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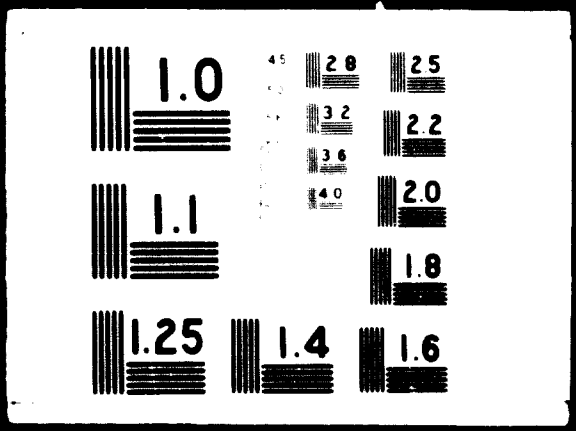
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PREPARATION OF THE IN-PLANT TRAINING PROGRAMME
FOR ENGINEERS IN THE FIELD OF OIL ENGINES

by
J. Dubsy

This is a forecast of the training programme
now being organized, to take place in the
Czechoslovak Socialist Republic

The views and opinions expressed in this paper are those of the
author and do not necessarily reflect the views of the Secretariat
of UNIDO

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1) Introduction

The Czechoslovak Socialist Republic is a well-developed industrial country which participates at the general world industrial production in average by 1,7 % whereas at the world population by 0,44 % only. Besides the tasks connected with the realization of the production development the Czechoslovak industry has paid a considerable attention to the education of specialists, especially of the industrial intelligentsia and workers, not only of the own country but also of the development countries.

The field of production of oil engines in ČSSR is showing a continuously rising trend, the feature of which is the increase of manufactured HP by more than 30 % and in the section of diesel generators by 125 % of installed kW during the past 10 years. The production is secured predominantly by the concern ČKD Praha in which besides the oil engines there are manufactured also locomotives, tram-cars, compressors, machines for treating of mineral materials and partially also electric rotating motors. Oil engines represented by the world known trade marks ČKD, ŠKODA and SLAVIA are exported to more than 70 countries. The basis of research and the production prospects are ensured within the ČKD concern by the Oil Engine Research Institute in Praha which coordinates also the development work carried out mainly in the production works.

These favourable circumstances and the elaborated technical and production basis create suitable conditions for the field of Czechoslovak oil engines for communication of research, development and production experiences.

In ČSSR there will be possible to make use of the extensive experience gained from the previously organized actions in training

of specialists as well as from the various international symposiums of the scientific workers. It will be necessary, however, to overcome some specific problems. The respective measures in this matter are already being taken.

According to the experience that ČKD gained at the occasion of training and courses organized for larger groups of foreign experts, these problems may be divided roughly into 3 groups:

- problems of human relations arising towards people and environment of the organizing party and also among the specialists forming improvised micro-collective with its own inner life
- problems of pedagogically technical nature connected with the training of a very heterogeneous collective
- problems of material securing and organization of the whole action.

The above groups of problems are arranged in sequence according to the difficulties to be overcome and are being given the utmost attention from the part of the organizing party.

When solving the problems of human relations we experienced the unfavourable influence of diversity of the general life environment, of different climate, of the language difference, of the psychological shock due to unorganic incorporation into a very developed industrial society with its undoubtedly prevailing activities in the field of the material production. There may arise more or less intensive feelings of a certain abstraction from such a situation which may sometimes lead - at different temper and living experience of the trained participants - to conflict situations at a new workplace and inside the collective as well.

These contradictory situations are to be solved in the first place by prevention. An intensive but not exaggerated utilization of the working hours, the most possible diversified working programme, an effective assistance (no guardianship) when organizing the individual leisure time, making possible a natural touch with the country atmosphere - these are the measures well

proved in long term courses in our works and institutes. Quite essential is an individual approach to personal problems of the fellows, both at the beginning of the course and especially about in the first third of its duration, when the long term factors begin to exert influence. When solving these problems it is evident that there are strictly respected all diversities such as religion, nationality etc. For solution of these problems there is available not only a specialist belonging to the course who is responsible for the smooth working of the training, but also a physician and a trained psychologist. The deciding factor is however the working collective of our works who has already experience from similar actions and who knows with full comprehension how to create heartfelt informal relations at the workplace which often leads to long-lasting friendships even outside these courses. These contacts cannot be underestimated even from the point of view of further special technical cooperation and they will be therefore supported also in the present action.

Pedagogically technical problems are no doubt very complex and still aggravated by the language difficulties especially in the production workplaces.

Existing experience in this field can be gathered roughly as follows:

- for the professional success of the training there is deciding its quality, well-thought-out preparation at a high technical level and provision of such a personality of the lecturer for the given theme whose technical authority is first-class and undoubted
- for the study itself there must be available lucid material in due time
- choice of the themes may not be too wide, but on the contrary it must be aimed at an open and reliable acquisition of chosen problems which may be attractive for the participants
- there must be left enough space for the spiritual creative activities of the fellows; that is why the lectures are

intended rather an incentive to contemplation simultaneously with the solution of typical examples than an encyclopedia in the given domain of science

- it is necessary to support all the forms of collective work, because this is in conformity with the way how to solve real problems in the to-day's industry
- practical trainings have to give the participants rather some pleasure from the gained knowledge than to complicate learning by exaggerated claims on physical skill or experience
- every fellow must gather in the training comprehensive material that would enable him to brush up his knowledge of main problems even after a longer time after the termination of the course.

It is apparent that the teaching must be suitably coupled with demonstration of models, samples, diagrams and measurements which corresponds best to the nature of technical understanding.

The specialized concentration of interests within the group of trained fellows creates a serious problem. As a matter of fact it is imperative to adhere to a certain fundamental scheme, but it was found useful to make maximum use of the individual interests of each participant, even at a certain sacrifice of a definitive appropriate modification of the programme naturally in mutual agreement with the organizer of the training. On the basis of arisen requirements the organizer will create for this purpose conditions for establishment of thematic special interest panels. It is shown that the final technical report being in organic connection with a definite special section of the given problems is then of substantially higher quality and is a proof of a greater asset to the training of the fellow.

It is true that the solution of the problems concerning the organizational and material realization of the course is often somewhat complex, but mostly feasible provided all the concerned parties show understanding for some extraordinary circum-

stances which naturally may occur.

When preparing coordinated project of the whole action all our experience was used.

When organizing the UNIDO In-Plant Group Training for the field of oil engines it is of course impossible to rely only upon the own existing experience. Naturally all the up-to-date methods of instruction including available experience from the previous group trainings which have been organized by UNIDO will be applied. The Czechoslovak party is endeavouring to provide the most favourable facilities both for communication of practical operational knowledge and for acquisition of theoretical fundamentals.

