of the Committee for Science and Technology and Higher Education for the comprehensive, intensive, and multisectorial development and utilization of such modern ways and means for the study of vital scientific and practical problems. On the other hand, as a complex scientific organization, the Bulgarian Academy of Sciences must organizedly direct its attention to remote control aerial and outer space methods and their scientific utilization, for this is precisely an area in which the multisectorial nature of the academy could achieve good results. Perhaps it has become expedient to formulate a comprehensive problem which could and should be included in the Unified Plan for Socio-economic Development, so that our instrument manufacturers in this area may cooperate with geologists, geophysicists, geographers, biologists, forestry and agricultural specialists, hydrologists, scientific workers dealing with water problems, and other scientists.

A mandatory element in the utilization of remote control methods is obvious: international cooperation, without which such methods would lose a substantial part of their advantages. Even countries such as the USSR and the United States have great need for international cooperation in this area, a need which becomes imperative in the development of remote control probing by other countries. This is due to at least the following three reasons:

1. The problem is global and a satellite launched into orbit to survey earth resources, for example, would control the entire planet or large parts of it. The full use of such an item would call for the delivery (or sale) of its data to all interested countries. This determines the need for international cooperation and worldwide legal control. Without such control we should silently acknowledge that the world's public and the United Nations made an error by adopting the extraterritorial status of outer space, since outer space would be used for direct espionage purposes. Thus, an interested country in our territory could be one of our neighbors or any other country. This would affect our national, economic, political and other interests. Consequently, the global problem of remote control methods demands global treatment and global control. No one makes instruments for a single country and no one cuts out pictures from outer space limiting oneself to the borders of his own country, shyly refusing to glance at data related to his neighbor. The idea formulated by Canadian and other scientists of deleting satellite information on countries unwilling to be probed (the deletion may take place aboard the satellite or in earth stations receiving outer space information -- see United Nations Document A/AS.105/156, dated 23 February 1976), was categorically and officially rejected by the United States in the United Nations Scientific and Technical Committee for

Outer Space. Consequently, outer space research, as formulated, pursues global objectives, covering all countries, and should be the subject of joint international cooperation and control.

2. The receipt, processing, and interpretation of remote control probing data may take place by any country whatever in principle only. In fact, investments for ground equipment (about 5 to 7 million leva), the need for highly skilled cadres, the availability of specialized computer centers, and others, have been the reasons for the building of regional centers for receiving, processing and disseminating information. Their utilization is possible only through regulated international cooperation. The need for such cooperation is backed by yet another factor in this area. Modern equipment has such interpretative facilities that tremendous amounts of data accumulate which could be fully processed only through the coordinated efforts of a number of countries.

3. The complete interpretation of data provided by complex satellites through remote control measurements is possible by a very heterogeneous circle of specialists who cannot be found in the small countries. For this reason specialists from different countries must be used even in interpreting data for a single country.

Therefore, international cooperation is an organic requirement for the effective utilization of remote control methods. Naturally, as a world organization, the United Nations had to engage and is factually engaging in most active participation in the coordination of studies from outer space. However, that organization does not have its own satellites with corresponding technical equipment. It does not have ground stations or centers for data processing and dissemination. On the other hand, at the present stage, only the American satellites of the Landsat series have been registered as ground resource satellites. The Soviet orbital stations (Salyut-4 in particular) provide numerous and exceptionally interesting data on USSR territory. The major problem which limits the use of Soviet data is the correct attitude adopted by the Soviet Union and the CEMA-member countries on the right to control foreign territory. On this matter the socialist countries categorically believe that the gathering of economic, geological, transportation, agricultural and other data covering the territory of a given country could take place only with the agreement of its government. This view is shared by most of the developing countries and by some developed capitalist states. Ignoring this, however, the United States authorities obtain multi-spectral and photographic images of the territories of all countries, openly stating that they earn considerable funds by selling such photographs to commercial organizations (i.e., from commercial intelligence). In 1974 an agreement was concluded between the governments of Bulgaria and the USSR on the use of remote control aerial and outer space methods, according to which, under certain circumstances, Soviet unmanned and manned facilities may engage in remote control detection over our country and transmit the respective data to the Bulgarian authorities through corresponding trade organizations. Thus, remote control probes were conducted over our country by the crew of the Salyut-4 orbital station (June-July 1975)



and from the unmanned research satellite of the Kosmos series (September 1975). The data are at the disposal of the Committee for Science, Technology and Higher Education to be used, in accordance with proper procedures, at the Central Laboratory for Outer Space Research. These organizations could also provide data on the big Soviet-Bulgarian expedition aboard the special AN-30 airplane-laboratory of the USSR Academy of Sciences Institute for Space Research, conducted in our country in 1975. The existence of Soviet multi-spectral indications and photographs are of excellent quality and, in a number of respects, exceed the possibilities offered by similar photographs which we, as a private entity, purchase from the United States (data provided by the first satellite of the Landsat series, also known as the ERTS-1 satellite). The photographs obtained from the United States also include parts of the territories of neighboring countries, the responsibility for which is borne by the government of the country selling such material to private individuals.

