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CONSIDERATIONS ON DEVELOPMENT OF ENGINEERING CAPABILITIES 1/

by

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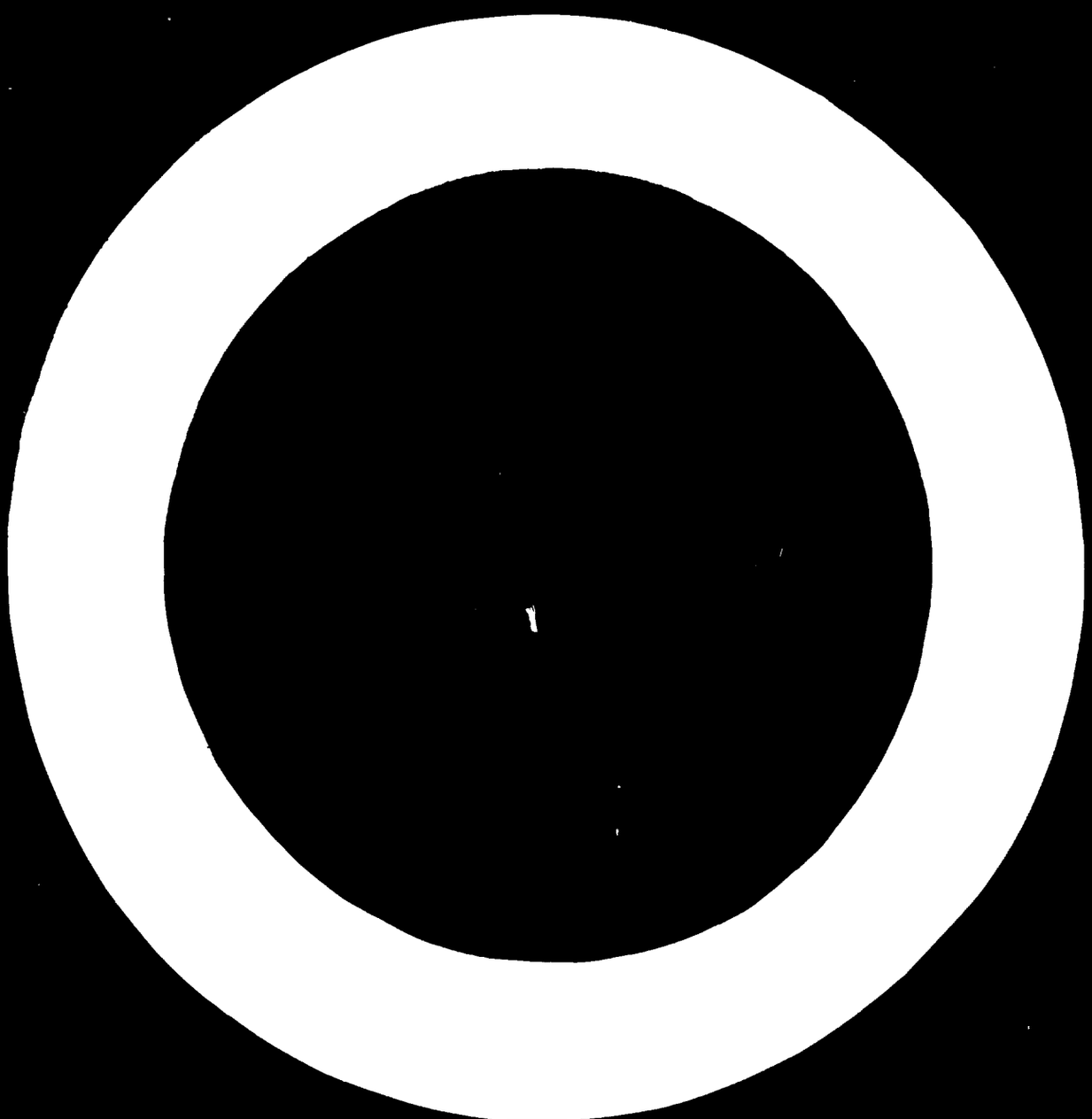

I. Technical Development Conditions Concerning the Design of Production Processes Automation Devices and Other Industrial or Laboratory Appliances

The People's Republic of Bulgaria is putting into effect serious measures to speed up the development of the chemical industry, of power production, food and light industries, and machine-building. Efforts are made in these branches to implement the newest technical progress achievments in the fieldsof technology, production organization and automation. A policy of consecutive concentration and production specialization is carried out.