Please allow me to avail myself of my presence at the session of specialists in education and group trainings in industry to get you acquainted with the preparatory and organizational works which are carried out in conformity with the general uniform scheme for the realization of the education of engineers from the development countries in the field of oil engines in ČSSR, namely in the technical, material, organizational and social domain.

2) Technical domain

The purpose of the technical training will be to get the participants of the course acquainted with the modern knowledge of the development of science in the field of oil engines with utilization of said knowledge in the projection and the design of oil engines and their application, and with their utilization in the manufacture and operation.

Based upon our own experience that if the graduates of the course are to exploit fully later their knowledge for the development of the mechanization of agriculture, of the electrification, of the motorization of marine and railway transport and for the organization of economical operation, repairs and maintenance or even oil engines manufacture, they must cover by an appropriate distribution of the themes in accordance with didactic and carefully selected pedagogical conditions not only the theoretical, but also the productional, technological and, of course, even the

operational fields. The participants will get the opportunity to check what they acquired during 3 months by elaborating a suitable, practically aimed and to the conditions of each participant adjusted selection of a complete technical report. This is the only way how to achieve the cycle of lectures psychologically, the target of which is to transfer the gained and by the practice acquired know-how from the industrial society to the development country.

That is why the selection and volume of the programme on one side involves

- some modern points of view of oil engine design and their most important assemblies
- to get the survey of modern calculating methods
- new points of view for selection, testing and checking of fuels and lubricants, and
- new tendencies in technical and economical exploitation of different levels of oil engine supercharging etc.

On the other side there is paid a considerable attention to the problems of technology and manufacture and the training programme contains

- structure and organization of oil engines manufacture
- principles of technology and technical solution of main operations
- modern methods of oil engines manufacture projecting
- organization of the technical preparation of the production
- oil engines testing on the test bed etc.

Furthermore there is considered also practical training in the oil engines manufacture directly in the works which will be aimed mainly at

- getting acquainted with the organization of the plant
- getting acquainted with metallurgical works and with problems

- of metallurgical production for the field of oil engines
- handling of materials and their storage
 - practical exercise in the manufacture, at measurings and checking incl. practical measurings in test-rooms.

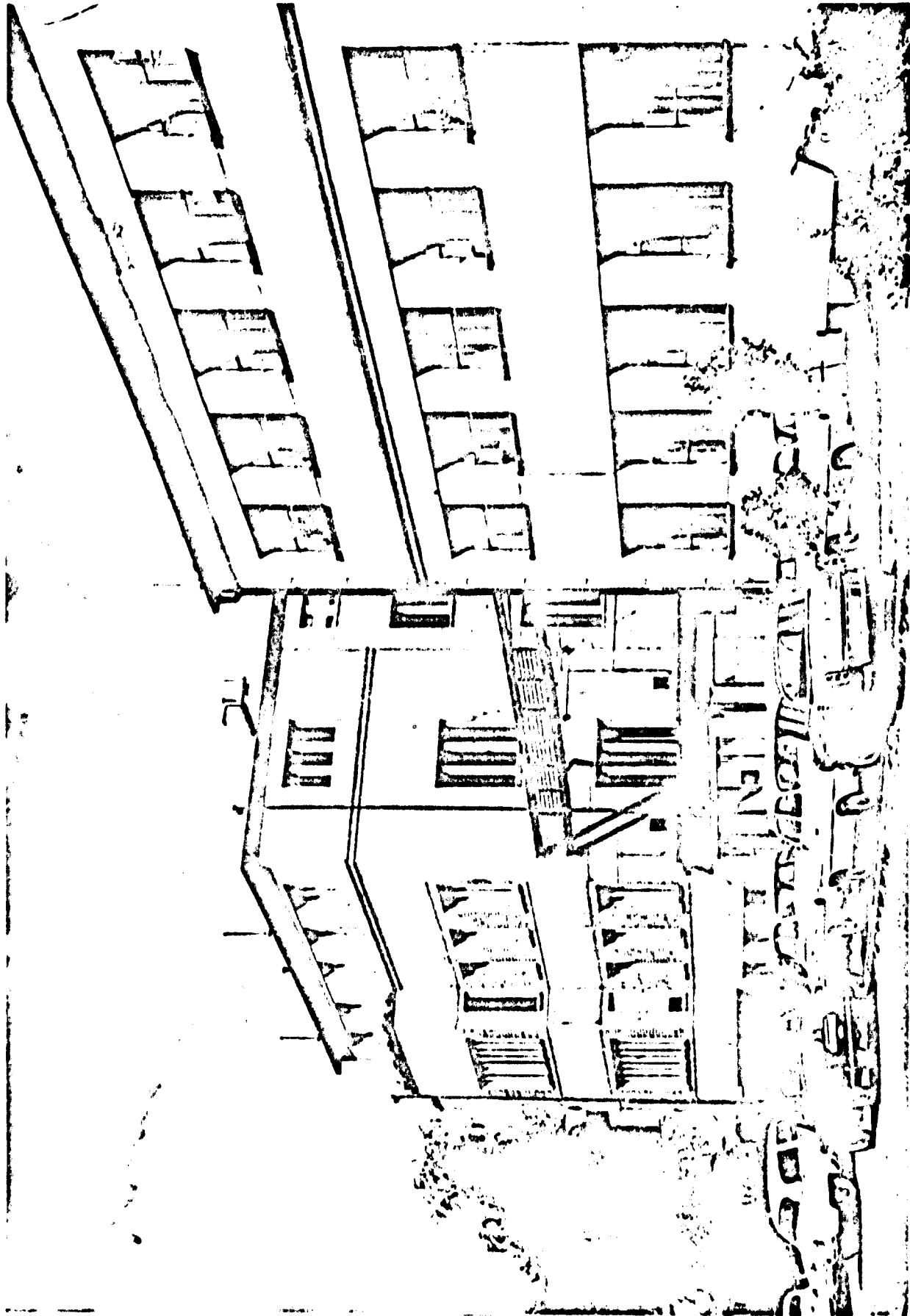
At this occasion there will be studied the main economic problems of the manufacture, time studies, principles of economical evidence, planning and operative management of the production.

On the basis of mentioned principles there are being actually elaborated exact texts of the lectures, the contents of which will be before issue revised from the point of view of the pedagogically technical problems by a special committee of specialists of ČKD Praha.

As it results from the outlined selection and volume of the programme, in the procedure of teaching in the Oil engine research institute there will be organized besides theoretical lectures also practical trainings in the laboratories and in the test-rooms of the institute in the field of measuring technics, works on models, in measurings on test engines and their accessories etc.