We can see so far the appearance of two different legal and organizational approaches to remote control probing data. The so-called free dissemination of data may easily be converted into regulated espionage, whereas the system of bilateral treaties may affect the interests of third countries without this being deliberately sought. For this reason the coordinating role of the United Nations is necessary and, in the case of international relations, absolutely mandatory.

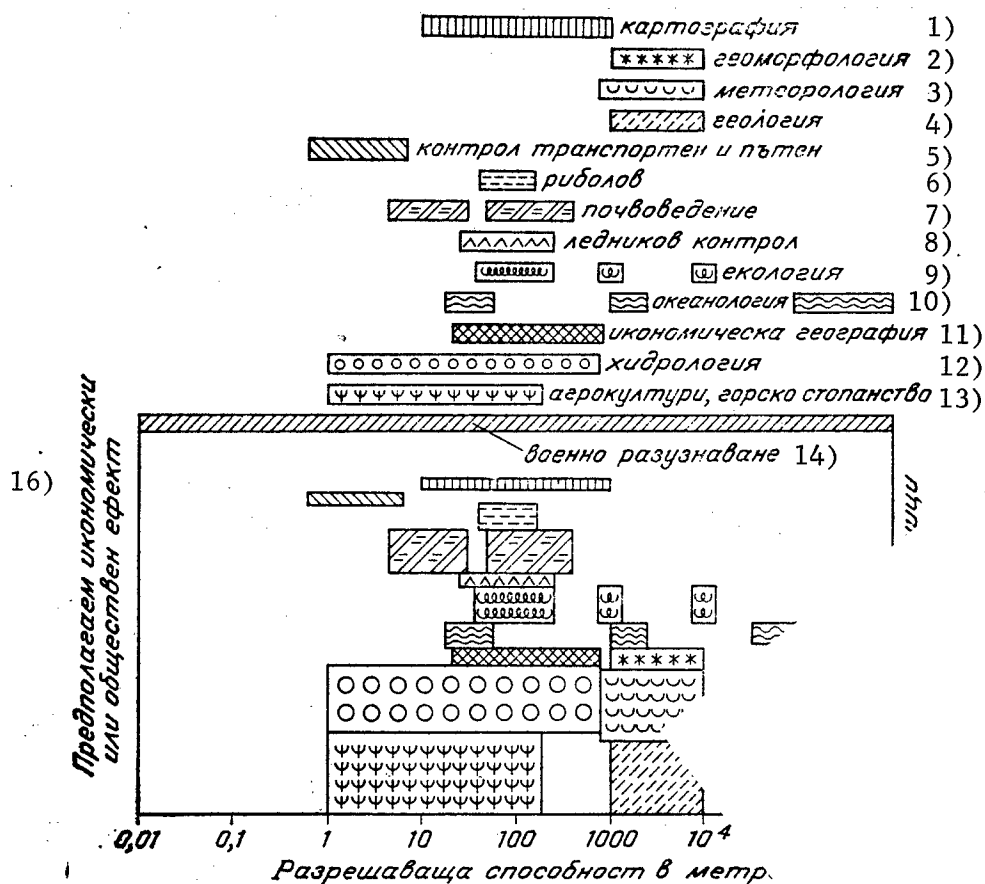
For this reason the Soviet Union and Bulgaria have adamantly suggested in the United Nations the adoption of a system for a partially free and partially regulated obtention and dissemination of data from remote control probing. According to our suggestions submitted to the United Nations Scientific and Technical Subcommittee on Space, the information obtained through remote control methods may be divided into two types: freely disseminated or disseminated with the permission of the government of the probed country. The criterion on the classification of such information and of space probing data is based on three categories of characteristics of probing instruments:

Resolution capacity (i.e., the possibility of instruments to obtain images in sizes exceeding a stipulated minimal size);

Degree of multi-spectral capacity and use of optical, infrared, and radio channels for control purposes;

Methods for recording, receiving, processing, storing, and disseminating data on the satellite and on the ground.

The possibility of classifying information into free and regulated may be seen in the diagram which, even though roughly, offers an approximate idea of the resolution capacity of the equipment and its application in the national economy, science and intelligence. Traditionally, by virtue of their all-human nature and need for global utilization, even though



Key:

- |                                    |  |
|------------------------------------|--|
| 1. Cartography                     | 9. Ecology                             |
| 2. Geomorphology                   | 10. Oceanography                       |
| 3. Meteorology                     | 11. Economic geography                 |
| 4. Geology                         | 12. Hydrology                          |
| 5. Transportation and road control | 13. Agriculture, forestry resources    |
| 6. Fishing                         | 14. Military intelligence              |
| 7. Soil science                    | 15. Relative units                     |
| 8. Glacier control                 | 16. Presumed economic or social effect |
|                                    | 17. Resolution capacity in meters      |

they may be used for geological purposes as well, meteorological data with a resolving capacity in excess of 1 kilometer should be free. This is followed by a major unused area of resolving capacities not used in practice. Resolving capacity in excess of 200 meters already provides economic, political and military information which is sovereign to the countries. The multi-spectral nature of the images drastically upgrades their level of information. For example, the monospectral photographs provided by the Landsat-1 (185 meter resolution capacity) is of no particular economic significance affecting the sovereignty of the country, whereas the combination of several such multi-spectral photographs offers qualitatively new

information which could have major consequences for a given country. The speed of processing and dissemination is quite important as a criterion for controlling the dynamics of processes (the course of crop ripening and harvesting, development of a given process, troop movement, and others).

We would like the United Nations to play a coordinating and regulating role, leaving the operative functions to the respective national, regional, and world organizations. Scientific problems could be interpreted, directed and coordinated by the World Committee for Space Research (COSPAR) of the International Council of Scientific Associations, the International Astronautical Federation and its astronautic academy, or other organizations. Cooperation with other socialist countries, based on the INTERKOSMOS program is of basic significance to our country. We expect of such cooperation to acquire possibilities for obtaining periodically and operatively aerial and outer space data on our country. We hope to acquire the possibility to create aerial and outer space instruments. We are planning the production of our ground equipment which has been tested quite successfully.

All this also shows the numerous problems which remote control methods present to our social scientists. Let us emphasize that the time has come, in particular, for our jurists to coordinate their efforts with other academic or nonacademic specialists to formulate the complete position of our country in the solution of the rather delicate problems of remote control probing, for taking merely one of the numerous problems -- that of assessing and paying damages to other countries caused by ecological destructions, the use of remote control methods opens an essentially new, important, and interesting legal, economic and scientific and technical set of problems.

This is a new scientific and applied area of great importance to theory and practice, powerfully entering worldwide research activities. The time has come for our scientists and, particularly, the units of the Bulgarian Academy of Sciences, to concentrate their efforts and assume their responsible tasks for the comprehensive development of this important scientific area.

5003

CSO: 8108/0614

## BULGARIA

### EARTH STATION FOR COLLECTION OF SPACE INFORMATION OPENED

Sofia ZEMEDEL'SKO ZNAME in Bulgarian 27 Jan 77 p 3

[Article by Prof Dr Kiril B. Serafimov, director of the Central Laboratory for Space Research, and Scientific Secretary of the Bulgarian Academy of Sciences: "Radio Bridge to Satellites"]

[Text] Yesterday an earth station of the Unified Telemetric System of the socialist countries for receiving and processing outer space information was solemnly inaugurated at the Yuriy Gagarin Base Observatory of the Bulgarian Academy of Sciences Central Laboratory for Space Research, near Stara Zagora. The station will receive signals from most satellites for scientific and applied purposes. It is the result of the joint work done by specialists from the USSR, GDR and Czechoslovakia, implementing the INTERKOSMOS program.

A major project has enriched the basis for our study and utilization of outer space. Everyone can understand the significance of radio contacts with satellites used for a variety of purposes, for it is only through radio signals that the satellite and its equipment could be controlled. On the other hand, we can obtain information on the way the space projects are carrying out their assignments, the condition of their systems, and their orientation and location only through radio waves. Now our country as well already has a basic item of the overall telemetric network of the socialist countries, enabling us to receive measurements data and information on the condition of basic Soviet, American, and international satellites, and to engage in the primary automatic processing of such data. To understand the significance of this major and interesting equipment let us mention briefly, above all, the ETMS, the United Telemetric System of the Socialist Countries, of which the Bulgarian telemetric station inaugurated yesterday is a major link.

From the very beginning of the creation of the INTERKOSMOS program, major studies were undertaken on the development of a socialist telemetric system which would guarantee the most modern transmittal and processing of satellite data. As a result of the joint efforts many new basic results were obtained in the field of the theory of information, methods for

classifying and selecting data, primary data processing, memorization and speedy transmission from satellites to earth. At the same time a new and original instrument was designed and manufactured: the satellite part of the ETMS, which has already flown and proven its good qualities aboard the INTERKOSMOS-15 space object. The flight of this object marked the beginning of the utilization of a new generation of satellites which, as a result of their big size and payload, good stabilization and modern telemetry are known as automated unified orbital stations (AUOS).

The specialists who set up the ground station expressed their satisfaction with the excellently chosen location. Because of its accessibility and the traditional close relations existing between the Base Observatory and the public and the students in Stara Zagora, Sliven, Kazanluk, and other cities, the ground station will be also used to disseminate knowledge among the broad masses.

The initial experiments of establishing contact with satellites have yielded excellent results. Thus, for example, reception from the American Solrad satellite was received in the record time of 17 minutes. Naturally, in the future the data of a number of other satellites will be received, processed and stored. The ground station will enable us to expand and receive in the future pictures of the earth in various spectral ranges for purposes of geological, geographic, and soil studies, and vegetal, ecological, and all-around control.

