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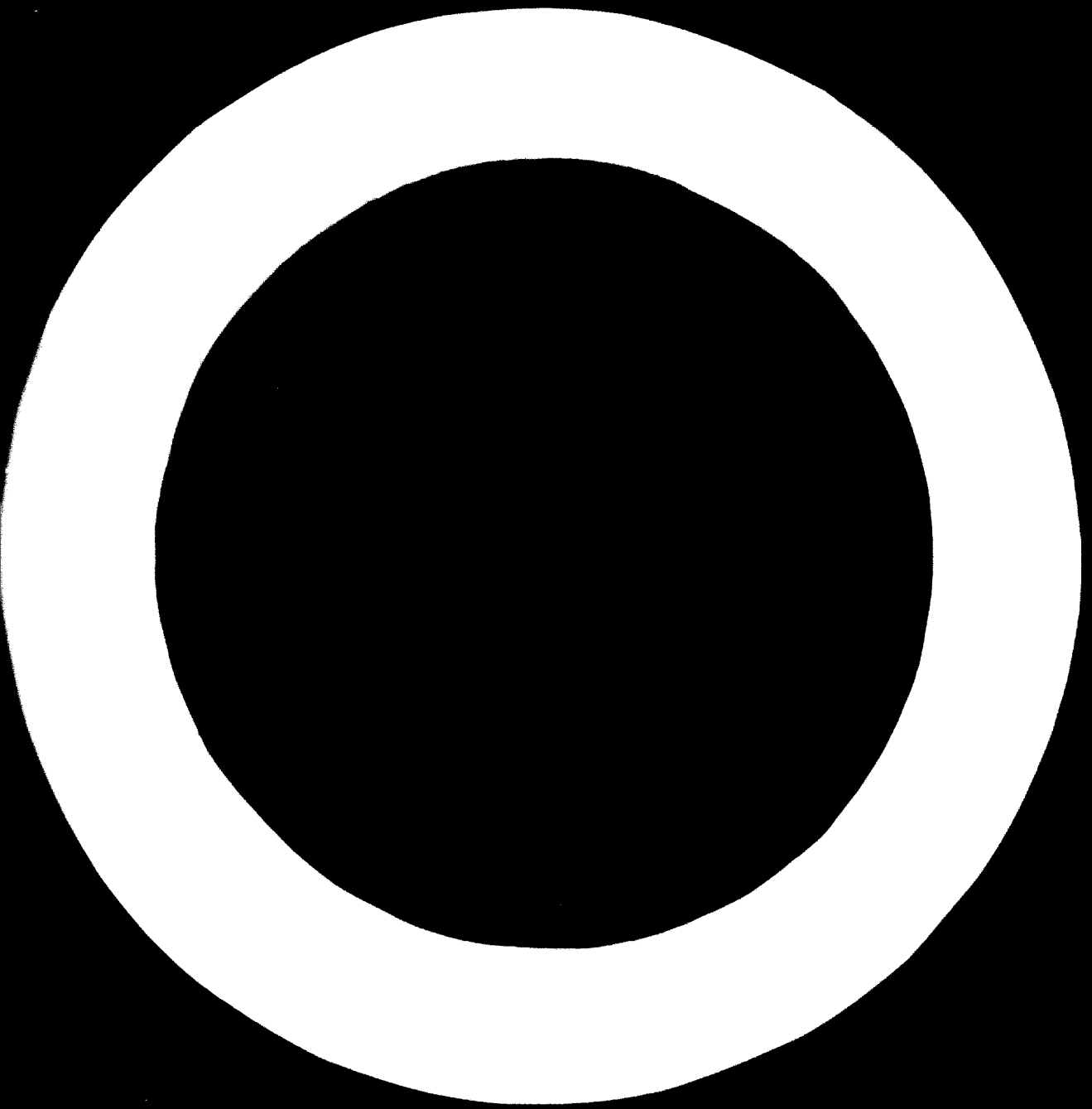
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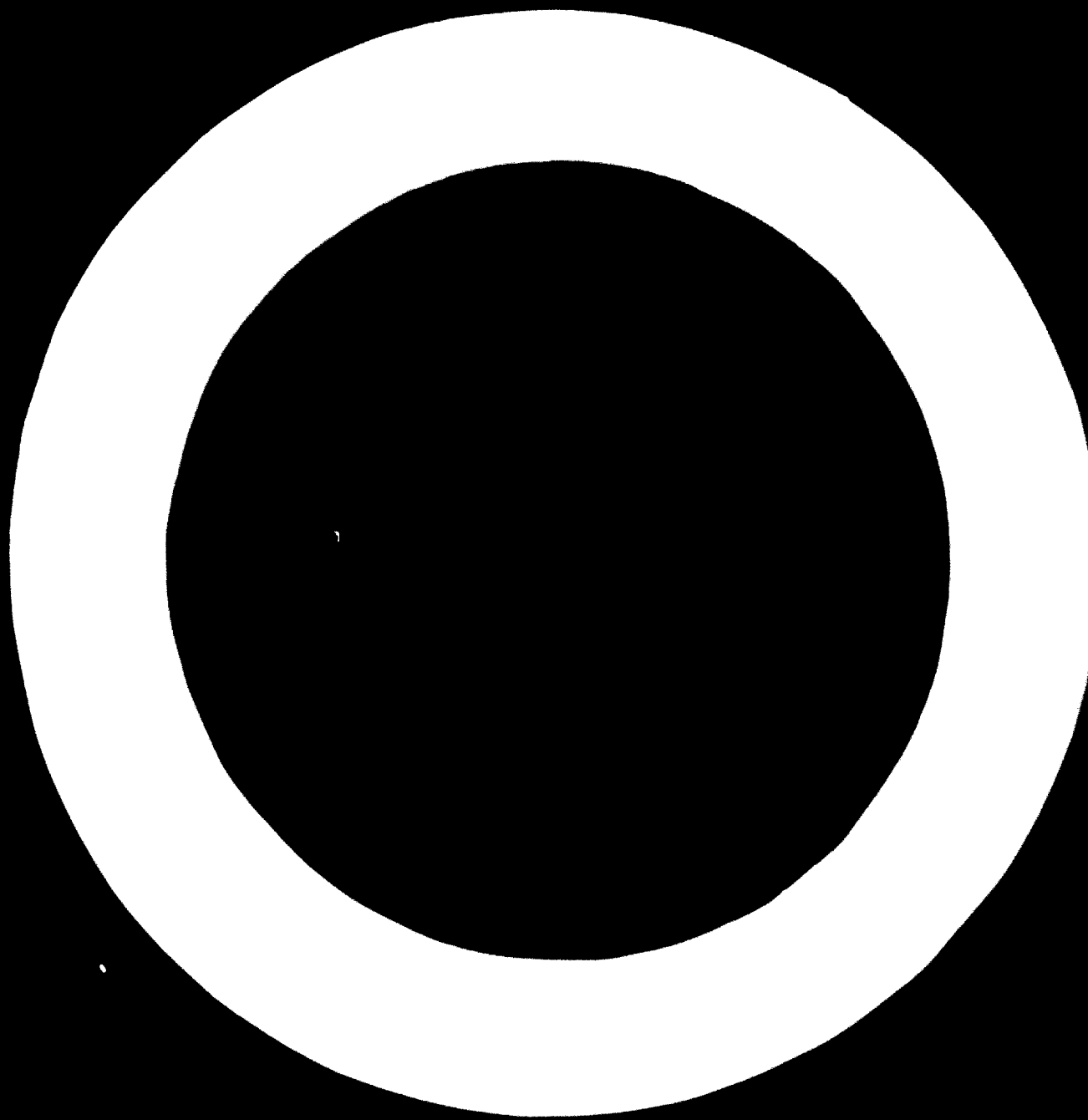
**ESTABLISHMENT
AND DEVELOPMENT
OF AUTOMOTIVE INDUSTRIES
IN DEVELOPING COUNTRIES**

**Report and proceedings of seminar held in
Karlovy Vary, Czechoslovakia
24 February - 14 March 1969**

Part I REPORT OF THE SEMINAR







UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION, VIENNA

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Preface

This publication is in three parts:

- Part I** The Report of the Seminar, including a summary of the discussions and the conclusions and recommendations, with annexes including the statements made to the opening meetings, the agenda, lists of the participants and papers presented, and summaries and comments on certain of the papers.
- Part II** The Proceedings of the Seminar, including six selected papers representative of the principles and practices of the automobile industry. An Appendix to the proceedings presents data on the import and assembly of vehicles in seven developing countries.
- Part III**, now being completed, will be a tabular catalogue of automotive manufacturing and assembly plants throughout the world.

In selecting the papers to be published in Part II, care has been taken to ensure that all aspects of the automotive industry are covered and that the various approaches and viewpoints expressed in the meetings are represented. An attempt has been made to present a balanced view of the principles and practices of the automotive industry as represented in various geographical regions. Some papers of merit have been omitted because the topic has been adequately covered in another paper, or they exceed the scope of this publication, or because they have been published elsewhere.

EXPLANATORY NOTES

"Billion" signifies a thousand million.

"Dollars" refers to United States dollars (US\$) unless otherwise indicated.

"Pounds" (£) refers to British pounds sterling.

ABBREVIATIONS

CKD	Completely knocked down
SKD	Semi-knocked down
ISO	International Organization for Standardization
LAFTA	Latin American Free Trade Association

United Nations Organizations

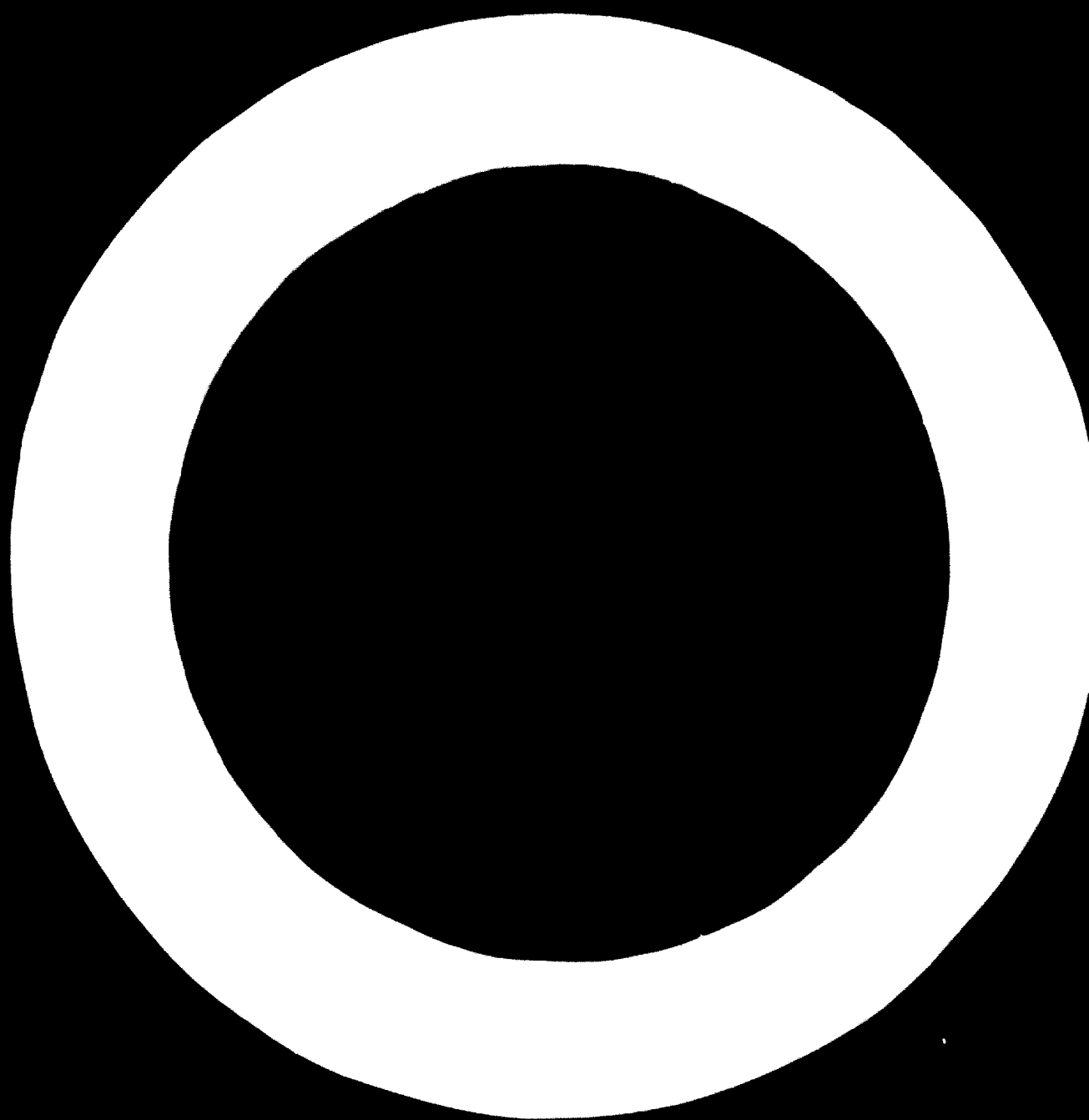
ECA	United Nations Economic Commission for Africa
ECLA	United Nations Economic Commission for Latin America
IBRD	International Bank for Reconstruction and Development
IFC	International Finance Corporation
ILO	International Labour Organisation

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Organization of the seminar

The Seminar on the Establishment of the Automotive Industry, organised by UNIDO in collaboration with the Government of Czechoslovakia, was held in Karlovy Vary, Czechoslovakia, from 24 February to 14 March 1969.