The participants will be acquainted with practical knowledge of the oil engine manufacture in two plants of the ČKD Praha Concern, namely at Hradec Králové - manufacture of large engines - and at Hořovice - manufacture of engines of lower and middle outputs. The lectures in both the plants will be aimed at the preparation of the manufacture, production technology, manufacture technics, checking in the course of the manufacture and of the final product as well as engine tests in the plant test-rooms. Practical training that will complete the lectures will create, according to the suggested programme, the prevailing part of the stay in the plants.

The conditions necessary for following and managing the lectured topics by the fellows are determined by preceding graduation on a Technical University simultaneously with satisfactory knowledge of English and as far as possible with knowledge



The Oil Engine Research Institute building at Podkovářská 6, Praha 9

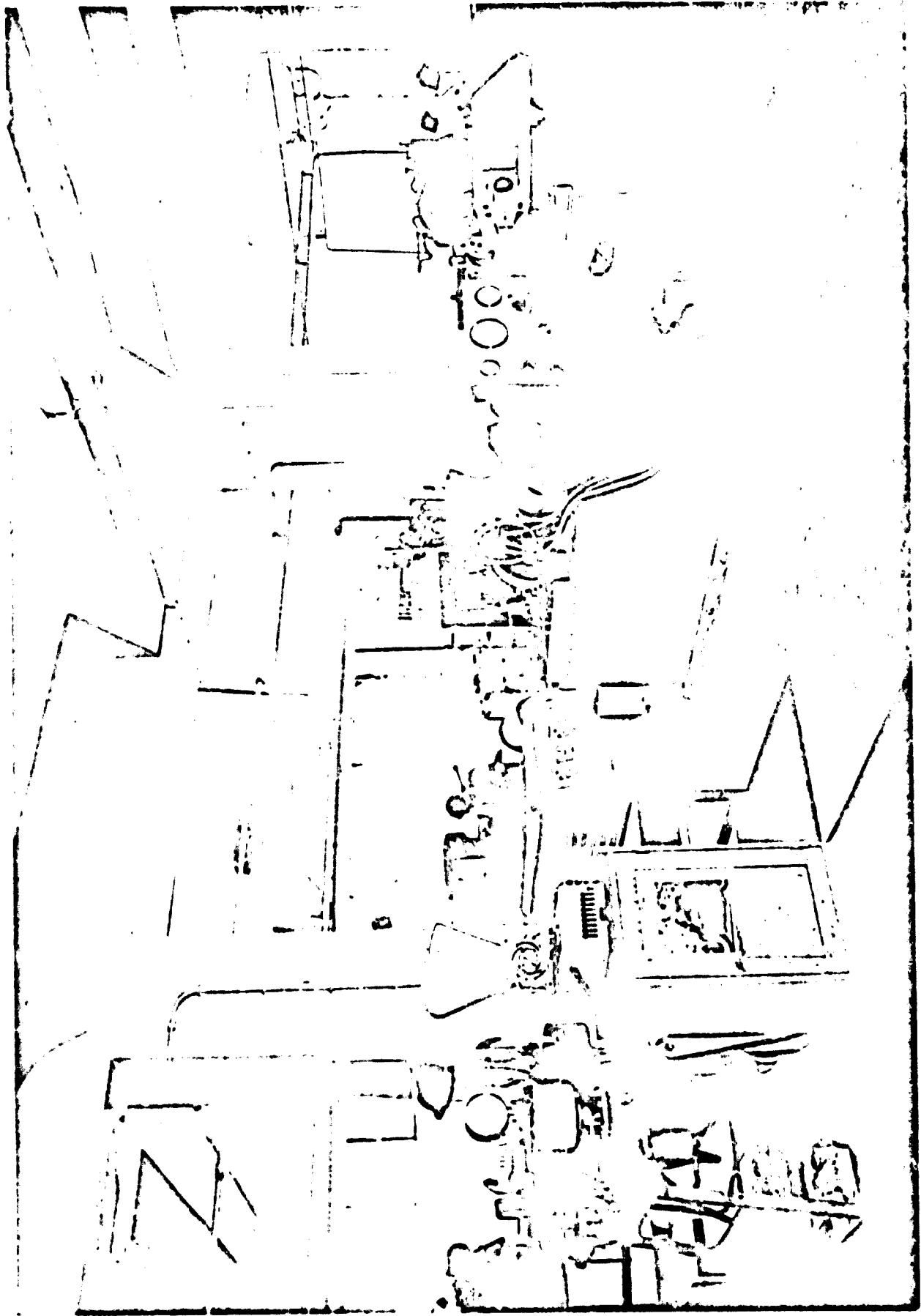
and previous practice in the field of oil engines. These conditions were - as known - stipulated by the mutual agreement between UNIDO the organizers of the course and the host country.

As a suitable completion of the group training there are considered common or individual visits of various technical exhibitions - even those of foreign societies - that may take place in Praha, or eventually at other places in Czechoslovakia during the training. The main interest in this sense will be concentrated by the host country upon useful organization of visits to plants which are engaged in the manufacture of oil engine accessories - subdeliveries (e.g. turboblowers for oil engine supercharging, injection equipment, bearings etc.) and companies in which there are oil engines used in operation (e.g. shipbuilding yards, electric power-plants, industrial construction works etc.).

When contemplating the most convenient termination of the group training there was abandoned the manner of purely individual evaluation of the course, its organizational securing of the level of the lectures, of the practical training as the sole manner of evaluating from the part of the participants and there was selected the method of elaboration of an individual or team final technical report on a theme stipulated in advance in which the knowledge gained during the training should be utilized and applied or eventually to select the final work in such a way that the solved theme could be applied upon participant's return in his home country.

At this opportunity there will be naturally evaluated also the personal comments of the participants and they will be exploited not only for future actions in ČSSR but also for the next scheduled trainings of UNIDO in other countries.

On the basis of these deductions the themes of the final technical reports especially those of practical nature will be selected so as to enable the participants to exploit them possibly also after their return in their home country in the way of further completing eventually in subsequent accordance with the consultant.



Injection equipment laboratory at Oil Engine Research Institute

As examples of some suitable or obligatory themes according to preceding practice or for future operational direction of the fellows there may be quoted the following:

- project and design for emergency supply of electricity of given outputs for a hospital and a broadcast station for the case of an average
- expert's report of dieselpower plant project for electrification of a larger town with a given number of population by the application of suitable dieselectric installations
- project of size and location of a main engine for ship propulsion of a given tonnage including the propeller drive with necessary auxiliary dieselectric aggregates
- basic project of arrangements of the manufacture and of the production flow for introduction of a series production of small oil engines for agricultural purposes
- project of test equipment, of test and checking methodics, apparatus equipment for the control of the final assembly operations and of acceptance tests of heavy dieselectric installation

and others.