The remote control station near Stara Zagora is the fruit of the joint effort of specialists from the USSR, the GDR and Czechoslovakia. It was set up by engineers and technicians from these countries assisted by Polish and Bulgarian specialists. Such stations are in operation in the USSR, Poland, the GDR, Czechoslovakia, and Cuba, and will be built shortly in Hungary, Mongolia and other countries. Thus, our ground station will be a link of the entire international satellite system. The Unified Remote Control System will enable the socialist countries to acquire a new bridge linking them through outer space. Our ground station, itself the result of socialist integration, is becoming a new factor for the constructive cooperation and fraternal relations among socialist countries!

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BULGARIA

# LASER USED IN COMMUNICATION EQUIPMENT

Sofia TEKHNICHESKO DELO in Bulgarian 5 Feb 77 p 5

[Article by Engr Vladimir Atanasov: "A Laser Communications Device"]

[Text] The development of the experimental [possibly, optical] range for communications purposes has been constantly growing. The use of the laser for this purpose makes it possible to increase the capacity of wireless communications equipment by many fold, because the capacity of a laser communications line is a million times greater than the capacity of a radio link of the meter band.

In being guided by these considerations, an enthusiastic young collective from the Institute for Special Electronics, under the leadership of the physicist Genadi Zhechev, for the first time in our country has developed the MOT-1 laser communications line. The new modification of the MOT-1 is a dependable and excellent means for two-way direct communications between two subscribers under the conditions of optic range.

The new experimental models have shown excellent qualities. The device has been made using a pulse semiconductor laser and has a range of up to 5 kilometers. The article is compact, economic and easy to operate. The storage battery provides around 100 working hours under receiving conditions and around 25 hours under conditions of simultaneous and continuous receiving and sending.

In design terms, the laser communications line is in the form of two units, an electronic unit and the transceiver. By a panoramic telescope rotating fine tuning head, the transceiver is attached to a stand. The unit weighs around 7 kilograms without the stand. A visual system, a telescope with 8-power magnification, is used for detecting and aiming toward the other subscriber.

The new improved version of the developed laser communications line will be applied in areas of airfields, ports, in construction, in geodesy, for communications between enterprises and associations, in the mail, between installations separated by rivers, roads, railroads and streetcar lines, anywhere that the stringing of a cable is ill-advised or impossible.

The laser communications line is noise-proof, and does not require permission for a transmitting frequency, it is light and easy to carry, and this provides the possibility of mobile communications. In design terms, it should withstand high mechanical and climatic testing. With its production, a start will be made to optical communications in Bulgaria, and in the near future this will become as essential as the radio is in our days.

10272

CSO: 2202

BULGARIA

## COOPERATION WITH USSR IN COMPUTER PRODUCTION

Sofia TEKHNICHESKO DELO in Bulgarian 12 Feb 77 p 3

[Article by Dr Dimitur Dimitrov: "A Reservoir of Knowledge and Creativity"]

[Text] Just seven or eight years ago we began not only talking about electronic computers, but also established the policy of developing and introducing this equipment. In this regard, three base computer plants were established. Blagoevgrad produces the cabinets and frames on which the parts are assembled. The plant in Ruse is concerned with producing all the electronics consisting of the so-called printed plates and the installation of the circuitry on them. Shumen produces the software such as the cutting tools, injectors, forms and so forth, while the plant in Sofia in essence is the central computer. In Ruse the printed plates are produced for all types of electronic computers, and we receive the circuitry for them from the USSR, GDR, CSSR and Poland.

The deputy director for production questions at the Ruse plant, Engr Khrastak Belev said:

"In a short period of time we have achieved exceptionally good results."

In 1969 we began to produce the plates for Soviet electronic computers using their technology. In 1971, we began production of a magnetic disc storage device. Three years later 20 types of electronic installations were in production, and at present the Ruse workers produce almost everything which is required for a computer center.

Our nation, after the USSR, is the largest producer of electronic equipment for computers in all the socialist community.

The plant operates basically for exports, some 80 percent. It is a question of production which is as delicate and precise as it is complicated.

Over the 6-7 years, due to close collaboration with the USSR, production has grown constantly. Due to the good quality of the produced products, and this is the opinion of the consumers, the plant has a good name and good prestige!...



What is the essence of Soviet experience?

The deputy chief of the technical control department, Engr Asen Iliev said:

"In 1975, upon a decision of the plant party committee, a group of specialists was assigned to become familiar with the L'vov system of product quality control, as well as its organizational principles and the practical results of its application. After a visit to the L'vov Plant for Telegraph Equipment, the Minsk Electronic Computer Plant and the VEF plant in Riga, over a period of 8 months, our model was developed for a comprehensive system of product quality control. In other words, the experience of our Soviet colleagues was adapted by us. This was also related to the 22nd Decree of the Council of Ministers concerning the elaboration of systems on the basis of standardization, and for a more advanced form of product quality control."