The participants included experts in many aspects of the automotive industry who came together to discuss the economic, technical and financial elements of the establishment of automotive and related industries in developing countries. (A list of the participants and observers at the seminar is presented in annex 6 of this report.) The participants came from 26 countries: thirteen in Europe, six in the Americas, three in Africa and five in Asia. The following international organizations sent observers: the United Nations Economic Commissions for Africa and Latin America, the International Labour Organisation, the International Bank for Reconstruction and Development and the International Finance Corporation.

Mr. Jan Schulmann, Chief, Department of Technical and Economic Services, Jawa Works, Prague, Czechoslovakia, was elected Chairman of the meeting. Mr. Joaquim Rodrigues Gonçalves, Secretary General of the National Syndicate of Automotive Manufacturers, Brazil, and Mr. Olayomi Olowu, Director (Mechanical and Electrical Department), Federal Ministry of Works and Housing, Nigeria, were elected First and Second Vice-chairmen, respectively. Mr. J. H. Stephens, Consultant to Otosan, Turkey, officiated as rapporteur. Discussion leaders of the seminar were: Mr. V. Jansa, Mr. Z. Kejval, Mr. A. Říha, and Mr. J. Valečky (Czechoslovakia), Mr. F. Picard (France), Mr. R. Moorkamp (Federal Republic of Germany), Mr. A. I. Gazarin (United Arab Republic), Mr. D. J. Page (United Kingdom), Mr. J. Beckel (ECLA), Mr. C. Moore (ILO) and Mr. J. Poth (UNIDO).

Mr. Otto V. Soskuty, Chief of the Engineering Industries Section, Industrial Technology Division of UNIDO, and Mr. Oscar Gonzalez-Hernandez of that Section, who had collaborated in arranging the seminar, assisted in conducting the meetings.

Mr. A. Barčák, Vice-chairman of the Czechoslovakian Federal Committee for Industry, welcomed the participants on behalf of the host Government. Mr. V. Keppert, Director of the Automotive Research Institute of Czechoslovakia and Co-director of the seminar, Mr. Soskuty and Mr. J. Schulmann also addressed the opening meeting.

In a message to the seminar, Mr. Ibrahim H. Abdel-Rahman, Executive Director of UNIDO, stressed the importance of the role played by the automotive industry in the economy of a country, particularly in view of the broad range of technological and manufacturing processes involved in this single industry. The motor vehicle, he said, could make a unique contribution to social and economic evolution, bringing people and ideas together from remote areas to the major centres of activity and opening the way to improved education, recreation and medical care. (Statements made to the meeting are presented in annex 1.)

The agenda of the seminar (annex 2) included the presentation of studies from major automobile manufacturers and experts from developed countries to supplement the discussions and to provide a practical view of the automotive industry. The host Government arranged visits to automotive assembly plants and related industries.

The Report of the meeting represents the views of the participants, who attended the meeting in their personal capacities and not as official representatives of their organizations or Governments. The views expressed are those of the group or of the individual contributors and do not necessarily reflect the views of UNIDO nor those of the Governments concerned.

Introduction

1. The development of an automotive industry in a new country involves a wide range of production, from raw materials to finished vehicles. A motor car assembly plant that relies entirely on the import of finished parts can be neither profitable nor effective as a contribution to a country's industrial maturity. The assembly plant, however, is prerequisite to the integration of locally made parts in the final stages of production. The real problems are generally found in the manufacture of parts, their cost, their quality and the reliability of their supply. Progress will inevitably be slow at first and problems will proliferate. Each step forward will increase the possibility that poor quality or short supply may halt production and create higher costs.
2. All those who carry the burden of a country's industrial development, including management, have the responsibility to foresee the future and to preserve and husband resources. A cursory view of industry will reveal a factory environment and the dirt and noise of the shop floor. Behind this practical aspect, however, if progress is to be made, there must be disciplines as exacting as those of science. The definition and discussion of these disciplines was the purpose of the seminar.
3. The following quotation suggests typical steps in scientific progress and industrial advancement:

"Every science has a natural curve of development. At first it is burdened with erroneous pre-scientific beliefs and poses its problems wrongly: progress is slow. A slow gathering of carefully observed facts is the indispensable preliminary to the forming of generalizations. Then, as insight is obtained, first in one subsection, then in another, progress becomes more rapid. The various fields begin to coalesce and illuminate one another."^{1/}
4. The automotive industry has been a very effective contributor to industrial development. It covers a wider field of effort than any other industry. A small passenger car may include 2,500 major parts and assemblies, or 20,000 parts if every nut and bolt is counted separately. Almost every aspect of the manufacturing process is used in building a motor-car, and approximately 60 different types of materials are used in its construction.

^{1/} Rattray Taylor, G., The Biological Time Bomb, Thames and Hudson (London, 1968).

5. While this wide variety of manufacturing effort offers increasing opportunities for industrial development through manufacturing integration, the 2,500 major parts and assemblies used in the manufacturing of the average car create 2,500 possibilities of high cost in manufacture and the same number of quality problems, many of which could halt production. Each of the many materials employed in manufacturing can also create problems of cost, quality or supply.
6. It is a weakness of mankind to label its problems, thus obscuring their real nature and causes. "Diseconomy of scale" and the "technological gap" are examples of this tendency. Pains have been taken to discover the essence of these problems and their cause. Thus, while know-how cannot be watered down in proportion to the scale of volume, manufacturing processes can be found to suit different levels of volume, not necessarily with cost increases or quality problems. There is a wide gap between the technology of developed and developing countries, but most of the business of making motor vehicles is conducted at shop-floor level, where the technology is that of manufacturing engineering, plant engineering, tool design and toolmaking. There is no reason, for example, why skills in toolmaking in a developing country should not be equal to the same skills in a developed country. From this point of view, much can be done to narrow the gap, even though the gap may grow even wider from other points of view.
7. It is only in recent years, both in Europe and in North America, that large numbers of university students have begun to find places in industry. This new factor has been made possible by the development of industrial disciplines in management and administration and in technical and delegated authority. Developing countries must use university students to bring these new disciplines into industries in the earlier stages of development.
8. The present report seeks to follow the logical sequence of progressive development in automotive-industry planning. It is hoped that the work of the seminar will serve to expand the ideas already developed and help to evolve other ideas of even greater significance, and that the report will serve as an effective manual of instruction for the national planners of developing countries.^{2/}

^{2/} For a complete list of the documents presented to the seminar see annex 7.

Chapter 1

ELEMENTS OF PRELIMINARY PLANNING

9. This chapter is concerned with the infrastructure of a country's development and those elements that determine the quantification of new and total vehicle requirement. It cannot be assumed that the present levels and specification of motor-vehicle supply are ideally suited to current needs. The examination must therefore begin with present usage, specification and quantity. Consideration can then be given to the future. Technological, economic and social changes cannot be predicted for more than ten years in advance and little useful planning can be done beyond this period of time. The first five years can be predicted with reasonable confidence; the second five years, however, must be regarded only as quantifications of anticipated trends rather than as firm estimates on which commitments can be made. Nevertheless, predictions of trends for the second five years can be very important, indicating ultimate plant size, site requirements and preferences as to geographical location. It is also possible to predict trends in population growth and population distribution, road and other transport facility development, and the probable development of the ancillary and supporting industries to the motor-vehicle industry itself.

10. Inevitably there will be a distinction between what is practicable and what is merely desirable in the development of a motor industry and in the distribution of its products. The potential demand is always greater than the figures shown in the historical record and its projection. This potential is only valid, however, for one point in time, for if the restrictions present at that time are removed, the potential existing in the earlier years may disappear. The planner's task, therefore, is to measure the change that results from

planned intervention. The potential of planned intervention as an indicator of scope for change can only be measured at a given point in time.

Factors influencing vehicle demand

Passenger cars

11. The appeal of the passenger car is universal because of its convenience, the freedom of movement it offers, and its capacity for providing enjoyment and recreation. Thus many people will make considerable sacrifices to obtain one. Aside from direct restrictions on import, income per capita and vehicle price have been the decisive factors in the size of the current vehicle park.
12. The vehicle park consists of vehicles that have changed hands many times and may be from 8 to 12 years old, some that are relatively new and some late models. The International Bank for Reconstruction and Development (International Development Association) presented a paper to the seminar on "Automobile demand in developing countries", which is concerned with vehicle-park forecasting and comments on the significance of "vehicle life". The paper makes an important contribution to the general problem of forecasting and should be useful to countries already in a fairly advanced stage of development. The paper, which is reproduced in Part II of this publication, illustrates the wide range of variables by which quantification of demand can be qualified.
13. The manufacturer of passenger cars in developed countries has the problem of assessing the degree of market penetration for both the home and the export markets. Market penetration is influenced by product appeal, customer loyalty, manufacturing reputation and public image as well as sales service and sales organization network and outlets, advertising campaigns, manufacturing capacity and product availability, price in relation to competition in the same market field and changes in the income structure by age groups. In developing countries, for example, the purchasing capability of younger buyers is on the increase.
14. In spite of all these variables, the principal manufacturers in developed countries have taken the following steps in their new product offerings and launching plans, at production rates in excess of 1,000 per day:
 - (a) Designed, engineered, and prototype-tested the new vehicle;
 - (b) Established total facility requirements, new and existing tools, machines and production methods; and manufacturing capacity for every part and assembly;

- (c) Started timing programmes;
- (d) Established manufacturing costs in terms of material and production part cost, variable and non-variable overhead cost, investment and tooling cost;
- (e) Developed pre-production training programmes and manpower requirements;
- (f) Filled the dealers' showrooms with vehicles and the service stations with essential spare parts;
- (g) Estimated total sales and market penetration; developed advertising campaigns;
- (h) Estimated total cost, the production volume, the break-even point of profitability, and the return on investment at selected increments of increased production volume.

15. While the national planner is not directly concerned with most of these points, an understanding of the depth and breadth of control that can be exercised is of general interest.

Trucks

16. The range of commercial vehicles, from light vans to the heaviest trucks, covers a far wider range of model types than is the case with passenger cars. The tendency in developed countries is to proliferate variety in meeting the special needs of differing trades and commercial usages. For developing countries, a rationalization of vehicle type and a restriction on the variance within each type is inevitable.

17. The national planner's problem begins with the establishment of this rationalization and limitation on the basis of the historical record. Thereafter he may begin to establish projected quantification. Desk studies and mathematical formulas are not likely to be of practical value. Discussion with interested bodies and field work must be the basis of calculation. In this respect we may list some of the underlying factors of quantification:

- (a) Current circumstance and forward plans in basic industries; iron and steel, chemicals and plastics, agriculture, power supply, gas, water, oil and natural resources;
- (b) General industry planning - heavy industry, electrical industry, light industry and textiles;
- (c) Town planning, urbanization plans, road planning and development plans for other forms of transport (rail, water, pipe lines);
- (d) Miscellaneous transport requirements, postal services, schools, local tradesmen's transport, motorcycles and military requirements.