For the elaboration of the final technical report there will be reserved 8 to 10 days at maximum and these reports will be elaborated under the leadership and assistance of professional consultants from the staff of lecturers. With the said final report the organizer of the course intends to offer some impetus to the participants for their further activities in the field of oil engines after their return to the home country on one side, and the verification of the real asset efficiency of the lectures and practical trainings on the other side.

In conformity with the prepared schedule and respecting a later advice of UNIDO, the distribution of the overall study time is divided into these main sections:

- theoretical lectures, laboratory trainings and measurements in the laboratories and in the institute test-rooms on functional engine samples incl. model technics

.....

35 %

presence of qualified interpreters of english language.

When deciding about the location of the lectures in Praha, preference was given to lecture-room and sitting-room directly in the Oil engine research institute to the school-rooms of the Czech Technical University or to other lecture-halls in Praha. This selection is considered useful for several reasons:

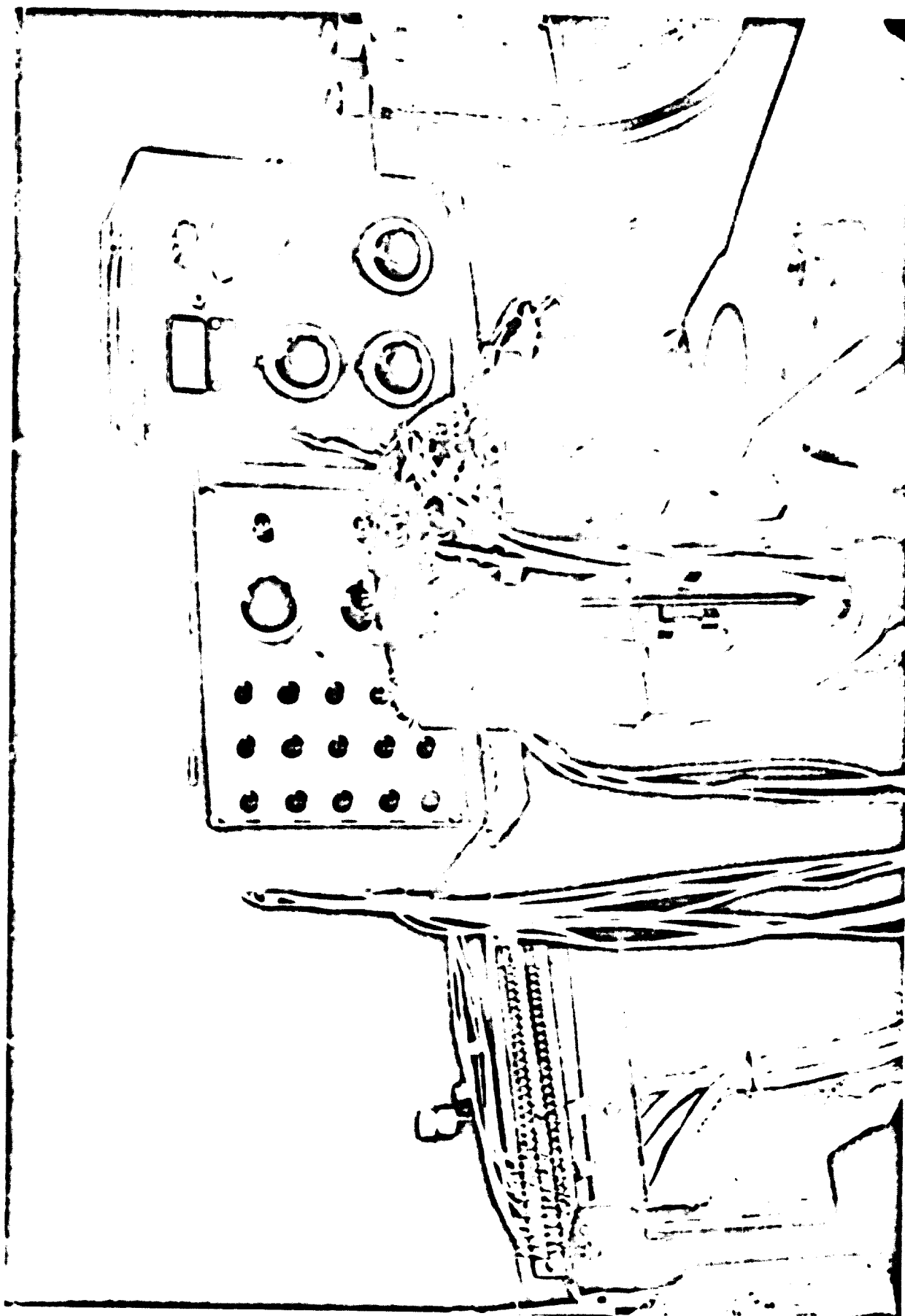
- trainings and lectures will take place in Praha at one place only
- there will be available at any time all means of instruction appliances, apparatuses and models, the transportation of which would be practically impossible
- presence of all lecturers will make possible the later consultations and the explanation of the doubts found additionally by the participants of the training.

In the production plants at Hradec Králové and Hořovice the lectures and practical trainings as well will be, of course, organized directly in the rooms of the plant.

For a good understanding of the lecture and for acquaintance with new technical terms and for discussion preparation there will be distributed the scripts to the fellows 2 - 3 days before the lecture. The purpose of this measure is to enable the participants to get acquainted with the material in advance and to make the lecture comprehensible to all of them; besides this in this way there will be gained more time for discussions and consultations which are to clear up the lectured themes in full width and depth.

The training finished, the graduates will get another, this time complete bound set of lectures for further utilization of acquired knowledge in their home country and for further deepening of knowledge respectively.