All these problems have been the subject of a series of most highly authoritative state documents. They are the object of attention both of the scientific and technical intelligentsia and the workers, and also of wide public circles all over the country.

The all-round modernization and the immense scale of construction for such a small country like Bulgaria, generated the need for a great variety of devices for automatic measuring, regulation and control of production processes.

Together with the building of new plants for domestic needs, Bulgaria exports some specific production plants to other countries which also leads to the question of their

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equipment with such devices, and, consequently, of our augmented need in them.

With a view to satisfying these demands there have been, and are now being, built, a series of plants specialized in the production of measuring, regulation and control devices for the production processes, as well as of instruments and devices for standardization, control and analysis of the production instruments' indicators.

For the purpose of conducting research and with a view to elaborating new articles, as well as to testing their prototypes, the Scientific Research and Design Institute in Instrument-making was created in 1966. The Institute which numbers an average number of collaborators has specialized in the following activities: preliminary technical and economic research with reference to the instruments;design of their construction (on the basis of special draughts of construction); elaboration of prototypes and their testing for the purpose of determining their qualities and fitness for use in industry.

The Institute also prepairs and trains specialists who are to work with the instruments.

It renders immediate assistance to the plants in their mastering of the production of these instruments.

To make the fulfilment of these tasks more easy there have been organized at the Institute several design groups; several research workshops ; one common experimental production workshop; several testing laboratories and one common laboratory for standardized testing of the prototypes,

The main fields of the Institute's activity at present are:

- Pneumatic measuring instruments and transbusers;

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- Electronic transbusers;
- Electronic devices for structure analysis of substances;
- Pneumatic indicating and recording devices;
- Electrical recorders;
- Electronic digital instruments;
- Electronic controlers;
- Pneumatic valves;
- Electrical valves;
- Control valves.

Besides, there is at the Institute a specialized Scientific and Technical Information Centre which gathers and treats information necessary for the design or the estimation of the qualities of the instruments and devices.

Independantly of the Instrument-Making Institute in this country exists a Scientific Research and Design Institute on Automation; its major task consists in designing of standard systems for regulation of industrial objects and for automation of whole productions or enterprises.

In a number of designing institutes which specialize in the elaboration of projects for new construction for the different kinds of industries, there are differentiated groups on automation and measuring devices ; they are working on concrete projects of automated systems. Same types of groups are also working in the fields of the chemical and metallurgical industries, the light and food industries, and in machine-building.

The above-mentioned Institute on Automation and the groups at the design institutes do not deal with designing of new instruments and devices, and do not elaborate or test prototypes for them.

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II. Training in Designing of Instruments and Devices

In Sofia, the capital of the country, there is a Higher Institute for training of machine- and electrical engineers; 5 of its specialities have much in common with the designing of devices for industrial process automatic measuring, regulation and control. These are:

- automation and telemechanics; it offers specialization mainly in regulation theory and electric systems, and less so in electric and electronic regulation appliances. About 25 people trained every year.

- electric machines and instruments; it offers specialization in electric quantities measuring devices and electric power stations automation. About 30 people trained every year.

- industrial electronics; it trains in industrial application of electronics, e.g. electronic regulation devices. About 15 people trained every year.

- computation techniques; it trains in digital and analogue computers and control systems. About 20 people trained every year.

- mechanical instrument-making; it offers specialization in kinematic devices and clock-work, and less so in pneumatic and hydraulic regulation instruments. About 15 people trained every year.

In Varna there is a higher Institute for training of machine- and electrical engineers, in which there is a specialized course in "Industrial Automation", mainly - electrical automation. About 15 people trained every year.

In Dimitrovgrad there is a high technical school for

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preparation of chemical industry automation technicians; the high technical schools in Burgas, Stara Zagora and Pleven have courses in chemical industry automation.

In Sofia there is a specialized high school of electronics which trains technicians in industrial electronics, computation and nuclear devices.

The high schools in Plovdiv, Rousse and Shumen have courses in pneumatic automation, while those in Varna, G. Oryahovitsa and Khaskovo - in electric automation.

The schools in Varna, St. Zagora and Radomir have courses in power production automation.

The technicians who graduate from these schools have the qualification for accomplishment of by-work in designing of new appliances, namely: make draughts; elaborate machine components; take part in their assembling, tuning or testing; take part in their exploitation; they, however, cannot accomplish any independent work either in designing or in the analysis of the devices.