Special vehicles

18. Engine-manufacturing facilities can be provided which will produce a range of engines suitable to bus and tractor motivation. The same engines serve a wide range of equipment, such as building appliances, commercial and pumping gear, farm machinery, and earth-moving and road-making devices.
19. Gear boxes, axles, suspension units and many other items of truck-vehicle specification can be commonly found with bus-chassis specifications. Bus bodies and truck bodies can be manufactured with common facilities. These factors must be considered in establishing rationalization, and will form part of future manufacturing integration planning.
20. Snow-clearing equipment and caterpillar-track vehicles may be included under special vehicles. It should be noted that truck vehicles which are suitable for hard-surface roads may be unsuitable for dirt surfaces, particularly in wet weather.

The discussion

21. The basic differences between the objectives of the automotive industry in developing and developed countries became quite obvious from the beginning of the seminar. For example, motor-vehicle demand in most developing countries exceeds supply substantially. This demand is not controlled by the purchasing power of the consumer; rather, it is conditioned by government intervention and restriction. This situation will probably remain the same as long as the industry is heavily dependent upon imports requiring hard currency.
22. Under these circumstances, the problem seems to be one of practicability and priority in which there is little need for an analysis of demand. Furthermore, the projection of demand during future years will be also conditioned by practicability and opportunity.
23. Another factor that limits the ability of developing countries to perfect comprehensive analyses of market requirement is the shortage of qualified personnel, and government priorities in other matters.
24. The participants were faced with the problems of developing countries and their dire need for growth and advancement. It should be recognized that good planning, policy making and administration are dependent upon proper

analyses and accurate reports. An industrial development based only on meeting present demands and solving crises as they arise, wastes the efforts and the resources of the country and is an impediment to progress. The concern of the participants over these matters was eventually expressed in the first recommendation of the seminar directed to the establishment of automotive institutes (paras.196-198).

Chapter 2

VEHICLE SERVICE PLANS

25. This chapter deals specifically with the concepts of vehicle service planning presented by W. F. Eaton in a paper prepared for the seminar entitled "Maintenance of heavy-duty commercial vehicles". The paper, which is essentially practical in its approach and covers the subject comprehensively, is reproduced in Part II of this publication.

The discussion

26. It had been anticipated that participants from developing countries would be very much interested in the potential for cost saving, in capital (including foreign exchange) and expense. However, this proved not to be the case. In the opinion of these participants, the shortage of spare parts and, in some cases, the complete lack of such parts was of greater importance. They considered this problem to be of such significance that a special study group was formed at their request. The work of this group resulted in the second recommendation of the seminar (paras.199-202).

27. The participants from developed countries found the shortages of spare parts difficult to understand because this problem was virtually non-existent in their countries. Possible reasons for the difficulty were discussed:

- (a) The makers of (so-called) spurious parts do not usually operate in developed countries;
- (b) There are less "breakers" spares available;

- (c) Local dealers do not carry the same level of stock as does the manufacturer;
- (d) Local dealers avoid ordering spares whenever there is the possibility of ordering incorrectly because constant engineering changes on spare parts make catalogue identification difficult.

28. The one exception to the otherwise unanimous agreement on shortage of spares in developing countries was Brazil. During the Second World War, Brazil was almost completely cut off from any external supply of spare parts. It had, however, already made considerable progress in industrial development and was able to develop a spare-parts industry which still flourishes, and which later became the basis for the development of a motor industry. As this report progresses, the importance of this aspect of the motor-industry development will be better appreciated.

29. The participants did not expect that international firms would accept willingly a proposal for developing countries to manufacture "spurious" spare parts. The example of Brazil, however, was very tempting, especially considering that, while there is a shortage of "genuine" spare parts, there is a market for spurious ones.

30. It is essential that an automotive industry in a developing country begin with the development of manufacturing capability on a broad base. It is impractical to start such an industry with an assembly plant and subsequently attempt to develop manufacturing integration in a country which has little industrial capability. (It was accepted by developing countries that much of the spare-parts industry is controlled by other concerns and not by the vehicle manufacturer.) The participants from developing countries were aware that these were good reasons why their respective countries should develop spare-parts industries and an after-market supply. A permissive attitude on the part of international firms in developed countries (vehicle and parts manufacturers) is not what is required in the interest of either developing countries or international firms. Industry in developing countries, left to its own devices, tends to develop higher costs, poor quality, and all the vices resulting from inadequate control, including wastage in machines, labour and material and bad industrial practices. In order to protect this embryonic industry, import tariffs and restrictions are imposed which eventually necessitate drastic remedial measures. It is therefore in the best interest of both the international firm and the developing country to develop a mutual co-operation that will result in good

practices, hold down costs, make the least use of tariff walls and restrictions, and encourage the development of the country's industry.

31. Representatives from developing countries did not accept readily that total good performance in vehicle-service maintenance and repair held a potential for cost saving and could, if well planned, result in the development of skilled personnel and the rudiments of management know-how in the disciplines of industry. This was partly because much of the service and repair business is done by international firms and national employees who have established management discipline in their service depots. This was only true to a limited extent, and did not have the impact that it should have on the country as a whole. It was improper to make positive assertions in the absence of corroborative information. Only an analytical appraisal of typical operations in public-transport maintenance depots, commercial-vehicle fleet operators, service maintenance and repair in general could permit positive conclusions. The automotive institutes recommended by the seminar would have the proper resources to investigate this aspect of the industry in co-operation with developing countries (paras.196-198).

32. Concerning the use of second-hand vehicles and equipment, the Brazilian experience is worthy of note. One of the participants stated that, in several instances where maintenance standards and procedures had been rigorously applied, vehicles up to 25 years old were still giving good service. In general, however, the participants of developing countries were not sympathetic to the acquisition of second-hand machinery. The reason for this lack of enthusiasm centred principally on two factors:

- (a) The problem of the availability of replacement parts;
- (b) The difficulties of ensuring good maintenance.

33. There was a feeling among the participants that, in accepting second-hand machinery, developing countries were being burdened with unwanted goods, which in turn gave the advantage of the latest advances to developed countries.

34. None of these reasons provides a sound justification for rejecting the acquisition of second-hand machinery. This report does, however, reflect the main points of the discussion and the attitude of the participants from developing countries.

35. The differences in attitudes between the developing and developed countries is a strong test of both the profitability of a competitive trade and the practicability of building an industry in a protected and developing market.

Chapter 3

INTERMEDIATE ASSESSMENT OF VEHICLE DEMAND

36. It will be shown later in the report that the major difficulties of a growing motor industry in a developing country are technological problems, the relatively low volume of production required and the resulting high cost. For these reasons it is essential that the national planner rationalize his vehicle list to include as few types as possible. Under circumstances of unrestricted import, many vehicles of only slightly varying specification will be included in the total list. There will be many vehicles of different manufacturing origin with similar functional characteristics. Thus, total volume requirements can be brought to a maximum for each type.

37. Two factors contribute to high cost at low volumes of production in a developing country:

- (a) Economies of scale;
- (b) The inherent lack of know-how, particularly in the middle strata of management and technical authority, as regards product design, manufacturing management and cost control.

38. Proliferation of vehicles by type and manufacturing origin not only reduces production schedules for each vehicle and for each of its production parts but also increases the responsibility of those staff members who are capable of taking over the duties of middle management and technical personnel. Progress is likely to be most rapid where there has been the greatest conservation in resources of every description and where the effort can be concentrated on a narrow front.

39. Unavoidably, the total list will contain some vehicles for which there is little demand. The selection for manufacturing integration will consist of those vehicles for which the volume of requirement is highest.

40. Developing countries can be said to fall under one of the three following categories:

- (a) Small countries of limited resources and of relatively slow development, particularly in the industrial field;
- (b) Medium to large countries with some established industries;
- (c) Countries already well advanced in industrial development.

This section of the report is more concerned with countries in the first category. Countries in other categories have already established their manufacturing integration patterns.

Development stages of the automotive industry

41. The stages of the development of the automotive industry of a small country of limited resources are as follows:

- (a) The development of good service and facilities and education of the people in good driving practice and vehicle care;
- (b) The development of manufacturing facilities for easily made replacement parts;
- (c) The establishment of motor-vehicle assembly plants;
- (d) Integration of the manufacture of easily made replacement parts;
- (e) The manufacture of more complex vehicle components such as engines, axles, gear boxes and suspension units; and
- (f) An ideal full integration of automotive manufacturing.

Stage 1

42. The first stage offers the greatest opportunities for technical advance, profitability and quick return of invested capital. These opportunities will be found in the areas of (a) maintenance of the vehicle fleet, which in turn reduces the expenditures for new vehicles; (b) improved performance in the transport services and better utilization of vehicles; (c) reduced need to import replacement parts for service and repair; and (d) wide dissemination of education in industrial disciplines. There is an introduction to vehicle assembly in the training of men in sheet-metal repair, body painting, in

soft-trim repairs, in lighting, instrument and electrical servicing and in the replacement of engines, drive lines and the like.

43. Training programmes for service and maintenance engineers, which follow the patterns of procedure and control set out elsewhere in the present report, are used by all of the principal vehicle manufacturers in their servicing networks. Rationalization in this respect is as important as in any other sector of the automotive industry.

Stage 2

44. While stage 1 can be associated with high profitability and reductions in import, experience indicates that stage 2, the development of manufacturing facilities for some of the simpler replacement parts, may result in increased costs, since the locally made parts may well be more costly and of poorer quality than those formerly imported. It may also be the starting point for protective tariffs and general escalation of prices.

45. Tires and batteries are the most basic items in the initial development of a spare-parts industry. However, they constitute only a fraction of a unique and variegated industry and make only a small direct contribution to vehicle manufacture. The manufacturing of such items as door rubbers and other rubber pieces, on the other hand, is considerably more useful. The glass industry could also contribute by manufacturing door windows, windscreens and lamp glasses. Mufflers, filters, wiring harnesses and ignition cables are readily manufactured. A second group might include relatively simple machine components such as water pumps, brake drums, bushings and various springs. More technical and financial help may be required for a third category of parts, which requires higher skills and more sophisticated materials and elaborate equipment, including forging and foundry installations, to produce valves and valve-train components, pistons and piston rings, steering components, complete brakes, spark plugs, distributors, carburettors, starting motors and generators. This threefold classification furnishes a key to the progress of a developing country towards satisfying demands for automotive components. It also points the way to the more-advanced stages of the automotive industry.

Stage 3

46. Stage 3, the establishment of motor-vehicle assembly plants, will not be conducive to reductions in vehicle cost or in foreign-currency expenditure, as

the CKD cost does not differ very much from the finished-vehicle cost. Consequently, stage 2 should be developed only as a necessary preliminary to further manufacturing integration. The guidance and assistance of the licencer or manufacturing affiliate has made it possible for some developing countries to accomplish this stage of development without any major difficulties. The principal manufacturers of Europe and North America have considerable experience in this aspect of manufacture in developing countries.

47. The first selection of vehicle types for domestic assembly is made in the wide category of passenger and commercial vehicles. The choice is too complex to be based on specific recommendations. The volume of demand must be an important consideration. True justification for beginning the development of stage 3 of a motor industry must be founded on an assurance of potential, as evidenced in other industries. Consideration must be given to the availability of staffing resources in schools, universities and technical and training institutions. Stage 3 must be thought of as a point of no return in the development of a motor industry. In order for the industry to develop smoothly and at the lowest cost, production schedules must be kept steady, with planned increments. Stop-start production resulting from delays in the release of funds and licences of approval for imports has a disastrous effect on efficiency and manufacturing cost. Uncertainties in tariff arrangements and the problems of over-protection and under-protection can be equally damaging to industrial development. The negotiated agreement with an overseas affiliate will establish the pattern of future development.

Stages 4, 5 and 6

48. The weaknesses of a developing country as regards technical and management know-how become apparent in stage 4, the integration of the domestic manufacture of certain easily made parts. In the previous stage, the development of vehicle assembly, such weaknesses may be concealed by great capabilities of the foreign personnel who provide assistance at this stage. The manufacturing experience of such highly qualified people can be seen in the plant layouts, assembly-processing sequences and tooling and facility specifications.