The form of final examination with a resulting mark is not considered the most appropriate conclusion of the training and consequently there has been determined to elaborate the final technical report with the option or allotment of the theme aimed either at the previous practice of the attendants or at



Deformation and stress measurement on a bearing assembly of a 9 SL 350 II
PS Skoda engine

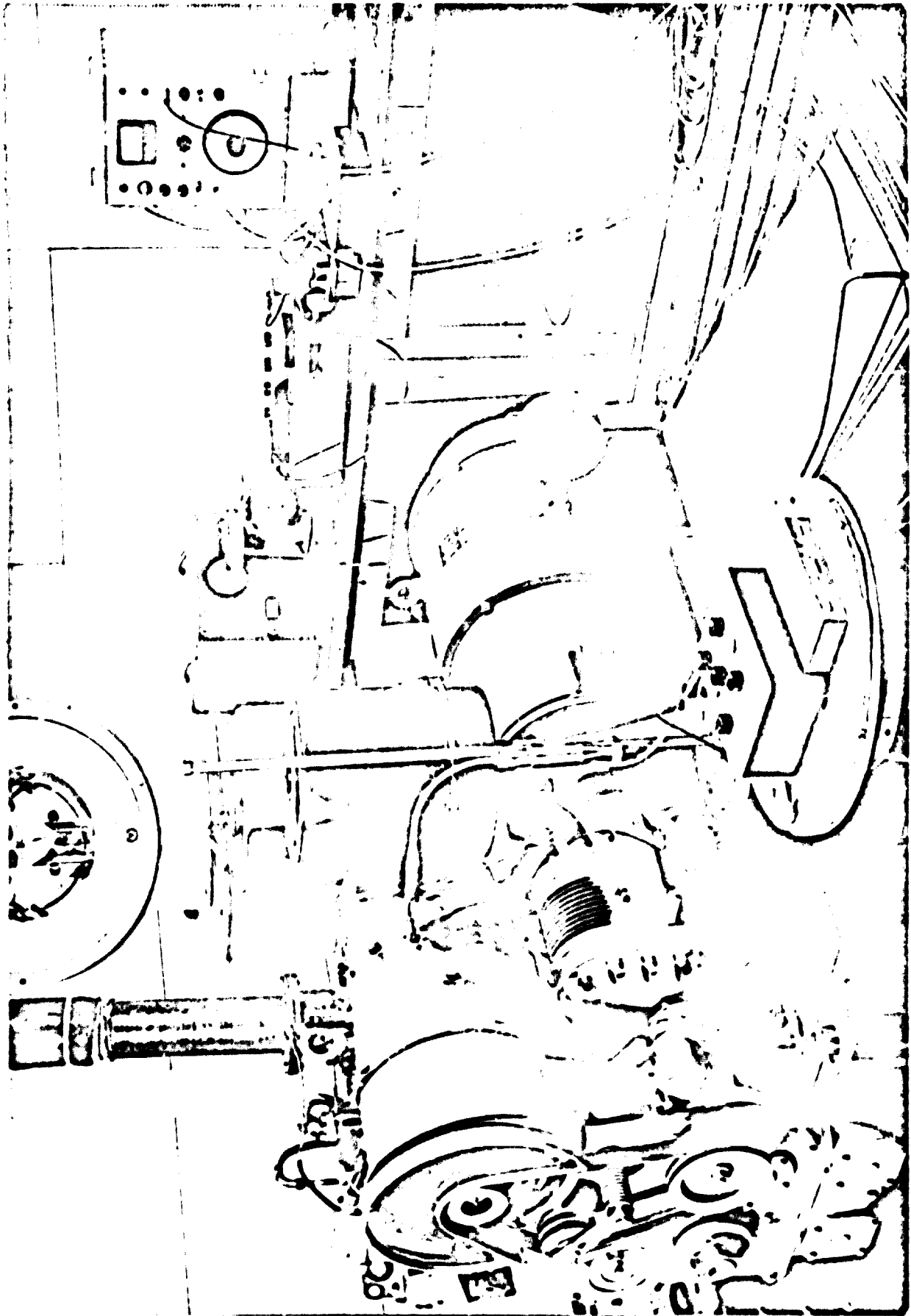
- practical trainings, operational and productional practice, including measurings in plant test-rooms and consultations, inspections of production works of suppliers and engine operation at users as well 58 %
- final technical report 7 %.

3) Organizational sphere

The period March-June 1968 was selected for the group training due to the fact that in Czechoslovakia at the beginning of April there is already steadier weather with slight increase of temperature. The month of May is one of the most beautiful months in Czechoslovakia and in that time the fellows will have the opportunity besides the professional training to learn also the natural beauties of the country. With regard to the given beginning the group training in the field of oil engines in ČSSR will close in the second half of June 1968.

In order to ensure the corresponding technical level of theoretical lectures, their texts have been elaborated by the specialists of the Oil engine research institute and also the consultations and practical measurings and training in the laboratories of the institute will be under the management of these specialists. The fundamental information of general character will be read by the workers of the general management of the ČKD Praha Concern.

In mutual agreement with UNIDO one of the conditions for the participation in the group training is a good knowledge of English. That is why the lecture are being prepared in English. Provided the participants of the training will show interest in explanation of the used english technical terms in the field of oil engines, their accessories and applications, there may be, after general, economical and organizational information paid one or maximum two days to this purpose. The linguistic standard of the lectures, discussions and of the explanations at practical plant trainings as well will be guaranteed by the



Noise test room at Oil Engine Research Institute

their future working aim upon their return to the home country. In this way there would be created also the possibility for a practical use of the course and its application at a later deciding. The participants would elaborate the selected themes at their discretion either individually or in smaller working teams of two or three members.

To give the participants the necessary tranquility and possibility of concentration for elaboration of these technical reports there will be organized at that time a stay in one of the recreative centres of ČKD Praha where all technical aids will be available. In the period devoted to the elaboration of the final report in the recreative centre there will be alternatively present the consultants for the respective themes so as to render necessary completing information, advice and hints for the final work.

In conformity with the previous experience and due to most useful utilization of the daily working programme the lectures and laboratory trainings in the Oil engine research institute will take place from 9 a.m. till 1 p.m. and from 3 p.m. to 6 p.m.; after each lesson a short break will follow. In the morning there will be organized predominantly lectures whereas afternoon will be reserved for practical trainings in the institute test-rooms and for completing discussions and consultations for a deeper elucidation of the read papers.

The daily schedule of practical lessons in the plants will be adapted to the factory customs; there on the contrary will be most suitable to arrange practical trainings in the workshops, laboratories and test-rooms in the morning hours, whereas complementary lectures or discussions in the afternoon.

The supposed study day of 7 to 8 hours will enable the fellows the additional daily elaboration of their own notes and a rough preparation for the next day according to the scripts distributed in advance. At this time schedule there will be left to the participants still enough time for their personal leisure time, recreation and amusement.