The system elaborated at the plant, like the Soviet one, consists of individual instructions and directives which regulate work quality at all units in the plant. Basic to this system is the directive for defectless labor, and here specific indicators have been worked out for assessing the labor of both the workers in basic production, as well as the production engineers, designers, supply workers, economists, timekeepers and others whose labor also determines product quality.

Like In Minsk

The introduction of the system of defectless labor was preceded by enormous work related to the creation of the material and technical base, the organization of production, and providing the precision of the basic facilities which would guarantee the output of high quality product.

In order to achieve the necessary results underlying the elaboration of the system, all the workers, inspectors and inferior-level leaders were to undergo a testing of their knowledge in the area of the tasks performed by them and for production operations.

The system, in addition to the basic directive concerning defectless labor, included another 15 directives and instructions which regulated the checks on production discipline, quality and reliability of the articles, prevention and analysis of factory rejects, for the introduction of certain more progressive inspection methods, for granting bonuses to the executers, and so forth.

The introduction of some of the instructions included in the system of quality control at the plant began on 1 September 1975. As the more important of them, we might mention the instructions for introducing inspection control, the instructions for introducing hourly operational control and the instructions for the inspection of finished products.

From the first of April 1976, a directive was introduced for control of production discipline and inspections by the department of the chief production engineer, and of 1 January 1977, a schedule was approved for the comprehensive inspection of individual shops for the quality and reliability of the produced product.

At the present moment, preparations are being completed to introduce the basic directive for defectless labor.

In the USSR, at Our Teachers

For the precise application of Soviet experience, in this area leaders and specialists from the plant are sent each year to L'vov, Minsk and Riga. Recently from the Minsk plant we received the last plans of the system for electronic computers. It included the subsystems for control and economic activities, party political work and other such related specifically to improving product quality. On the basis of these plans, the task has been posed of having the various departments work out specific materials on introducing these subsystems.

To put it more accurately, not only the workers of the plant will be responsible for product quality, but also the leaders, the party workers, the trade union leaders, the shop heads, that is, everyone!

Seven Hundred Types of Plates Mean 700 Types of Plans

In line with the introduction of Soviet experience at the plant, a program plan has been prepared. By 1980, standards are to be worked out for quality control in the aim of raising its role to a higher level. This is not easy, in bearing in mind that the plant manufactures 700 types of plates, and this, in turn, means the presence of 700 types of plans.

Finally, we asked the trade union chairman, Mariya Penkova, to describe the introduction of Soviet experience.

"Our plant," she said, "employs over 2000 workers and specialists, predominantly young people, most of whom are girls. Product quality is an important problem, and it has always been at the center of our attention.

"The system is a very useful one, if it is used in the form which it is proposed. It cannot be applied partially, and undoubtedly will be developed and improved in the future. Initially experiments were made in just one shop, but it turned out that this was impossible.

"Our plant is the first to begin the introduction of this Soviet system. It has also been well received at the G. Dimitrov, P. Karaminchev and ZhITI plants. As far as I know, our results are the best!..."

And we also were left with this impression. The results are truly good, because it is a common concern of the entire collective. The workers and specialists by common effort are introducing new and progressive features, drawing fully from Soviet experience. And they will succeed!...

And if someone is to be considered responsible for the good results achieved, then this must be the great Soviet nation, that rich reservoir from which we draw knowledge, ability and experience!...

ACHIEVEMENTS IN THE FIELD OF MICROELECTRONICS OUTLINED

Sofia RADIO, TELEVIZIYA, ELEKTRONIKA in Bulgarian No 8, 1976 p 2

[Article by V. Vlaeva: "Microelectronics Institute"]

[Text] Electronics has entered every sphere of life. This is due to the rapid rate of development of the economy and the modernization of production. This has led to a rise in the requirements for structural elements, the introduction of new technologies for producing them, and the endeavor constantly to improve them.

In 1976 [sic! Error for 1972 or earlier? See next to last paragraph of text] the Microelectronics Institute was created out of the Semiconductor Devices Section of the Bulgarian Academy of Sciences. Here for the first time in our country transistors and devices with a small degree of integration -- the UNIMOS series -- were developed on the basis of MOS technology.

As the institute has developed, the specialists in this field have gained recognition. For everyone the beginning has been equally difficult and new.

In just a few years' time the young staff of physicists, chemists and engineers developed devices with a medium degree of integration, and a little later devices with a high degree of integration.

Several series of MOS integrated circuits have been designed, with which it is of interest to familiarize ourselves.

Series 3000. The circuits of this series are shift-registers and can be used as storages, delay lines and frequency dividers.

The SM 3006 is a quasistatic shift-register operating off one external clock pulse, with information storage capability. The circuit is fully compatible with TTL integrated circuits. It has a 128-bit capacity and is encapsulated in a case with 12 outputs.