49. In stage 5, the person responsible for manufacturing the first complex part selected for integration must ensure the production of a quality part at an acceptable price. At the relatively low-volume production required, it will probably be necessary to make simple but important changes in the product design and to develop manufacturing processes and tooling that differ from

those used in high-volume manufacture. The plant manager may be handicapped by low-quality materials, unsuitable equipment, ineffective toolmaking and many other difficulties. While this challenge should give him the incentive to develop and expand his industry, the odds are heavily against him.

50. Proliferation in the manufacture of motor-vehicle parts and the resulting problems can cause great disappointment, substantial losses and delay in the attainment of stage 6, the full integration of automotive manufacturing.

Negotiating with manufacturing organizations
in developed countries

51. A study of the observations on corporate attitudes towards overseas commitments, presented in the paper "Automotive industries in developing countries", by A. S. El Darwish (see Part II of this publication) reveals that the national planner of a developing country would be well advised to have a thorough knowledge of his quantification of demand and forward projections. He may be certain that the leading firms in Europe and North America have the capabilities and the necessary resources to analyse in full detail any proposal from the motor industry. (Sometimes there is a shortage of personnel available to do this work.) Their analyses include not only the facility requirements and the manufacturing cost of production, but also the problems of management training and development, of the skilled trades, of the training of production operators and of launching costs.

52. It has already been noted that a considerable degree of industrial development is a prerequisite for automotive-industry development. In developed countries, the training period for middle-management personnel, manufacturing and plant engineers, quality-control and production-planning personnel and cost accountants is approximately ten years; few men under the age of 30 achieve full responsibility in these fields. Tool designers need five years of apprenticeship and five years of experience before they are considered fully qualified specialists. Toolmakers and maintenance men require similar qualifications. It is part of the national planning of a developing country to elaborate manpower plans for the economy as a whole, as well as for the automotive industry. Indeed, such plans should be already in the process of development. Manpower planning has been one of the major preoccupations of the International Labour Organisation (ILO) for a number of years, and it has rendered assistance in this area to a number of developing countries.

The discussion

53. The discussion of this subject made no significant contribution to the establishment of make-and-buy patterns for the vehicle requirements of developing countries. The following important features were identified:

- (a) Commercial-vehicle manufacture, including that of buses and trailers, presents substantially fewer problems to a developing country than the manufacture of passenger cars.
- (b) Vehicle-assembly plants should not be introduced until the country has a well-developed industrial base that can result in rapid progress towards manufacturing integration.
- (c) In many countries, the premature introduction of vehicle-assembly plants and an excess of assembly plants have created a handicap to manufacturing integration and the development of a parts industry by proliferating variety and reducing the volume of each requirement.

54. The discussion resulted in the fourth recommendation of the seminar and in part to the third recommendation as well. The request for standardization of vehicle parts may not be as hopeless as it seems at first sight. For example, in some instances, proprietary manufactured axles and gear boxes are common to vehicles of different manufacturing origin. Some electrical items are commonly fitted to different makes of vehicle. What the developing countries are asking for, however, is a really constructive effort on the part of international firms to find the solution of a problem which they themselves helped to create. It seems reasonable to predict that approximately ten or twelve vehicle makers will not be able to participate much longer in a market which, in some instances, consumes only 10,000 units per year.

55. It is in the interest of developing countries to negotiate with international firms with the objective of reducing variety and seeking greater co-operation in the development of their industry.

Chapter 4

TECHNOLOGICAL PROBLEMS

The technological "gap"

56. The record of the development of the automotive industry in developing countries shows that the main problem has been to achieve quality in manufacture at costs which bear comparison with those of developed countries. It is also generally accepted that developing countries experience difficulties trying to achieve full utilization of the available production equipment. In practical terms, the record is one of substantial achievements, sometimes under the most unfavourable circumstances. Developing countries have shown that motor vehicles can be built in their environment and that substantial degrees of manufacturing integration can be accomplished.
57. While the achievements of some of the nationals from developing countries are often worthy of the highest praise, the manufacturing know-how in establishing plants, as well as the provision and installation of equipment, machines and tools, originate in the developed countries, under the supervision of the respective personnel offices. It is reasonable to question to what extent the problems of low-quality products and high manufacturing cost could be anticipated and curtailed by the corporations responsible for transplanting the industry.
58. Two reasons are usually given for the disparity of performance between developed and developing countries. One view puts the blame on the technological gap existing between developed and developing countries; the other contends that the blame lies within the economies of scale and affirms that production costs at low volumes are unavoidably high. There may be some truth

in both of these explanations, but it is doubtful that they will be accepted as perfectly valid. Developing countries are not expected to engineer motor cars in competition with developed countries, any more than they are expected to improve the technologies of space travel. In the years before the Second World War, the Ford Company in England marketed an excellent car at exactly £100. This happened long before the advent of highly automated machinery and was done at a relatively low volume. An analysis of technology in its widest sense may be helpful in finding a more satisfactory explanation to this problem.

Scientific research

59. Pure science, the pursuit of knowledge for its own sake, is perhaps more international in character than any other human activity. There is a certain fellowship and communication between scientists that freely oversteps national boundaries. Scientific publications are available practically everywhere. The presence of institutions of scientific research in a country is a matter of national pride. Undoubtedly, communication by social propinquity results in a greater awareness of scientific development. Nevertheless, it is difficult to see why a lack of this advantage would necessarily be conducive to poor quality and high cost.

Applied research

60. The above comments are also true of applied research. While propinquity plays an important part in communication and hastens the work of production development, its effect on current production is negligible.

Production research

61. Although applied research can often be used in the production of new materials, processes and techniques, a great deal of work (and sometimes expensive experimentation) is necessary before production problems are overcome. The majority of the firms in the motor industry are very active in this regard. Few developing countries, however, are interested in this kind of development work. Their concern is the advancement of their industries on the basis of well-tested and proven methods. When the development work is undertaken by the machine-tool trade or by the manufacturers of production equipment, the results of these efforts becomes readily available on the world markets. Not all of this work is concerned exclusively with high-volume production; many

machines now available were designed for greater versatility and batch-production methods. There is probably an opportunity for production research aimed at high quality at low volumes. If so, its exploitation could create a potential competitive advantage for developing countries with relatively low labour costs over developed countries with high labour costs and an occasional shortage of manpower.

Product engineering

62. The sophistication of modern product engineering in the motor industry, incorporated as it is in the total organizational structure of management, is remarkably complex. At the same time it is completely under corporate management control. A paper by F. J. Hoover on "Automotive research and development", provides an insight into the planning and control of creative effort.^{3/} This aspect of product engineering is concerned with future development. Two of the techniques used deal with product quality and the cost of current production. One is known as "value engineering" and the other as "method engineering". They are neither sophisticated nor technically difficult. Fundamentally, they are the result of applied common sense and are easily available to reasonably well-trained technicians in developing countries.

Manufacturing engineering, plant engineering, quality control, production planning and control, production-part purchasing, time phasing, and cost accounting

63. The most important people in middle management are those who plan and install manufacturing facilities and who are responsible for providing accommodations that can be used by production supervision and labour in the production of a quality product at the right price. Manufacturing engineers identify the manufacturing process, design the tools, specify machines and facilities, measure the cost of production and material usage, specify and determine materials-handling arrangements and identify manufacturing capacities. Quality engineers interpret product specifications, identify quality in the manufacturing process, and control it at the end of the line. The production planning and control personnel quantify the production schedule in terms of material and production parts, control inventories, and minimize obsolescence. Plant engineers ensure good maintenance in machines and production equipment. Timing personnel develop timing programmes for new model and

^{3/} Presented to the seminar as ID/WG.13/8.

facility developments and exercise control over the production programme. Cost accountants measure and report costs on a continuing basis.

64. Undoubtedly, the greatest weakness of developing countries is found in this aspect of technology, in knowing how things are made on the shop floor, in doing things properly and in the right order, and in working as a team. In the language of management technique, such industrial disciplines are defined as "procedures of working", "systems of reporting", "delegation of authority and identification of personal responsibility", "commitments to performance" and "the appraisal of performance against commitment". Traditionally, the background of these men has been in apprenticeship and in the technical colleges. Only recently has there been an influx of university men.

The skilled trades

65. The skilled trades of industry, particularly in toolmaking and pattern-making and those trades which develop maintenance engineers in every field of activity have their roots in a long tradition of craftsmanship which goes back to the Middle Ages. The idea that craftsmanship has been lost in the machine age is erroneous. The craftsman of the past is to be found today in the skilled trades of industry and in the ranks of junior and middle management. The industrial machinery which maintains production schedules of more than 1,000 vehicles a day every year is the triumph of craftsmanship and middle management.

Production supervision and production skills

66. Some forms of production work require special skills for which appropriate training and an initiation period are necessary; some examples are body painting, some machining operations, torch soldering of bodies, metal finishing and panel beating. The majority of production operations can be learned very readily, and no great difficulties have been experienced by developing countries in this respect. Natural leaders can always be found who, with some training, fulfil the responsibilities of shop-floor supervision.

Business know-how

67. It has been said that we live in an era of managerial revolution. The control of industrial enterprises requiring capital investments in excess of \$1 billion, and which can reach staggering proportions in companies such as Ford and General Motors, can only be effected through a management organization

with constant regulations regarding all aspects of production, from policy decisions to shop-floor supervision. Such an organization must be sensitive at every level to variations in product cost, product quality and product acceptance in the market, as they happen, before they happen, and to the effect of corrective effort as it is applied. Efforts in this area have become as much a discipline and technology as any other part of the productive endeavour.

68. It is easy to understand that the gap between the developed and the developing countries is to be found in business know-how, middle-management expertise and the skilled trades as well as on the technological level. This concept is perhaps different from the one that regards technology as a great mystery, understood only in the developed countries. All such gaps can be narrowed as development progresses.

69. Developing countries should not, on the other hand, concern themselves with the design and development of new products, involving new techniques and materials, for competition in world markets with the products of such international manufacturers as Ford and General Motors. Any such effort would be quite unrealistic.

The discussion

70. The discussion of technological problems began with a search for the reasons for the high cost and inferior quality of the motor-vehicle products of developing countries. Although some of the probable reasons were considered, it was agreed that further analysis of cost implications and of economies of scale is necessary before this important problem can be fully understood.

71. Perhaps the most important aspect of the discussion was a clarification of the differing technological objectives of developing and developed countries in the present and in the foreseeable future. The technological objective of developed countries is a progressive evolution of all national resources in science and technology for the development of improved vehicles capable of meeting international competition in customer appeal (in all its aspects), at a price and volume that will ensure good profitability. On the other hand, the technological objective of developing countries is the growth

of the manufacturing aspect in support of industrial progress and national affluence in a protected market, and therefore it cannot be profitable by the standards present in developed countries. There are a few instances where industrial progress affords the hope of international competitiveness, but these are rare exceptions.

72. The participants recognized that there is a need for design adaptation where product design has been developed exclusively in the interest of high-volume production at minimum cost. There are many instances where parts and assemblies can be slightly modified to make them suitable for simple machines and low-volume production. It is probable, however, that the greatest opportunity for effective design change lies in the vehicle's body and cab, because such changes can result in simplification of the cost and control problems usually encountered by press shops during sheet-steel fabrication. Chrysler, Mack and the former Leyland group have developed special bodies which largely dispense with the need for an elaborate and expensive press shop. These bodies are of unconventional form, but functionally they are entirely satisfactory. The plastic body can be also highly recommended. The capital outlay to produce it is low, special skills needed are readily acquired, and the vehicle is not only functionally acceptable but it can easily compete with those made in the traditional way. In this respect, the best interests of the developing countries and the international firms will not be achieved if developing countries are left unaided in their search for design changes that will simplify their problems.