Test room of large marine engines at Hradec Králové

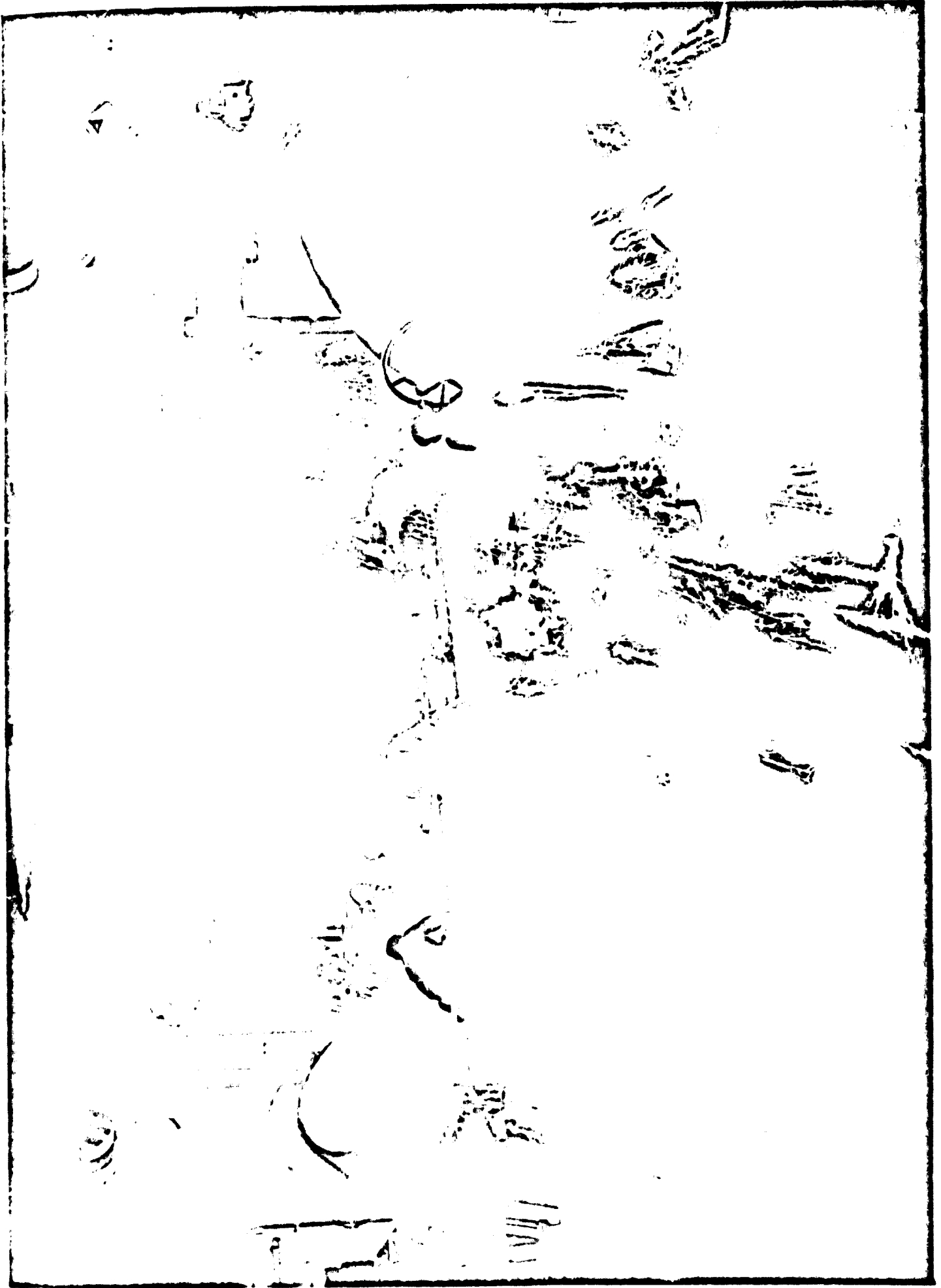


Precision bore of the main bearings of the new six-cylinder 6 SL 525 II PS

Skoda engine at Hradec Králové



Assembly of crankshaft



Foundry at Hradec Králové

Saturday and Sunday are free days and it is left at the discretion of the fellows whether they will participate at the actions referred to in the point 5 of the report.

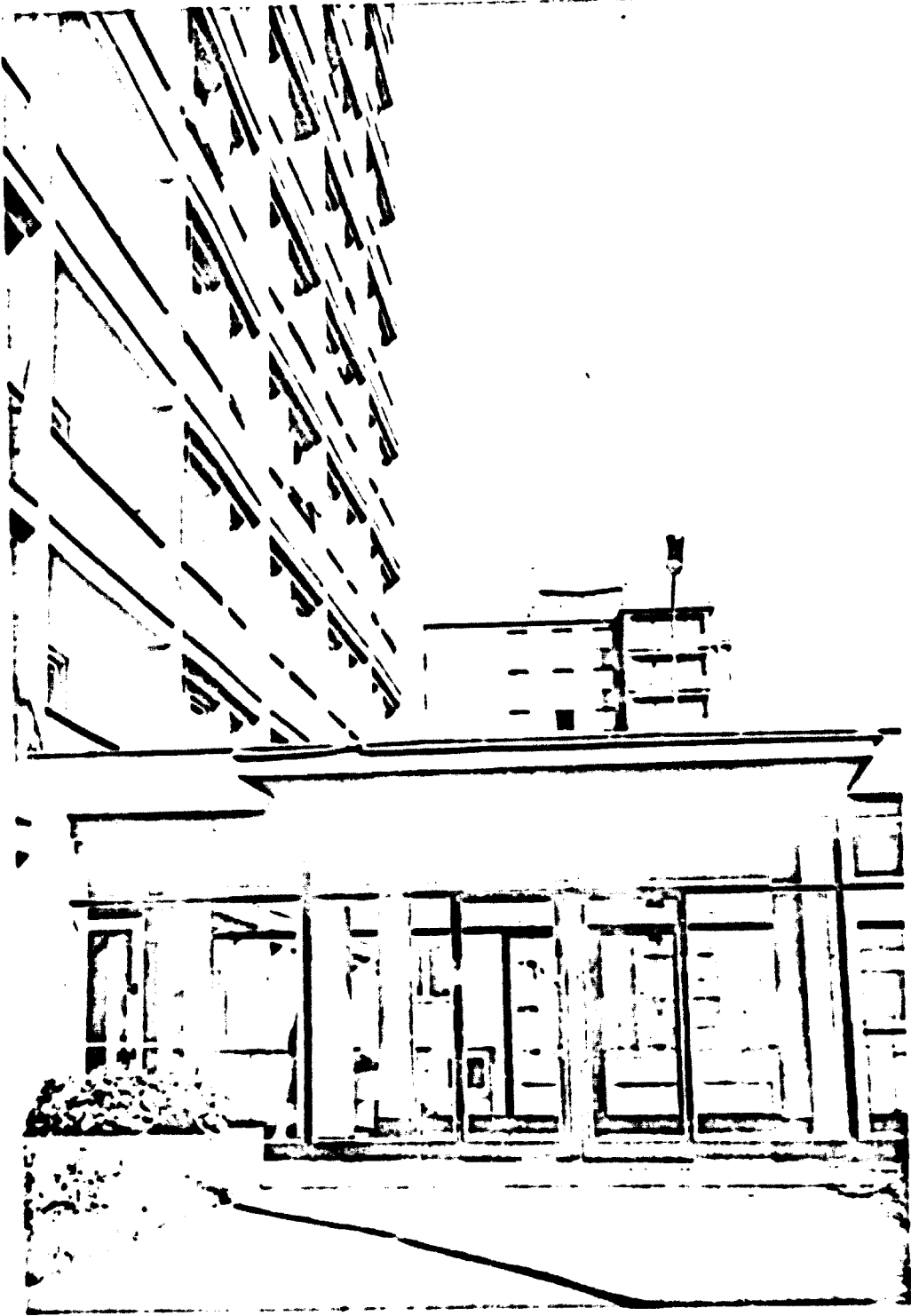
4) Material domain

ČSSR grants the material provision in accordance with its membership in UNO by the contribution of about half a million Czech. crowns; this contribution covers lodgement, board and pocket money.