From what has already been mentioned above it follows that the training of specialists with higher education inside the country does not truly correspond to the needs and requirements in the designing of new devices and prototypes.

The Institute of Instrument-Making numbers among its collaborators many designing specialists who possess certain industrial and technological experience, and have demonstrated their marked creative interest in research.

These specialists have undergone certain training, and have additionally specialized in the designing of devices and prototypes mainly by getting themselves acquainted with foreign literature on these problems or through the study and testing of ready-for-use devices and instruments or - most of all - by the conclusions they have come to, and the inferences they have drawn from their own mistakes

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and their successes.

The language barrier erects some complimentary obstacles before them. The technical and scientific literature printed in Russian, is of great help to them in this respect, the Russian language being closely related to the Bulgarian and, consequently, easily understandable to all specialists in this country.

Quite different is the picture, however, when it comes to literature in English, French or German for the reason that the number of specialists who have a good knowledge of these languages is quite restricted.

During the past few years special courses have been organized with the purpose of filling this gap.

III. The Country's Requirements Concerning the Augmentation of the Number of Specialists of Designing of Instruments and Devices

It is evident that the specialists who have been trained in the above-mentioned manner, are not in a position to assure the necessary high-level contemporary technique as far as it concerns the designing of instruments and appliances which is namely the Instrument-Making Institute's field of activity.

Firstly, the need is felt for system-engineers - specialists who are to analize the objects, compose correctly the structure of the necessary regulation systems, determine the controlling algorithms, and choose the necessary appliances. One important task of these specialists will be their recommendations as to which appliances, with what indicators, and when, should be designed, in order to satisfy most expediently the demands of the country.

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The most appropriate form of specialization in this respect will be the sending of engineers with common training (on a 6-to-12-month scholarships) to countries with a developed instrument-making where they could specialize as system-engineers.

Together with this, it is necessary that scholarships be granted in the same specialities, for those countries which have higher schools providing such training.

Another important speciality whose lack is also felt here, is that of the engineer-valuer who is to make technical and economic analysis and evaluation both of the designing and of the qualities of the elaborated prototypes and instruments.

Training in the designing of electronic and pneumatic instruments is insufficient, too; as there is no possibility for a quick improvement it is necessary that the leading designersfrom the Institute be granted 6-to-12-month specialization at advenced instrument-making firms; this will enable them to get acquainted with the contemporary designing and elaboration methods, with the organization of the way in which prototypes are created, and with the modern construction of testing devices.

Together with this, it is necessary that experts from tha basic specialities from the same firms be sent here for a period of 1 to 2 years during which they should train the personnel and thus further a quicker modernization of the designing methods and the methods of elaboration of instruments and devices; they should also consult with the specialists from the Institute both about concrete projects and the choice of the trends of designing.

The insufficiency of a specialized testing equipment , of measuring high-precision devices, of a number of specialized machines for parts of instruments, represents a

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most essential hindrance to a quick and high-quality designing. Other drawbacks are the lack of modern constructive elements and the insuffucient samples of modern foreign apparatuses which could be a good basis for study and comparison. That is why the need is urgent for a complete equipment of the Institute's main laboratories and workshops with modern appliances and apparatuses which are to be supplied, for their greater part, from countries with a developed instrument-making.

The facts speak for themselves: unfortunately enough, although many specialists from the Institute have reached the state at which they can elaborate and design some types of devices of a highly modern nature; they, however, cannot obtain all the necessary results simply becouse of the non-existence of specialized machines and of measuring and testing devices and equipment.

IV. Possibilities for the Creation of a Centre for Designing of Instruments and Devices

From what was stated so far, it is obvious that Bulgaria has made its first steps towards the organizing of an Institute for Designing of Instruments and Devices; The equipment of the workshops and the laboratories for the testing of models and prototypes has begun. Some progress exists in the training of specialists.

The country's speeded development imposes however the necessity for a much more intensified and effective activity in this field. This is beyond the powers of the country alone

These facts incited the Bulgarian Government which proceeded from the noble goals of UNIDO, to present in 1968 an official demand for assistance in the organization of the Research Institute of Instrument-Making in Sofia.