73. The seminar discussed at some length the problems of supply and the many ways in which production suffered as a result of parts shortages. The lack of even the smallest component can bring production to a halt. In developing countries, where there is a dependence on local supply that may result in an inability to deliver parts (or in the delivery of substandard parts that may be rejected later), the problems of keeping production going and at the same time exercising cost and quality control are difficult for a manager in an international firm to understand. The discussion helped the participants from developed countries to understand the type of difficulties which can be found in national industrial life. The greatest difficulty in the development of an automotive industry in a developing country is shop-floor technology rather than scientific research. Developed countries can be of help in this respect by providing financial assistance and appropriate manufacturing facilities. Education and training establishments can also contribute. Participants from

developing countries acknowledged the help that has been and is being given by international firms; however, it is the middle-management personnel and the practical technicians of industry in developed countries who have the know-how that is required. Industrial progress in developing countries will be proportional to the contribution made by these middle-management personnel in the dissemination of practical know-how. This does not imply that this is the only assistance and guidance that developing countries need, but rather that this aspect of development is more effective when the quality of know-how is communicated from person to person.

74. Part of the discussion centred on the problems of product design, and some of the participants from developing countries showed an awareness of the time factor involved in the development of product-design engineers. A participant from a developing country asked for the assistance of developed countries in the training of product engineers by direct contact with product designers in the design offices of international firms. In this respect, it should be stated that the record shows that international firms have always been willing to provide this type of assistance. The problem is one of opportunity and convenience rather than a lack of generosity. A representative from UNIDO expressed the opinion that developed countries make a valued contribution to world progress in this way, and that there can be no substitute for their assistance. It is hoped that an even greater contribution will be made in the future.

75. It has been pointed out that the vehicle industry rests on the broad base of the supply-and-parts industry. True industrial progress begins with the development of manufacturing processes of least capital investment. In this respect, motorcycle manufacture, and particularly that of parts other than engines, presents such an opportunity.

76. In many respects the motorcycle foreshadows the motor car, both in the manufacturing process and as a means of transport. A summary of the paper by V. Jansa on "The motorcycle, its present and future" (presented in annex 4) is annexed to this report as it indicates the size of the market for motorcycles.

Chapter 5

COST IMPLICATIONS, CAPITAL AND EXPENSE, PROFITABILITY

77. The cost implications faced by a developing country in the manufacture of motor vehicles, particularly at low volumes of production, can be appreciated in the following analysis:

- (a) Manufacturing costs in developed countries are an acceptable objective for cost performance in developing countries.
- (b) Prevailing high costs in developing countries are unavoidable because of the high-cost parameters characteristic of these countries, and what those parameters are.
- (c) Prevailing high costs are the result of transition and development in manufacturing know-how. Means of expediting these changes should be sought.
- (d) There is an interrelationship between cost, quality and capacity utilization.

It is also helpful to examine some specific examples of total cost performance to discover the relationship between manufacturing cost and other costs.

78. In Europe, in particular, a transition period in the motor industry dates from the immediate post-war years of industrial recovery to the present. During this period there has been an almost continuous improvement and development of product design, manufacturing methods and product machinery, as well as a steady increase of production schedules. In management there has been a total change in organization and management-control systems.

79. During the 1930s and in the years immediately following the Second World War, production processes involved a large amount of handwork, and production volumes were relatively low. Production figures of 30 per day for specific vehicle types were by no means uncommon. The following descriptions of the

manufacturing processes for outer door panels at high and low volumes of production illustrates this difference:

Older method: The earlier method was as follows:

- (a) Cut blank to shape including rough pierce-window opening, simple tool for press operation, single-action press;
- (b) Form-panel contours, draw tool, double-action press;
- (c) Pierce-window opening, single-action press;
- (d) Finish the trim of door panel, manual operation on a band saw;
- (e) Finish the form of door panel, drill lock holes, manual operation on a hammer form;
- (f) Metal-finish door panel at assembly - manual disk operation.

The speed of press operations was approximately 200 pieces per hour.

Modern high-production method: Door-panel design has changed very little in principle since that time. The manufacturing operation has, however, changed completely, eliminating all hand operations, with the following results:

- (a) Blank and rough pierce-window opening from coil stock, blanking press coupled to sheet uncoiler and levelling rolls;
- (b) Form-panel contours, double-action press;
- (c) Trim panel and finish pierce-window opening, pierce-handle holes, single-action press;
- (d) Finish the form of door flanges, single-action press.

The inherent capacity of an automated press line is 900 pieces per hour.

80. The presses and tooling of the former method were simple and relatively inexpensive. The presses were frequently of considerable age and had been written-off as assets. The modern requirement is for presses of higher tonnage and press-cycle time. The new presses are more accurately built and more elaborate in their control mechanisms; naturally, they are more costly.

81. The complete line of presses and the uncoiling machine are linked together with interchangeable automatic handling devices. Tooling is more robust and designed to facilitate the mechanical transfer of panels from one press to another. In some instances the inner and outer door panels are run simultaneously down adjacent lines of presses, and come out together at the start of an automated assembly line, at the end of which they are clinched and welded together.

82. The total cost in presses, automated equipment and press tooling is extremely high, but the labour input is very low. Apart from labour saving and a conservation of manufacturing space, there is a marked improvement in panel quality and a subsequent saving in the labour of body-metal finishing.

83. Whereas idle machine time in the older method made relatively small additions to manufacturing cost, its effect in modern equipment is ruinous. Total press-shop utilization figures in the order of 80 per cent are essential if planned vehicle cost is to be achieved. The assurance of meeting these objectives (which are commitments on the part of the management personnel concerned) is adequacy in the skilled labour force, tool designers, process and material-handling engineers, production planning and control personnel, maintenance and plant engineers, and good-quality raw material (sheet steel).

84. Manufacturing cost justification for high capital cost is implicit in:

- (a) Labour saving;
- (b) Conservation of manufacturing space;
- (c) Savings in materials handling cost;
- (d) Material savings in the use of coiled stock;
- (e) Inventory savings and savings in storage space;
- (f) Cost savings inherent in good quality.

85. This list of savings looks impressive, but it must be remembered that capital cost is very high and that economy is dependent on a high level of capacity utilization. At the lower level of labour cost prevailing in developing countries, the margin of profitability could disappear in favour of simpler forms of productive effort.

86. One cannot overemphasize the production difficulties associated with this kind of production equipment. It is in this respect, however, that the larger and more efficient corporations gain a cost advantage in a highly competitive industry.

87. The substance of this review of high- and low-volume production methods in sheet-metal body panels also applies to most other production processes in the industry. Engine-block manufacture by high-volume production methods requires an investment of approximately \$10 million. The production capacity

inherent in this equipment is about 120 blocks per hour. Actual production count on an all-day basis rarely exceeded 80 blocks per hour until recently. Using the same basic equipment, but with the incorporation of important changes in layout for breaking up the sequence of automation and allowing small banks of blocks to accumulate between important sections of machining operations, all-day production achievements of over 100 blocks per hour have been recorded. This example illustrates the difficulties of achieving the planned capacities (on which profitability depends) which are associated with this kind of equipment.

88. The automated block-machine line is, as the term implies, a series of machining operations linked together with transfer mechanisms. The machining and the transfer of the block from one operation to another is entirely automatic in action. The control mechanism for transfer, stopping and starting of tool feeds and speeds, cutting coolant supply, gauging operations and tool-wear correction is so complicated that the failure of a limit switch can stop the complete line of operations. It is this that limits production capacity to 80 blocks per hour. Simpler block-machine tooling relies on an operator to control the machining processes and to handle the blocks between operations. Small banks of stock are held between operations, and a high level of capacity utilization is more readily achieved.

89. The problem of achieving a high level of capacity utilization with simple manufacturing equipment is certainly no more difficult than with highly automated equipment. A growth in manufacturing capacity is achieved by increments. The next of these increments in block machining capacity is another block line and a further investment of \$10 million. Low-volume equipment provisions can be more flexible and utilitarian, and increases of capacity can be achieved at relatively lower cost.

90. Capacity utilization is also a matter of shift-working patterns, scheduled maintenance and tool change-over planning. The success of the larger and more efficient corporations in developed countries is not merely a matter of manufacturing efficiency. The success of one corporation in the rapid introduction and acceptance of new vehicles of greater customer appeal deprives their competitors of sales and thus of production volume. The purpose is to increase their own capacity utilization through increased overtime and shift-working patterns, and to create the opposite effect on their competitors. Low capacity utilization, whatever its cause, contributes to higher cost.

Supplier shortages of production parts or raw materials, government delays in the approval of import licences and release of funds, not only affect capacity utilization by direct stoppage but also by dislocation of productive effort.

Quality problems

91. A high potential of quality performance is inherent in the design and specification of high-volume production equipment. Machines which are designed for fast, continuous production must be fundamentally robust and consistent in their performance. Quality faults that develop during the course of production proliferate very fast. Quality-control equipment which permits quick and readily made quality assessment is essential. This equipment is expensive and adds significantly to the total cost.

92. In new model development and launching, changes in product design and specification are inevitable. There is a considerable cost increase in changes in automation and associated equipment to tools and machines well advanced in construction.

93. The problems of quality performance in low-volume production facilities can be solved by proper control on the part of inspectors and by the determined efforts of production supervisors and operators. Good quality, however, is always dependent on good production-process engineering, proper tools, efficient maintenance and effective management control of the production operation.

Cost comparison examples

94. The paper on "Automotive industries in developing countries", by J. Baranson, reviews and analyses the cost performances of several developing countries.^{4/}

95. At the beginning of this chapter, an analysis was presented on the difficulties encountered by developing countries in their efforts to achieve lower cost performance and it was stated that production costs in a developed country are an acceptable objective for developing countries.

^{4/} Presented to the seminar as ID/WG.13/22, this paper has been published by the Johns Hopkins Press, Baltimore, Md. (1969).

96. Production costs in developed countries are not at an irreducible minimum; management is constantly aiming towards ever-lower production costs. This effort can be appreciated in the use of cost clinics, monthly cost meetings, specific cost reviews, material usage and weight-reduction exercises; value engineering and methods engineering committees; materials-substitution cost analysis in powdered-metal techniques, plastic mouldings and die castings. The supplier of production parts is also under constant pressure to reduce costs. There are participation schemes for employees, and substantial bonuses are paid for successful proposals on cost reduction. Cost consciousness is an essential attribute of management at all levels. New model design and planning has, as its primary objective, a better vehicle at a lower cost.
97. Although cost performance, as exemplified by developed countries, is a major objective of developing countries, there is no direct evidence to the effect that the same skilled effort in developing countries is as productive as it is in developed countries.
98. While current high-level costs in developing countries could be substantially reduced, the problems are very real, and there are difficulties in every aspect of national life, and great efforts must be made to remedy these conditions. It is therefore reasonable to identify high manufacturing cost with the transitional development of know-how in these countries.
99. It has also been shown that cost, quality and capacity utilization are interrelated. None of the problems inherent in these aspects of production could be solved in principle by the added expense of new machines, which would only create additional problems of a similar nature. There may be other justifications for new machines, such as the unsuitability of the old machinery to the production process, but the cost-quality comparison study must be made on the basis of optimum performance on the part of existing equipment and methods.
100. The early stages of development of the automotive industries in underdeveloped countries are deceptively easy. There is no great difficulty in establishing a small assembly plant; however, high cost begins with the further integration of manufacture. Assurance of low cost, on the other hand, begins with technical schooling, apprenticeship and management training and with planning that makes the best use of available know-how.

The discussion

101. The discussion did not make any significant contributions towards a factual cost appraisal of the motor industry in developing countries, but it did clarify the basic differences between values and objectives in developing countries and those in developed countries. If it is said that the objective of an international firm is primarily and unavoidably the accumulation of profits in a competitive market, it must also be said that the objective of the automotive industry in developing countries is primarily to overcome the practical difficulties of manufacture. Its first aim is to reach a reasonable standard of quality, and its second one to achieve a continuity of production volume. The problems of supply, of vehicle part and material quality, of machine maintenance, of tooling inadequacy and breakdown, and of qualified personnel overshadow all other difficulties. Good cost control, as practised by international firms, is only feasible when circumstances can be reasonably predicted. Such prediction is possible only when a high level of industrial progress is present. For example, good machine utilization is an objective of production achievement rather than of profitability. Materials usage is overshadowed by quality problems. The economic use of labour is constantly disrupted by material shortages, parts-quality correction requirements and machine and tool breakdowns. This statement is made, not in order to discourage efforts for advancement, but to define the difficulties at hand. The problems of management should be also understood, especially in the early stages of industrial development.