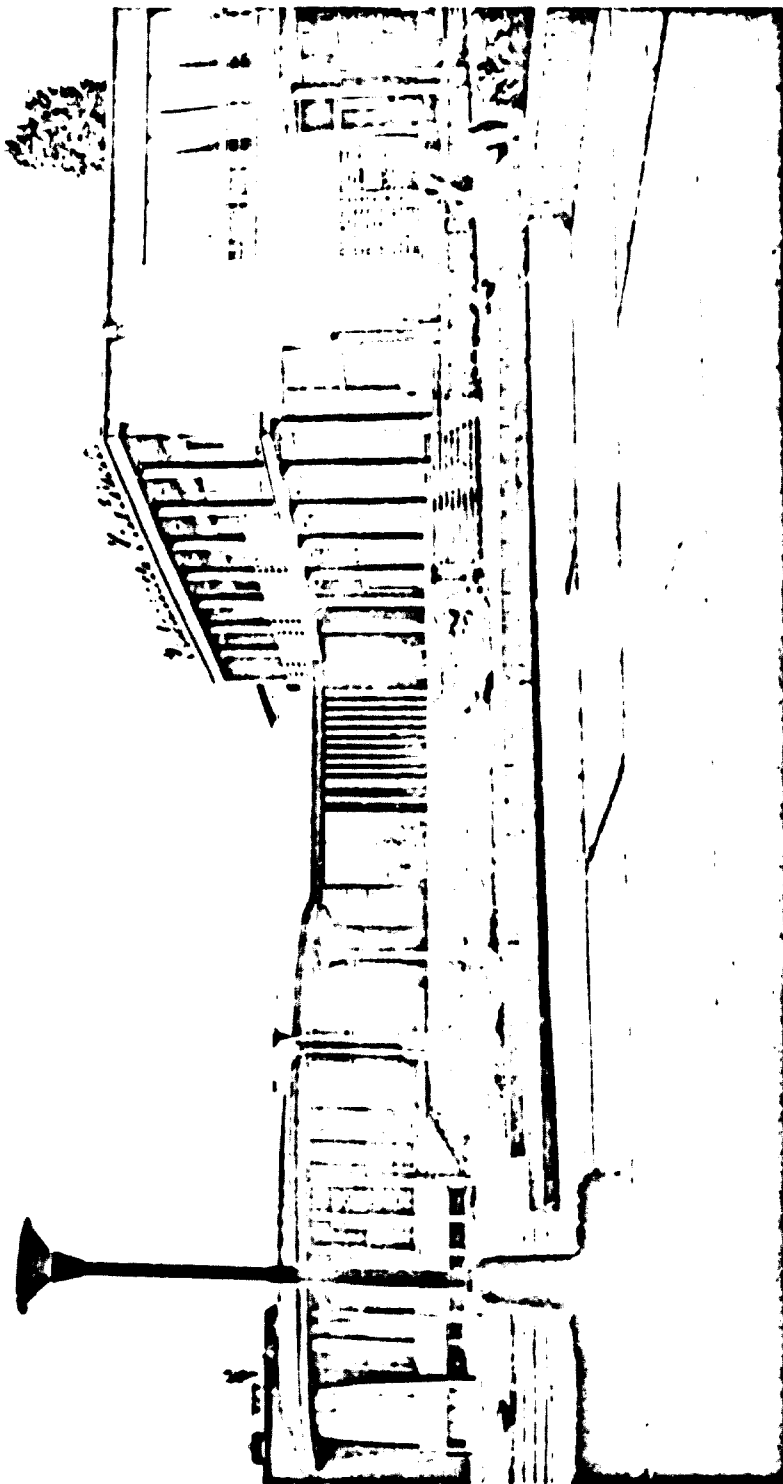
When solving the problem of accomodation in Praha there has been abandoned, with regard to the experience from the previous group trainings organized outside ČSSR, the provision of rooms in the city - most probably in more hotels with multiple transport difficulties at the daily opening of lessons in the morning - in which case it would be also very difficult for us to meet the individual wishes. That is why the accomodation is reserved in a modern 8-floor building of the ČKD Praha boarding establishment not far from the place of the lectures, i.e. the Oil engine research institute. For the participants there will be reserved one whole floor and it will be possible to meet their individual wishes concerning the lay-out due to the availability of both single and double bed rooms. On the same floor there is at the disposal and reserved exclusively for the use of the participants an uptodate well equipped social room suitable for collective discussions, for closer personal touch, eventually for collective study and preparation.

The distance between the boarding-house and the place of the lectures, i.e. the Oil engine research institute can be covered within 12 - 15 minutes' comfortable walk. Provided there are used means of mass transportation (tramways), it is possible to shorten the time to 7 - 8 minutes only.

The health centre is about 3 minutes off the boarding-house, the department store and the house of services (shopping, repairs, laundry washing etc.) about 4 minutes. The city of Praha can be reached by tramway within 25 - 30 minutes without changing.



Entry hall of CKD boarding house



Surroundings of CKD boarding house - view of restaurant

The board in Praha will be ensured in a restaurant situated between the tram station and the boarding-house if desired in a separate room. There will be available a selection of meals that will respect the national conditions and customs at the discretion of the participants.

During the practical lessons and training the fellows will have their boarding and lodging in the hotels of the place. If there is inevitable to postpone the lunch break for operational reasons, a small refreshment will be served in the plant canteen.

5) Securing of the social domain

The leisure time of the group training participants may be, at their discretion, used for learning to know the cultural life in Czechoslovakia.

To this aim, provided there will be sufficient interest, a brief course of colloquial Czech will be organized, which will be extended for the concerned also by a brief course of technical Czech. According to the wishes of the participants the host country is ready to organize collective or individual visits of theaters of classic types and of new modern forms, eventually attendance to concerts, especially during the world-known music festival "The Prague Spring" with the participation of the prominent artists and orchestras. A number of cinemas presenting films of famous producers will also offer a suitable recreation and amusement to the participants.