The SM 3020 is a dynamic shift-register with information storage capability compatible with TTL integrated circuits. It has a 256-bit capacity and is encapsulated in a 12-output case.

Series 8000 includes circuits designed for random-access working storages. The circuits of this series find application in electronic calculators, micro- and minicomputer peripherals and terminals, digital computers, automation, instrument manufacture etc.

The SM 8001 is a static store with complete internal decoding. The circuit is compatible with DTL and TTL integrated circuits. It is an analog of Intel 1101A. The capability for direct OR connection of the outputs is provided. It has a 256-bit memory capacity, a 256x1 organization and 16 outputs.

The SM 8002 is a static store with complete internal decoding and the capability for direct joining of several outputs. It has a 256-bit memory capacity, 64x4 organization and 24 outputs.

The SM 8003 is a quasistatic store with complete internal decoding and is characterized by very low consumption. It has a 512-bit memory capacity, 128x4 organization and 24 outputs.

Series 7000. The integrated circuits of series 7000 are static stores with complete internal address decoding. The recording of information in the memory matrix is effected by changing the thin-oxide technological masks. The circuits are used in electronic calculators, terminals etc.

The SM 7200 is an approximate analog of TMS 4300 I. C (Texas Instruments). It is compatible with TTL integrated circuits. It has a 4096-bit memory capacity, 1024x4 organization and 24 outputs.

The SM 7300 has a 6144-bit memory capacity, 512x12 organization and 24 outputs.

The SM 7701 and SM 7702 are symbol generators with a 2560-bit capacity. They are compatible with TTL integrated circuits. Sixty-four standard symbols (Latin letters, digits and signs) are recorded in the memory field of the SM 7701 circuit, and 35 standard symbols (Cyrillic letters) in the memory field of the SM 7702.

The SM 7600 is compatible with TTL integrated circuits. It has a 2048-bit memory capacity, 512x4 organization and 24 outputs.

Series SM 500. The SM 500 general-purpose system is designed to be used in computing and control devices with microprogramming control. It consists of five integrated circuits with arbitrary logic and a high degree of integration (from 1000 to 1600 elements per microcircuit) and two standard stores:

SM 501 -- input unit;

SM 502-- microdesign control;

SM 503 -- input unit;

SM 504 -- arithmetic unit;

SM 505 -- printing block;

SM 7600 -- 2048-bit permanent storage and 512x4 organization;

SM 8002 -- working storage with 256-bit capacity and 64x4 organization.

The institute has also developed special-purpose MOS integrated circuits.

The SM 201 circuit is a digital electronic clock. It contains 1600 transistors and 650 resistors. It occupies a 5.0x3.6-mm area and is mounted in a ceramic case with 42 outputs. It is used to make electronic clocks and time-reading and measuring devices. A detailed description of the technical data and the possibilities of using the circuit is shown in Issue No. 2/1976 of the journal RADIO, TELEVIZIYA, ELEKTRONIKA [Radio, Television, Electronics], page 10, in the article "MOS Integrated Circuit of SM 201 Electronic Clocks." The Chronos 25, Chronos 10 and Chronos 50 clocks were designed on the basis of this circuit. The technical data for these are given on the covers of this issue [Not included in this translation].

The SM 901 is a special-purpose MOS integrated circuit for an automatic [telephone] dial. The memory capacity permits the recording of 30 eight-digit numbers. On the basis of this circuit the institute has developed the AN-10 automatic dial and introduced it into the production program of the Belogradchik Telephone Plant. It is the first automatic dial developed in a socialist country using an MOS integrated circuit. Its introduction into administrative practice will contribute to a considerable decrease in the time spent in establishing telephonic connections.

The SM 700 series is designed for the construction of digital automatic devices, instrument manufacture, medical and nuclear electronics. All the circuits of the series permit direct (conductor) OR connection of an arbitrary number of like outputs.

The SM 701 consists of four decade reversible counters with independent inputs and outputs, a memory, a controlled decoder for an arbitrary type of digit-display elements and logic for the control of a 3-1/2 decade counter for digital measuring instruments operating on the double integration principle.

The SM 702 is a circuit for the control of the signs of digital position indicators and an anode signal generator with a dynamic type of display.

The SM 703 is a multifunctional operational device -- a divider with an arbitrary programmable quotient of 1+9999 per circuit; a counter with a programmable counting coefficient; a digital comparator of four-digit decimals; an adder. The circuit permits the direct joining of an arbitrary number of

SM 703's for the purpose of increasing the digit capacity of the processed information.

An important factor in the production of instruments is establishing their serviceability. This involves creating complex and expensive apparatus. This is why the Microelectronics Institute gives special attention to systems for measuring the functional and static parameters of the circuits. One of the institute's latest development in this respect is the AS-2000 automatic general-purpose system for measuring MOS integrated circuits, hybrid integrated circuits and printed circuit boards.