102. To put this matter in better perspective, however, it must be recognised that cost control will be effective in proportion to:

- (a) The level of industrial progress achieved by the country;
- (b) The degree of influence exercised by international firms, either by direct control or by co-operative assistance.

In this last respect, the influence or control which is exercised affects the entire field of industrial effort, and not the automotive industry exclusively.

103. Shortages of capital or lack of facilities were not cited during the discussion as being major causes of problems. There may be shortages of these essentials in many instances, but this did not seem to be a major preoccupation with participants from developing countries.

104. A more comprehensive review of the economics of the automotive industry is contained in three of the papers presented: "Automotive industries in developing countries", by J. Baranson (see footnote 4 above); "Establishment of an automotive industry in developing countries", by A. S. El Darwish and "Automotive demand in developing countries", by A. G. Nowicki.^{5/}

^{5/} The three papers were presented to the seminar by the IBRD. The Darwish and Nowicki papers are reproduced in Part II of this publication.

Chapter 6

TRAINING REQUIREMENTS AND TIMING

105. All historical evidence points to the fact that the advancement of a motor industry in a developing country is invariably one of continually increasing production cost. There are many indications that the major cause lies in an inadequacy in manufacturing and business know-how. Low-volume production facilities are inevitably associated with a high labour input. Generally speaking, this is not objectionable in itself. High manufacturing cost, however, is never acceptable. The term "high cost" implies highness in relation to some other costs, and for the national planner, the implication must be highness in relation to planned cost. The development of an automotive industry unavoidably involves the training of people in a wide variety of industrial practices; it involves education, training in skills, and learning the disciplines of industry. All of these activities are expensive and increase the over-all production costs.

106. A programme of development which has as its objective a high level of manufacturing integration must also include training and educational programmes for industrial personnel. It must be remembered, however, that while training and education are essential, know-how is the attribute of practice and experience. In this larger sense, training and know-how are derived from three sources:

- (a) Technical schools, training establishments, and universities;
- (b) The example and influence of foreign nationals from overseas affiliates;
- (c) Practice and experience (on-the-job training).

107. The problem of wastage is very difficult to assess. Of every hundred men being training for the automotive industry in technical schools and other establishments, perhaps no more than ten will continue their studies after two years. Still fewer are those who are able to accept junior management posts or technical authority and go on to become first-class designers and skilled tradesmen.

108. The direct contribution, both in physical progress and in personnel development, that can be made by overseas affiliates of national automotive industries is of the utmost importance. Such a contribution can be made not only to the vehicle manufacturer but also to the parts and material industry. The relationship between the overseas affiliate and the developing country has a significant effect on the contribution made by the overseas personnel. This aspect of co-operation is discussed in the paper "Automotive industries in developing countries" by J. Baranson (footnote 4).

109. On-the-job training may mean learning bad habits and unprofitable methods perhaps more often than it may mean acquiring good practice. When men do not have any training, guidance or example, they often employ great ingenuity in overcoming their immediate difficulties, although not always wisely in the light of subsequent problems. These problems will not be solved by themselves. There is an urgent need for good examples and a new approach.

110. Experience has shown that protracted overseas training for nationals from developing countries is often unsettling, and that, upon their return, if they return, these men often find difficulties in readjusting to their home environment. Short periods of overseas training, however, with specific objectives which relate to problems encountered during actual work, will aid their progress and avoid the inertia of a defensive attitude. Such short periods of overseas training, at the international level, are offered by the International Centre for Advanced Technical and Vocational Training established by the ILO in Turin, Italy. The centre offers advanced training, ranging from three to six months, and combines it with short periods of actual practice in appropriate enterprises or institutions. This type of training is also available through programmes established by several developed nations, private institutions and individual enterprises.

111. The most pressing need of the automotive industry is for apprentice-training centres. There is also a need for training in manufacturing engineering, plant engineering, quality control, production planning and control, and

cost accounting. This training must be conducted within the country itself, in the various industrial centres. A planner from a developing country needs to know the costs that are involved, the financial assistance that is available, the buildings that are required, the amount of training that is needed, the numbers of students who are in training and the annual quotas of trained men. Most important of all, he needs to know what help is available for staff training.

112. The ILO, which has various technical co-operation programmes in the areas of vocational training and management development, presented a paper to the seminar, which is summarized in annex 3 to this report. Manpower planning is essential if labour supply is to meet actual demands, both in the major sectors of the economy and in special occupations. Like other areas of economic and social planning, such planning can be divided into three phases: first, the evaluation of past trends and the assessment of future prospects; second, the determination of objectives and the setting of targets; and third, the selection of policies and measures to reach the targets. In practice, the three phases tend to overlap.

113. In the first phase, comprehensive statistics of the labour force must be shown - by type, by geographical subdivisions, by industries, occupations and training attainments. Unfortunately, the breakdown by occupation and educational classifications are of recent origin and in many developing countries such statistics are still at an early stage of development. At this stage of manpower planning, it is also necessary to have a growth model of the industry and data on past trends in productivity and analytical studies from which demand estimates can be derived. The demand for manpower by occupational categories must then be translated into categories according to the kind and duration of education and training.

114. In the second phase of planning, alternative sets of estimates, based on key variables, including output and investment and their distribution, are worked out for employment and skill formation. As part of the elaboration of a comprehensive national development plan, it is possible to select targets which provide the most favourable combined growth of output, employment and skills by exploring the various possibilities and by using a process of reciprocal adjustment of the variables. A common failing is that planning is often confined to certain categories of manpower. A comprehensive approach should be the goal, but this is often precluded by the limited data and knowledge available.

115. Once manpower targets have been set, manpower planning enters its third phase, which comprises the adoption of specific policies and measures (with regard, for example, to investment and remuneration) and the development of appropriate machinery (such as vocational-training facilities and manpower services) for attaining the targets.

116. Attention should be drawn to the fact that manpower planning is an integral part of national planning. As such, it cannot be developed unless its planners work in full co-operation with general development planners and with other specialized planners in related fields such as education. Moreover, in order to ensure that questions on human resources (which are generally of concern to a large number of public agencies and private bodies engaged in the development and utilization of manpower) are dealt with in full knowledge of the various issues and interests at stake, it is desirable to have, at the national level, a representative and authoritative body for planning, policy-making and co-ordination purposes. On the whole, however, even in countries where such planning has made more progress, the supply of manpower from educational and vocational training systems still remains largely unrelated to development needs, both in quality and in quantity, and only limited action has been taken to improve the utilization of the available skilled manpower. There is still a long way to go before manpower planning becomes an integral part of general development planning.

117. Finally, there should be a specific recommendation for each trade, the technicians of all manufacturing staff personnel and all levels of junior management.

The place in industry of university students

118. The following news item appeared in the London Daily Telegraph on 15 January 1969:

"The Ford Motor Company plans to recruit 260 university graduates this year (100 more than in 1968), and expects to interview more than 2,000 students during the next three months."

119. One may be sure that in the Federal Republic of Germany, where there is a comparable Ford plant, there will be similar recruiting programmes. In the United States itself, it has been the practice for many years for major corporations to recruit large numbers of university graduates yearly.

120. The paper by J. Baranson, previously referred to, comments as follows:

"Volkswagen was especially outspoken on the shortage of such people ('Fachleute'), complaining that engineers from developing countries often lacked the necessary practical experience to take over plant responsibilities and were often unwilling to soil their hands in factory operations. Typically, there was an inadequate supply of the 20 to 30 middle-range managers, technical supervisors and master mechanics necessary to set up initial procedures and improvise or make adjustments when things went wrong, especially during the first years of plant run-in."

121. The industrial laboratory is composed of the shop floor and the office of manufacturing management and technical authority. In the developed countries, the key that has opened the door of industry to university graduates is the system of delegated authority and personal responsibility, the disciplines of working procedures and systems of reporting, and approvals which are given on the basis of commitments made.

Pilot-plant facilities

122. During the 1920s and 1930s there was an autarky among the vehicle manufacturers in the developed countries. Ford, in particular, aspired to almost complete self-sufficiency. The reason behind this policy was an inadequacy in the part-supply industry and in the availability of some raw materials, a situation which is present today in developing countries. This policy was reversed in the 1950s, however. The increases in volume demand created a need for more floor space and additional investment in facilities. At the same time, considerable progress was being made in the development of automated machinery and improved process equipment. Better understanding of the problems of materials handling, the profitability of good plant layouts, reductions in inventory holdings and reduced obsolescence, coupled with new impetus in the development of the supply industry, brought about a dispersal of many of the manufacturing processes which had previously been considered "captive" to vehicle manufacture. The tooling, equipment, manufacturing standards, inspection equipment and quality-control specifications were handed over to supply-industry firms. The cost effect of these transfers was favourable to the vehicle manufacturer. Additional manufacturing space gained in this way could be offset against the cost of new buildings and the opening of new plants. In any case, fixed overheads in vehicle manufacture tended to be higher than those of small firms manufacturing relatively simple parts and assemblies in

buildings with less head room and simpler construction. At that time, labour rates tended to be lower in the supply industry than in vehicle manufacture. The result of all these combined factors was that the negotiated agreement with the parts supplier often achieved a cost lower than the "captive" cost of the vehicle maker.

123. Pilot facilities were frequently set up by vehicle manufacturers whenever new and changed product designs were contemplated. Having established manufacturing feasibility and cost implications, these facilities were also passed over to supplier firms after the appropriate negotiations had been completed.

124. The deployment of opportunity represented in the concept of pilot-plant facilities provides the means of developing a supply industry in which cost and quality standards remain under control. It is to be expected that progress in management competence and the development of manufacturing know-how will move faster in the organization of the vehicle manufacturer than elsewhere. In the use of pilot facilities, the vehicle manufacturers' organization can act as a catalyst of change for the development of the supply industry.

Chapter 7

PROBLEMS OF LAUNCHING NEW FACILITIES

125. It must be accepted that the launching of new manufacturing facilities is neither a matter of speculation nor an unfathomable mystery. Nothing will happen within the plant (natural disasters excepted) and little outside of it which is not foreseeable. Obviously, knowledge and experience are of considerable importance. The more creative the planning of a new venture is, the more difficult the task will become.

126. Planning should be a constantly expanding effort. Mistakes are inevitable. If there is to be recrimination for every miscalculation, no one will be willing to make a forecast. Recrimination should be reserved for failure to recognize changing circumstances when they are known and to replan when it seems advisable.

127. In transplanting a manufacturing operation from a developed country to an undeveloped one, complete information in manufacturing standards should be available. These standards should include detailed manufacturing costs, maintenance standards, capacity assessments and the like. In many instances, launching planning will be included in the "package deal". Some of the difficulties of launching are the following:

- (a) Tooling, machine and facility tryout;
- (b) The learning curve of production and manufacturing staff personnel;
- (c) Material supply problems of quality and delivery;
- (d) Quality control of in-process manufacturing operations and final appraisals;
- (e) Cost control.

128. The provision of pre-production training facilities, tool tryout, facilities and machines, and other educational exercises will minimize the production problems which occur after the beginning of an operation. The cost of these preliminary exercises is substantially less than the costs that will arise during the initial period under normal production conditions. Good anticipation implies a clear understanding of the achievable objectives in cost, capacity and elapsed time.

129. The launching achievements of the major manufacturers is truly remarkable. There is usually a six-week period of tooling, machine and plant change-over. Every possible effort is made to advanced pre-production try-out and training. Full production at near standard cost is achieved in three weeks. Where new plants are involved, the elapsed time is a little longer, but it is still measured in weeks rather than in months. It may be said that the problems of a developing country are of a very different order and that the problems of launching a new model involving new product designs and processes (for suppliers as well as for vehicle manufacturers), at production volumes approaching 10,000 per day, is infinitely greater than that of launching a current model at perhaps 30 vehicles per day. The example is a challenge and a proof of what can be done with thoughtful planning. Naturally, this type of planning is costly in initial expense, but this is more than compensated by lower production cost.