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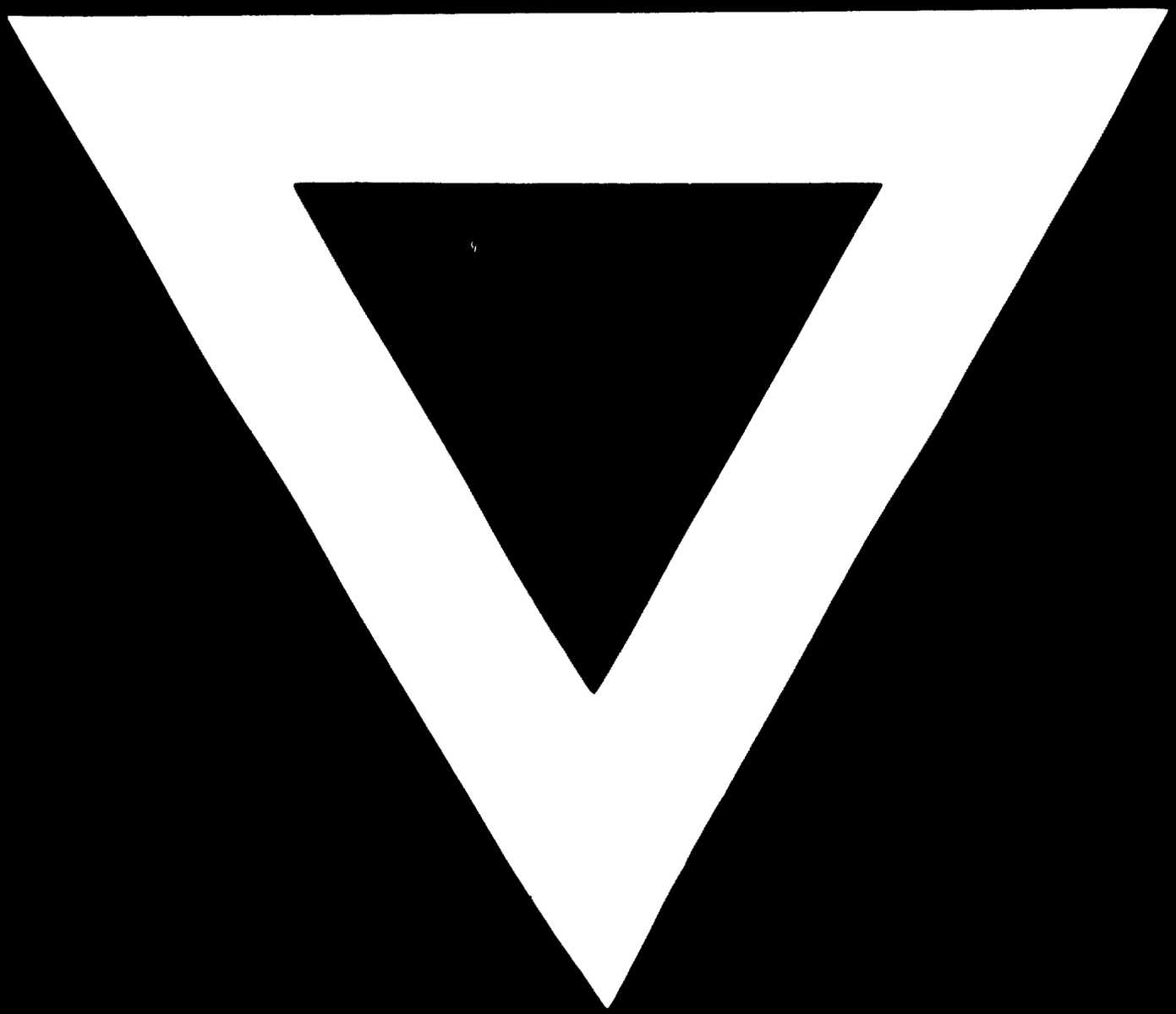
The demand envisages the following forms of assistance:

- the sending of a group of experts in the main activities of the Institute who are to assist our specialists in organization and in scientific and technical control, for a period of 1 to 2 years;
- the sending of specialists from the Institute on specialization at firms with a developed instrument-making;
- the supply with the most important modern machines and appliances necessary for a successful activity;
- the supply with modern language-training equipment for the use of the specialists.

In order to assure a maximum result from the demanded assistance, the Bulgarian Government alloted the Institute with a suitable terrain in the best area of Sofia; the Government gave their approval to the project of a new and modern building of the Institute, and have provided the necessary means for its fitting-out and its equipment with home-made machines and installations.

At the present stage a timely assistance on the part of UNIDO would not only bring about highly appreciable results but would also represent a wonderful illustration of UNIDO's noble tasks and the great benefit from this Organization.



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