During the period from 1972 to date specialists of the institute have been granted 27 inventor's certificates, and all of them have been put into production.

Refinement of the MOS technology makes it possible to design instruments with an ever higher degree of integration. At the moment work is under way to create a microprocessor circuit. The institute state will thereby join in implementing the decisions of the 11th Party Congress regarding the development of electronic equipment that will increase the efficiency and quality of managerial activity in Bulgaria.

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COMPUTERIZED TRILINGUAL TECHNICAL DICTIONARY REPORTED

East Berlin DIE TECHNIK in German Feb 77 pp 82-83

[Article by Dr Eng G. Neubert, Grad Eng H. Kukuczka, and Dr Eng E. Meyer: "Electronic Dictionary of Russian/English/German Technical Terms;" originally delivered as a paper at the Fourth Conference on Mathematics and Cybernetics in the Economy, 27-29 October 1975, in Dresden]

[Text] 1. Requirement

Socialism is also placing greater social demands on linguistics. They lie, for instance, in the compilation of and care for systems for technical concepts or also in the ready availability of the rapidly developing technical vocabulary to translators, interpreters, and standardization personnel, for data technology, students and so forth. Also in linguistic science and in practical linguistics, EDP is an important intensification tool. The use of EDP in linguistics, especially in the processing of terminology, is justified only when the lexicography of specialized technical dictionaries no longer finds its task exclusively in the production of the traditional type of technical dictionaries but concerns itself with all areas that to a prominent extent depend on the processing of language. To give an example: In data processing, the development of so-called key term listings calls for an inventory of the existing technical vocabulary. The result, the thesaurus, is in spite of certain normative linguistic operations it performs a dictionary-like compendium of technical terms differing but slightly from those used in everyday speech. However, the individual technical term entries have to have supplementary, function-conditioned information, such as the informational quality of the term, the place of the concept within the hierarchical system, possibly even the terminological standard, its equivalents in the case of bilingualism, that is, the words of identical meaning in the other language, and so forth. Other cases of application which create their own conditions in terms of scope, selection and supplementary information are technical term compendia in preparation of standardization projects, technical term listings for the training and advanced training of interpreters, translators and students, and technical term inventories for computer-aided basic linguistic investigations.

The Dresden Electronic Dictionary of Technical Terms (EWF) was conceived in such a way that most tasks placed by linguistic science and practical linguistics on a dictionary can be solved. EWF was produced in close cooperation of social science and natural science disciplines in the Institute for Applied Linguistics at Dresden's Technical University with the computer center of Dresden's Technical University. The first stage went into operation late in 1974. At present, the Institute for Applied Linguistics has stored for its own teaching and research needs approximately 320,000 technical terms in electrical engineering, chemistry, chemical engineering and hydraulics/pneumatics. The project is carried out in the Soviet large-size computer system of BESM-6.

## 2. Data-bank Structure

### 2.1 Lexicographic Structure

The lexicographic unit of EWF, analogous to the "word entry" in dictionary lexicography, was termed "concept entry", and any one concept entry stores all terms of identical meaning in the languages represented.

A lexicographic unit in EWF is divided into "definitional" and "supplementary" elements, and either of them is traceable separately. Supplementary elements are coordinated with the concept as well as with the definition. Supplementary information consists, for example, of the definition or explanation of the concept, the specialized technical field, the conceptual category, the chemical formula (in chemical compounds), the source of literature, the status of currency, the terminological quality of the definition and, if necessary, the standard, grammatical detail and so forth. Supplementary information of limited variety is stored in catalog form, all other information, verbally from (1) to (4).

### 2.2 Computer Structure

All verbal data are stored in their normal orthography in the EWF. This makes possible processing the EWF inventory while taking account of all customary modes in which the terms are written and going over, when the time comes, to more suitable peripheral equipment at any given time and without any intellectual effort. The internal set of signs in BESM-6 permits the inclusion of all small and capital letters in the Russian, German (thus also the English), French and Greek alphabets, the decimal figures and a number of linguistically relevant special signs. The raising and lowering of signs can also be signaled. In conformity with the various possible receiver units chosen, the user may select various simplified output sets but, of course, when reading the computer is facilitated, a certain loss in unequivocalness occurs. In any event, teletype printouts carry the Russian letters nontranscribed.

The complete concept entries, that is, the definitions and the supplementary data, are stored without any definable sequence in a so-called complete storage unit. The definitions are found in addition in register storage units, separated by languages and in alphabetical order. They are tagged there by references to the complete storage unit. This concept of storage



saves a lot of storage space as every concept entry, regardless of the number of definitions contained in it, need to be available only once, with the reference register storage - complete storage requiring but slightly more effort.

### 3. Use

The programs in the current first stage allow for input and maintenance and output of two basic types of EWF products.