130. The capacity of a manufacturing plant is the capacity of the least productive unit of production. Maximum capacity is the production count achieved with the shift-pattern, using the greatest number of hours available after scheduled maintenance and plant clean-up. Each shift, however, requires its quota of supervision, manufacturing engineering and plant service. For each additional shift there must be planned training and development. It is a cost penalty to be confined to single-shift working.

131. When there is an unbalanced capacity in manufacturing facilities, partial shift working and overtime hours can be employed to balance capacity until further rises in production schedules create the need for additional facilities.

The discussion

132. To a very large extent, the planning of new facilities, including launching, has been the work of international firms transplanting their industries to developing countries. The subsequent industrial progress achieved by nationals from developing countries usually takes place on a smaller scale (the exceptions are the more advanced developing countries). The skills and know-how that are part of the planning, installation and launching of large manufacturing facilities are examples of the limitations created by the technological gap that exists between developing and developed countries.

133. The discussion did not emphasize this aspect of the development of the motor industry, but it recognized it as an important factor. It is logical to assume that, whenever industrial development is not well planned, it will result in faults and shortcomings that will be obvious for a long time, and that may seriously impede further development.

134. It is not surprising that the discussion did not contribute to the solution of this general problem. It is to no one's advantage that the industry of a developing country should be developed on any other terms than the best planning of its manufacturing facilities. It must also be acknowledged that only the international firms have enough available resources in skills and know-how to make a significant contribution to this aspect of industry.

135. International firms in the process of transplanting manufacturing operations to a developing country will develop launching planning and forecasts of profitability in their new place of operation, on the basis of conservative estimates of vehicle sales. There was a complaint from one of the participants, supported by several others from developing countries, that international firms were only interested in their own profits and had no interest in the country in which they operated. On the other hand, a participant from a developed country stated that, in some instances, there was unreasonable suspicion on the part of the developing countries towards the international firms. As a result, developing countries often acted against good advice. This exchange may seem more emotional than practical, but it helped to show that, in the past, international firms have not been sufficiently involved in the problems of the country of operation and, in consequence, they have not worked on the basis of a mutual interest. In short, while the amount of management time

spent on the problems of the developing country may be proportional to the volume and profitability of its own operations, it has not been proportional to the size of the problems of the developing countries.

Chapter 8

PERSONNEL RELATIONS

136. The ILO has done considerable work in the areas of labour-management relations, safety and health, the development of employment services and the conditions of work, which are embodied in the conventions and recommendations adopted by the Organisation, which have become known as The International Labour Code.^{6/} The extent to which ILO standards influence the laws and practices of a given country depends on that country's economic and constitutional structure, on the degree and timing of its social development and on several other related factors. In developing countries the immediate repercussions of these international standards may be limited in the early stages of development, but industrial expansion and the growing demand for manpower increase their importance. Thus new countries that have recently achieved independence or older countries in the process of building up their own systems of labour protection can draw special benefit from the decisions of the ILO, whose standards can also exert their influence through technical co-operation. Governments often seek ILO assistance to draft or revise their labour legislation, to establish or improve social security schemes, to develop labour inspectorates and so on. In giving their help and advice, experts in technical co-operation can refer to the ILO instruments that deal with the relevant subjects.

137. For the most part, the portions of The International Labour Code that deal specifically with industry do so at the national level and are generally applicable to all industries. Of particular relevance to the automobile

^{6/} The International Labour Code (1951), 2nd ed., vol.I, vol.II, International Labour Organisation, Geneva.

industry are the Conclusions and Resolutions adopted by the Metal Trades Committee of the ILO. These regulations offer guidance to the automobile industry, not only at the national level, but also at the level of the individual plant within the industry. Thus before submitting recommendations to a national planner in a developing country, the above documents should be consulted. The assistance of ILO may also prove invaluable.

The discussion

138. During most of the discussions, from the beginning of the seminar, there was a constantly recurring indication that the greatest difficulty with which new countries had to contend was that of developing industrial management and technical personnel of sufficient skill and know-how to meet the demands of an expanding and developing industry, particularly in what is, roughly, the broad band of middle management. In the simplest terms, there is a desperate need for good and comprehensive manpower planning. This need was acknowledged by the participants and it was emphasized in the discussion that the dominating factors were:

- (a) General schooling and technical schooling;
- (b) Trade-apprenticeship training, including further education;
- (c) Accountancy and economic training;
- (d) Environmental experience in which the environment provides a good example (this includes both assistance from skilled personnel from international firms and time spent "on the job" in the home plants of international firms by nationals of developing countries);
- (e) The time factor, which was recognized as covering the entire span of a man's working life.

139. Participants from several developing countries which had made some progress in the development of their industries, expressed the feeling that they had learned a great deal, particularly about what should be avoided and what must be accepted, as well as that developing countries could help one another by a free exchange of information. There was a request from the floor that the final report contain the comments and the assurance that developing countries would freely co-operate with each other in this respect.

140. Recommendation No.5 developed out of this discussion (paras.208-210).

Chapter 9

REGIONAL CO-OPERATION

Preliminary planning on joint ventures

141. The following is a quotation from the paper by J. Baranson previously referred to (footnote 4).

"One of the conclusions that emerges from the study is that sound economic and commercial policy is as important to industrial progress as is success in overcoming critical shortages or deficiencies in financial resources, production factors, managerial and engineering skills, and supplier capabilities. A corollary to this conclusion is that the pattern generally followed by developing economies in establishing their automotive industries needs critical scrutiny."

142. It follows also that the potential advantages of common-market arrangements will not be achieved if the pattern generally followed by developing economies in establishing their automotive industries is the same one used in regional co-operation.

143. Sound economic and commercial policy is equally dependent upon the excellence of analysis and fact submission by middle management and by technically authoritative personnel as it is upon skill in policy making.

144. With this understanding, some of the potential advantages of common-market arrangements are:

- (a) An opportunity for economy in a concentration of management effort in policy making, middle-management administration and technological competence;
- (b) An opportunity for better utilization of manufacturing facilities by reductions in the number of manufacturing centres;

- (c) Better utilization of available skills in design, manufacturing processing and other manufacturing and plant-engineering activities, quality control and the like.

145. To reap these advantages, there must be a reduction in the number of different vehicles with similar specifications. A rationalization of models by potential profitability also may be desirable.

146. The importance of national pride in the location of vehicle manufacture cannot be ignored. It so happens, however, that vehicle assembly is not especially sensitive to volume demand. In considering regional co-operation among three countries, for example, the provision of three assembly plants is neither irrational nor overly destructive of economic potential. Capital investment is highest and the concentration of management effort needed is greatest in engines, axles, gear boxes and sheet metal, and it is still high in other components such as suspensions, electrical equipment, brakes and steering mechanisms. A regional co-operation planning proposal based on shared component manufacture at fixed transfer prices could prove more practicable than common-market arrangements where protective tariffs have distorted values and have not made any provision for the rationalization of productive capacity and the availability of skills.

147. An international firm's potential in the long-term prospect of earning a return should be substantially enhanced by a joint venture in which two or more countries were involved. There would be greater justification for a substantial commitment on the part of the international firm; a commitment which could include not only vehicle and major component manufacture but also technical assistance in the development of the parts industry.

148. International firms respond readily to planning based on sound and comprehensive analysis and appraisal. Here again, the combined resources of the planning personnel of two or three countries has the greatest potential for good performance.

The discussion

149. Mr. J. Beckel, of the Economic Commission for Latin America (ECLA), presented a summary of the regional co-operation agreements in use in

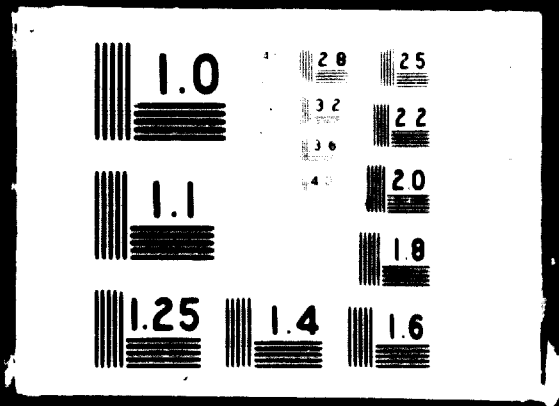


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South American countries, indicating progress made by these countries. Some of the difficulties retarding regional co-operation are these:

- (a) Difficult terrain between regions, coupled with long-distance communication and transport, can be a major obstacle to regional communication;
- (b) Difficulties in finding and establishing substitutional industries for trades which have been displaced by the amalgamation of industry resulting from regional co-operation;
- (c) Difficulties in establishing equitable transfer prices and agreement on capital investment;
- (d) Difficulties in ensuring that quality standards will be met and that continuity of supply will be guaranteed;
- (e) Difficulties in establishing a common product and in ensuring a supply of spare parts for abandoned production; model and engineering changes by the international firm can be a danger to production viability where production is tied to a specific model.

CHAPTER 10

COMPLETION OF MOTOR-INDUSTRY PLANNING

190. The following statements suggest the sequence of reviews, proposals and recommendations which would constitute a comprehensive plan for a motor industry in a developing country:

- (a) A review of the current status of national plans allied to the motor industry, including existing service, maintenance and repair facilities, road planning, current transport adequacies and inadequacies, major factors influencing forward requirement and special considerations;
- (b) Quantification and rationalization of requirements at present, during the next five years and, somewhat more speculatively, for the following five years; the quantification would assume a continuance of current trends and known factors;
- (c) An analysis of the requirements indicating significant volumes and principal cost items;
- (d) A review of the national vehicle park, including its age structure, with observations on (i) the effect of current service, maintenance and repair performance on vehicle life and (ii) actual achievements in vehicle performance in ton/miles and passenger/miles, making comparisons with standards achieved elsewhere;
- (e) A financial review of current circumstances in the motor industry with forward estimates made on the basis of implementation of approved plans; profit/loss accounting against assumed standards; actual cost comparisons with approved project commitments;
- (f) A review of selling prices in connexion with import duties and tax charges;
- (g) A review of the national tariff and tax structure and its effect on the development of the motor industry;
- (h) A review of current manufacturing and importation agreements with international firms, including conflicting interests and avoidable duplications;

- (i) A review of inherent motor-industry manufacturing capacity and production achievements with estimates of forward trends;
- (j) An analysis of current manufacturing cost with particular reference to high costs; a review of cost trends and the factors that condition them.

151. The following group of reviews will serve as a background to the presentation of new plans which may include regional co-operation:

- (a) A general review of new proposals, including expenditure estimates, supplier-industry proposals and plans for regional co-operation;
- (b) Details of proposed forward plans for regional co-operation; statements of specific expenditure and cost implications; statements of principal advantages and disadvantages; review of negotiations in hand and anticipations for progress;
- (c) Review of the special problems of the co-operating regions; statements of quantification of vehicle demand for each co-operating region;
- (d) A revision of items (a) to (j), inclusive, as dictated by the demands of regional co-operation;
- (e) An outline of proposed objectives for negotiation with international firms;
- (f) Statements and reasons for preferred international firms and products;
- (g) A full review of forward plans with proposals for financial participation of international firms.

152. Finally, approval should be requested for:

- (a) Regional co-operation proposals;
- (b) Tariff and tax revisions in principle;
- (c) Proposals for the participation of international firms;
- (d) Selected international firms, with alternatives;
- (e) Proposed expenditures and financial commitments;
- (f) Proposed assignments of responsibility for negotiating with co-operating regions and international firms.

The discussion

153. The agenda was developed as a logical sequence of those elements of planning which must be considered and analysed and which form the changing pattern of progress by which the future can be anticipated and controlled in some measure. In practice, and under the existing conditions in developing

countries, progress has become out of phase, and there have been leaps in development for which a country is often ill prepared. For example, a number of assembly plants are now operating in countries which are not yet ready for manufacturing integration and are therefore quite unable to integrate manufacture profitably, by any standards, at the low volumes prevailing for any specific model. For this and many other reasons, automotive-industry planning must, in many instances, begin with a rationalization of existing circumstances and the application of corrective measures which will make the most of past progress.

154. The true objective of industrial development in a developing country is the betterment of the nation as a whole. The motor vehicle of the international firm is invaluable to developed countries and will remain so in the foreseeable future. Developing countries, with very few exceptions, cannot compete with the giants of the industry, despite the great disparity in wage rates. The industry can only survive in the protected market of a developing country.