The foreign visitors can be acquainted with the beauties of the nature and with historical monuments of the country at the occasion of periodical group excursions that may be organized at their option during the free time. Besides this the planned inspections of the industrial plants may be also connected with sight-viewing of interesting surroundings.

Czechoslovakia is well known for its achievements in sports both in European and world scale. The friends of sports from

the collective of fellows will have therefore the opportunity to follow top sport events and races. Friends of active sports will be enabled as to their liking to participate in exercises on playgrounds and in drill halls.

The question of the most suitable termination of the group training has been thoroughly considered in several alternatives. The form of the final examination followed by the mark did not appear appropriate and furthermore, at random stipulated question cannot check properly the acquired knowledge. For that reason there has been adopted the way of closing the training by means of a final work, the elaboration of which will verify not only the gained complete knowledge, but in the course of the respective consultations there may be passed also further complementary information. The selection of themes for the final reports will make furthermore possible the exploitation in the home country, eventually the application to the modified specific conditions. The graduates will get diplomas certifying the elaboration of the final report and graduation of the group training, the ceremonial handing over of which is considered after the termination of the training and in presence of the representatives of UNO-UNIDO, of the Czechoslovak Government, of the Technical University, public life and representatives of the training organizer ČKD Praha and its Oil engine research institute.

6) Conclusion

The fact that the organization of the training for engineers from the development countries in the field of oil engines has been entrusted to the Czechoslovak Socialist Republic represents an important task for the whole Czechoslovak engine industry in 1968. The attention of the Czechoslovak party is concentrated to its realization fully in conformity with the principles of UNIDO.

The United Nations Organization is paying increased attention to the problems of the economic development of the development

countries especially to step it up, in order to avoid the aggravation of the position of these countries in the world economics.

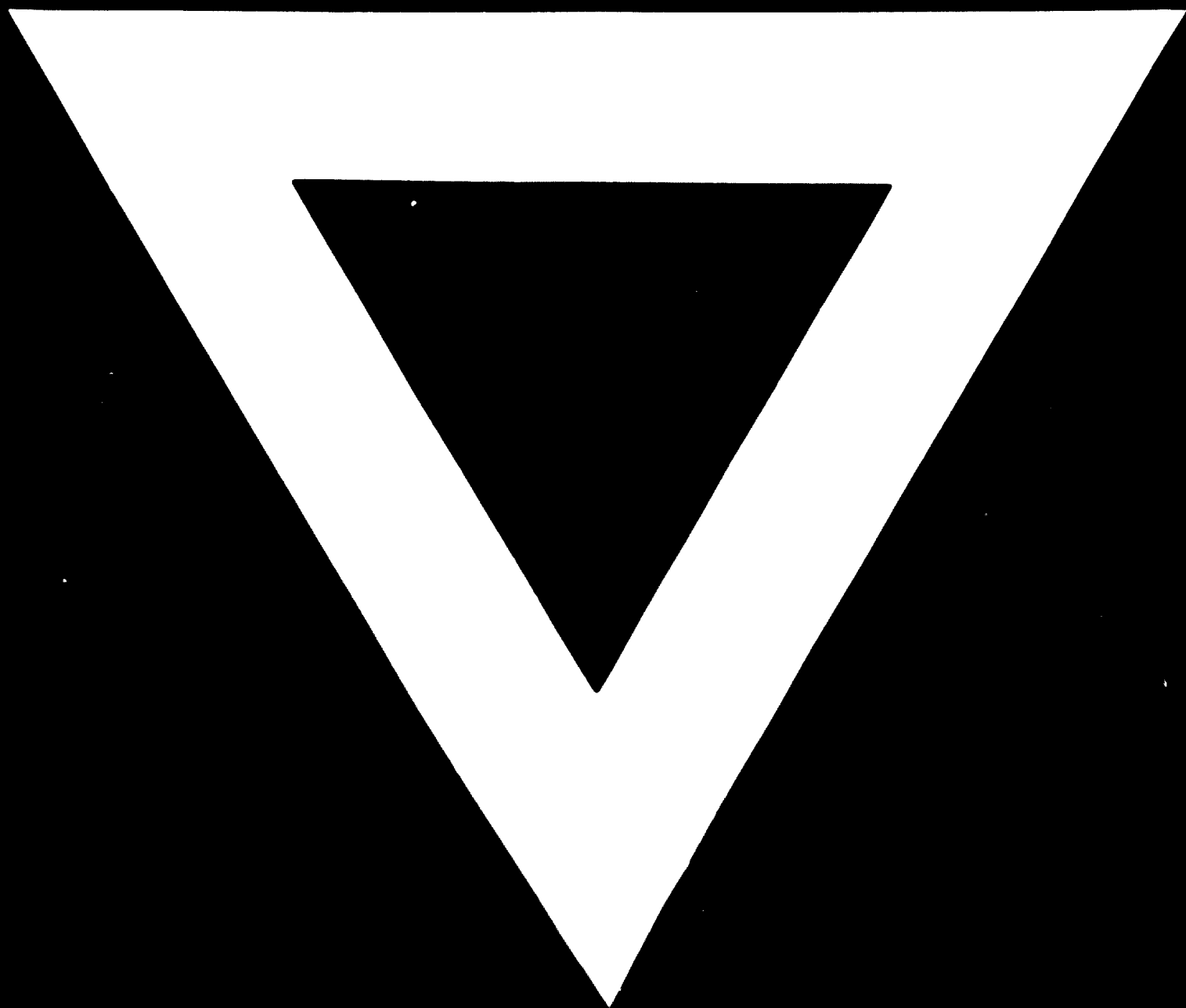
It is generally accepted that the development countries are able to reach a speedy development by the way of industrialization only. For that reason UNO is interested in solving the economic situation of the development countries especially by the development of industry and mainly by institutional solution of the problems of their industrial development.

UNIDO having been established in 1966 continues successfully the preceding activities of the Center for the Industrial Development of Development Countries and includes in its operational activities a series of specific actions on national, subregional, regional and international basis which aim at rendering an effective assistance to the development countries so as to speed up their industrial development. The scope of UNIDO operative activities is considerable and important by its significance for the development countries.

ČSSR takes an active part as to its possibilities in all the actions of UNO aimed at the assistance to the economic development in development countries, especially actively and practically in the training of UNIDO. In the spirit of this outstanding cooperation, the Czechoslovak party, or the organizer of the group training, the concern ČKD Praha and its Oil engine research institute respectively, accedes with full respect to securing of this action and believes that it will be possible to use and apply entirely the rich experience of UNIDO for a successful and smooth course of the group training for engineers of development countries in the field of oil engines.



Praha, October 5th 1967



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