Input and maintenance go via ordinarily readable data sets that also serve as punch hole reference. These data sets are designed for a relatively large number of information elements, and it would be useful to simplify them in accordance with the real storage and processing task, where one would only have to pay attention to the marking demands and the input and maintenance programs and some conditions resulting from multivalence requirements.

The two basic types of EWF products are equivalency lists and classification lists.

Equivalency lists (called "text word lists" - TWL) furnish data on "definitions" called for, for example, the German equivalents of technical terms in a Russian technical text, and they do so in the same sequence in which the queries are put. They are used as word lists in translation, in training students in technical languages and, for example, in checks on completeness in lexicographic work. A special feature of the program lies in the possibility of conditioned processing: If the user suspects that some definitions are lacking in the inventory, he can put in so-called queries on substitute definitions by simple notation, for which equivalents are then supplied only after it was determined that the unconditioned definitions queried were in fact unavailable.

Classification lists (called "feature word lists" - MWL) contain definitions classified in accordance with conceptual or definitional features. Query features may consist of the availability or nonavailability of supplementary information; the availability or nonavailability of certain signs and sign sequences at the beginning, inside or at the end of the definitions or of the verbal supplementary information; content of the supplementary information; or the number of the definitional elements. The program can process these features singly or in various ways combined. As output, the user can call for an addition of definitions of identical meaning in one or more languages and for supplementary information subject to choice. The output sequence can run in alphabetical order, in reverse alphabetical order, alphabetically according to parts of the definitions (nominal definitional core, lexicographic search term), or in the sequence of storage. Output can be chosen via teletype or magnetic tape for further electronic processing. The latter option largely expands the useability of the classification program in that further combinations can be tapped and, for instance, a selective mix of various components becomes possible.

To give a picture of what the program can do, a few examples of the first year of operation: To work out textbook material for training students in technical Russian, measurements had to be recorded for the frequency of certain formative elements in Russian technical terms. They were gained through querying the relevant sign sequences by means of the computational procedure developed in the program. The research by the Institute for Applied Linguistics in the field of German technical language has been, and continues to be, substantially supported through making available vocabulary that may be classified first in terms of its formative elements and then, along conceptual categories. Furthermore, a collection has been prepared of lexicological reference listings constituting a basis for investigations in applied linguistics which could not be put together through intellectual efforts at all. For supporting the preparatory work on terminological standards and thesauruses, concept listing are being prepared according to specialized technical fields and to certain definitional elements.

One may summarize by saying that through the use of EDP, linguistic processing operations are being greatly rationalized in many fields and that, indeed, a whole number of operations now became possible for the first time which, without EDP, would have called for an untenable or unfeasible, high intellectual effort. Prerequisite for it, of course, is the storage of technical vocabulary and an ongoing terminological maintenance of the inventory by paying attention to the development of technical language. Other prerequisites, in part not fully taken care of, are of a technical nature. They pertain, for one thing, to the sets of signs that let themselves be processed, and then it concerns peripheral facilities as those for tape transmission, the screening equipment and suitable storage media for the installations in use that are presently being set up for operations. This will also put into full use the extremely useful equivalency program, and extensive terminological services can then be established. Furthermore, through the storage with direct access, the installation of a complete reference subprogram will become possible, which is prerequisite to the work on the thesaurus. The lexicographic work becomes considerably speeded up by complementing it with a program on dictionary phraseology, by means of which print-ready dictionary manuscripts can be gained from the EWF in printout form for photo offset. And finally, even basic linguistic research will be facilitated by lexicological analysis and, possibly, synthesis programs.

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5885

CSO: 2302

## HUNGARY

### BRIEFS

HYDROGEN FROM PLANTS AND SUNLIGHT--At present under laboratory conditions only, Soviet scientists are succeeding in producing hydrogen with the aid of green plants and solar energy. It has been proved that hydrogen combined with oxygen is a readily usable source of energy. It can be used as vehicle and heating fuel, converted to electric power and used in metallurgy and the chemical industry as well as in other industries. Insofar as power per unit of weight is concerned, it surpasses natural gas 2.5-fold and petroleum derivatives 3.3-fold. Since its separation from water by electrolysis is expensive, cheaper methods are being sought. In the course of experiments, carefully selected plants produced hydrogen from water after being exposed to sunlight. Oxygen was a "byproduct" of the process. It has been calculated that if a 140 X 140 kilometer reservoir were established in an area of maximum sunlight and this reservoir were seeded with plants including single-celled green alga and if the resulting hydrogen were collected by some appropriate equipment, there would be enough to provide power for the entire Soviet Union. [Budapest NEPSZABADSAG in Hungarian 15 Feb 77 p 10]

ATMOSPHERIC RESEARCH--High atmospheric measurements in Hungary are conducted at Szeged and Budapest. In Budapest, the National Meteorological Service has begun testing the Soviet Meteorit II system which is a radio sonde system. [Budapest ESTI HIRLAP in Hungarian 14 Feb 77 p 3]

CSO: 2502

END