155. The participants felt that substitution achieved a clearer understanding of the essential differences in the objectives and purposes of industry in developed and developing countries, the true nature of the problems that developing countries face and some understanding of the path they must follow.

156. The recommendations of the seminar, with the exception of a suggestion for the establishment of a UNIDO automotive institute, were mostly concerned with current problems. The recommendation for such a UNIDO institute implies the recognition of inadequacy and need. While the institute may come into being and serve a useful purpose, the contribution of international firms to the advancement of the motor industry in developing countries must remain a dominant factor for a long time.

Chapter 11

SUMMARY OF DISCUSSION

157. Even a cursory review of the automotive industry in developing countries from the standpoint of developed countries would reveal that most of the problems stem from lack of planning. It is also an unavoidable conclusion that what is now needed in the automotive industry in these countries is good national planning, in order to provide a climate in which the industry can be brought to a level of performance closer to that achieved by developed countries. This pressing need prompted the organization of this seminar.

158. The representatives of developed countries and of UNIDO acknowledged that they had learned a great deal from the seminar and had acquired, as a result, a better understanding of the basic problems that beset the industry in developing countries. This report is an attempt to reflect this understanding and to contribute to a reorientation of the development efforts being made by those within the automotive industry in developing countries. This attempt necessitates a review of some of the problems that have been revealed by the seminar discussions and which have proved to be stumbling blocks to a proper understanding of the conditions within the automotive industry.

The general problem of planning

159. There is a widespread misconception that a plan is a static instrument with set objectives that will come to fruition if it is carefully followed. Planning, however, involves the actions of people over a period of time; it can therefore never be static. It is also a misconception in the sense that,

for what often turn out to be very good reasons, the plan cannot be always followed to the latter. The following example illustrates this problem:

Motor-industry planning as practised by the more advanced international firms: First, it must be understood that the organization is based on clearly defined delegated authority. Second, this authority is exercised through established, written procedures of working and formalized systems of reporting. Third, all reporting is either an accurate statement of past performance or a commitment to future performance on the part of the manager responsible for the report. Fourth, the report, either in summary or in detail, is the instrument by which senior management controls the business and determines policy direction.

It must also be understood that development, whether it be in new or changed products, new or changed facilities, and even in such matters as industrial relations, is a continuous process which has no beginning and no end. It can be identified at any time by a summary of the reports. This process of development can become crystallized into planned action (as, for example, in the approval of new model objectives). The instrument of approval will consist of a relatively small document which summarizes all the essential details but which is based on vast amounts of paper work. Every week approximately 1,000 pounds of paper in obsolete reports are discarded. The reporting system includes progress reports on approved projects which comprise the use of computers, critical-path networks and complicated timing-programme techniques.

160. This planning technique is characterized in its essentials by:

- (a) A specific commitment to performance which is assignable to a specific person for every necessary action;
- (b) A reliable reporting system which identifies quickly the need for corrective action;
- (c) An instrument of management control which allows management intervention on a day-to-day basis;
- (d) A reliable reflection of cost, cash flow, profitability and physical progress;
- (e) A sum of effort in which the whole work force, from the managing director to the floor sweeper, takes part identifiably.

161. A great number of staff members would be able to make significant contributions to planning:

- (a) Not less than 300 persons at management level;
- (b) Not less than 2,000 technicians covering all trades and technical aspects (even these figures do not include the back-up services and the contributions made by supplier firms).

162. Therefore, great care must be exercised with those objectives advised by experts as being both feasible and achievable.

The national planner

163. In the organizational structure of highly developed international firms, there is no one directly responsible for creating plans which are then implemented by others. There may be a central staff department responsible for coordinating planning efforts. From time to time, planning exercises concerned with feasibility and practicability of new and unconventional proposals will be developed in co-operation with the operating departments, but there is no autonomous "planner" in sole command.

164. This total and assuredly successful effort on the part of an international firm's organization is the result of the stable conditions of its environment and also of the comparable excellence of its supply industry. The stability of this environment is also enhanced by the efficiency with which other industries pursue their affairs. Government statistics are reliable, accurate and comprehensive. Government intervention in the form of restrictive or unrestrictive legislation is marginal in its effect and can usually be anticipated and provided for in total planning.

165. National planning in a developed country is concerned with trends rather than with objectives. Thus, an increase in the purchase tax on passenger vehicles will probably be part of the legislation concerned with the size of the national hire-purchase debt and the balance-of-payment problems.

166. So far this report has shown that automotive-industry planning in developed countries is the prerogative of the motor industry itself, and that the national planner, insofar as he can be identified, is concerned with coordination and the control of trends by measures which will accelerate or decelerate industrial and consumer tendencies. There may be industrial protection in the form of import charges on foreign products. Occasionally there are government grants or subsidies designed to stimulate backward industry or to divert industries to specific areas of high unemployment or other weakness. This report identifies two functions, both of which could be called planning but which have different functions. They are:

- (a) Planning directly concerned with the physical implementation of manufacturing objectives but in which control is exercised on cost, time profitability and production output on a continuing basis; and
- (b) Planning directed at controlling trends in existing industry, accelerating or decelerating progress and, in some instances, implanting new elements in the industrial complex.

167. Neither form of planning is static in the sense that it can be put into a document weighing so many pounds and which took so many years to produce. Each of them is dependent on a highly organized control system based on planning.

168. With this understanding, the role of a national planner in a developing country becomes more sharply defined. The principal differences between national planning in developed and developing countries follow from the fact that, in developing countries:

- (a) The environment is neither stable nor predictable;
- (b) Government legislation is inevitably far more drastic and salutary in its effect;
- (c) Government subsidies and grants are not merely stimulants, but vital necessities for industrial survival and progress;
- (d) The number of personnel required to take upon the administrative, technical, as well as the middle- and senior-management responsibilities, is inadequate;
- (e) Government statistics are not available and are extremely difficult to establish because of constant and swift changes;
- (f) The motor industry is partly in the hands of international firms whose planning and control is usually excellent, but who generally relay responsibility to the hands of nationals (usually the supply industry) whose abilities may not be the highest.

169. Most of these observations pertain to basic differences which are obviously considerable, but item (d) above is of vital importance and must be properly understood. Industry planning, which is concerned with the physical implementation of manufacturing objectives in a developing country by an international firm, can be highly competent. Cost quality and manufacturing control, insofar as they are in the hands of the international firm, can be expected to meet a reasonably adequate standard.

170. At its worst, manufacturing performance by national personnel who are receiving little or no assistance from manufacturers of developed countries will be beyond control and result in high cost, poor quality and manufacturing uncertainty; if this is not the case, then there is no major problem. This broad outline is the root of the problem, which is intensified by two further considerations:

- (a) The degree of manufacturing integration of the vehicle manufacturing unit;
- (b) The extent to which an international firm controls any aspect of manufacture.

171. These observations on the problems of planning the development of a motor industry in a developing country were not the direct subject of seminar discussion. During the course of discussion, however, conflicting points of view were revealed, particularly between participants from developed and developing countries. These conflicting attitudes were based on the problems of planning in these two different environments. At the end of the seminar there was general recognition that progress had been made towards better understanding. It was in part this recognition of a need for better understanding which gave rise to the first recommendation for the establishment of an automotive institute.

Why a motor industry?

172. The motor vehicle is a great communicator and, in many instances, the only practical means of transporting goods from one place to another. It is the lifeline of a nation's development. Capital cost in vehicles and operating cost are at their lowest where they are imported from and serviced by international firms.

173. Insofar as motor-vehicle transport is an element in the development of a nation and in the exploitation of its natural resources, cheap transport in terms of capital cost, passenger miles and ton miles must surely be one of the first objectives of good planning. Comprehensively good planning will be that which not only insures cheap transport in the present but also prepares the foundation of the future national industrial development (not necessarily in the motor industry).

174. Cheap transport in the present requires:

- (a) Limitation of manufacturers and vehicle types in order to simplify maintenance and reduce variety in vehicle spare parts and service complication; and
- (b) Good maintenance, repair and service facilities in order to maximize vehicle utilization, as well as to prolong and conserve vehicle life.

175. Industrial development for the future requires:

- (a) The progressive development of an industrial environment through capital investment;
- (b) Technical schools and apprentice-training establishments; accountancy-training schools; general education; special short-term training centres for craft training.

176. University education is not a short-cut or a substitute for technical schooling and apprenticeship. However, there are other industrial fields which require thorough university training. In the early stages of automotive-industry development, however, men with practical and technical training are in greater demand. Furthermore, a 21-year-old university man is not accustomed to the shop-floor environment and probably will not like it. It is not that he "does not want to get his hands dirty", but rather that his university training has shown him a world so different from the shop floor of a new motor industry that the latter will seem entirely unattractive. However, a few gifted men with vision and great energy may see in a growing industry an opportunity for self-expression and personal satisfaction. It is they who will be the senior managers of the future.

177. In developed countries, there is a period of about thirteen years between the start of technical schooling and the beginning of management competence. Approximately ten years must be allowed for the full development of management capability. It will be argued that developing countries cannot afford to spend such a long time in the development of a motor industry. In accepting this argument, the following analysis of elapsed time serves as a measurement of:

- (a) The strength and competence of available manpower; and
- (b) Basic training and environmental requirements for the future.

178. Poor quality, high cost and uncertainty of supply in national products, in raw materials and in vehicle parts have a disruptive effect on the vehicle industry. If such an industry relies heavily on the importation of material and vehicle parts, it saves very little in foreign exchange and makes no significant contribution to the industrial maturity of the nation. The development of the supply industry should proceed as follows:

- (a) Vehicle service, maintenance and repair facilities for public transport, commercial-vehicle fleets, industrial equipment (tractors etc.) and passenger vehicles;
- (b) Manufacture of accessories and simple replacement parts;
- (c) Development of manufacturing competence in other industries (domestic appliances etc.) which will insure a rapid take-over of vehicle-part manufacture following the establishment of vehicle assembly;
- (d) The development of the supply of raw materials such as iron, steel, chemicals, plastics and rubber.

179. A motor-vehicle industry will only succeed after at least the first three of the above points have been accomplished. It may, however, need governmental subsidies and grants. The co-operation of international firms in the supply and vehicle industry is essential, as well as manpower training, as explained above. A very early establishment of vehicle-assembly plants, followed by mandatory legislation for manufacturing integration based on a supply industry incapable of meeting the demands, must be avoided if progress is to be maintained. Otherwise, high import tariffs and import embargoes, ruinous increases in vehicle cost and, consequently, in the cost of national vehicle transportation, will be the inevitable result. The establishment of a supply industry which is basically inefficient and badly organized will, once established, be difficult and costly to correct. It is not an exaggeration to say that premature pressure on a supply industry can cause a general setback from which the industry will not recover for at least ten years. The reasons for this situation are:

- (a) Men who have neither the training or the proper experience become established in positions of privilege and responsibility;
- (b) Bad habits and practices in manufacturing procedure become ingrained and result in a resistance to change;
- (c) High tariffs and import embargoes develop overprotection, weaken the industry and rob it of its vigour.

180. There are many reasons for the high cost, poor quality and production uncertainty in the automotive industry. The technological gap is one of these reasons and diseconomy of scale is another. Self-criticism is uncommon. It was refreshing to hear during the seminar the acknowledgement of mistakes which could be ascribed to management inadequacy and planning deficiency. One of the mistakes acknowledged was the establishment of vehicle-assembly plants before first establishing a sound basis in the supply industry. Another confessed mistake was the attempt to establish passenger-car assembly before commercial-vehicle assembly. The reason for this is that the variety and number of vehicle parts and the nature of parts required (particularly sheet metal) present a rather formidable problem.

The planning problems of the more-advanced developing countries

181. While the difficulties of the automotive industry in the more-advanced developing countries are varied, the central problems are adequacy at all levels of management and the competence of the technicians and the men in the skilled trades.

182. The following analysis, which is based on the standards of developed countries, will serve to measure the depth of the problem and to suggest the necessary corrective measures, as well as the approximate time span needed for development and change:

- (a) Training background of all personnel, from foremen to top management, and of all technicians and skilled tradesmen;
- (b) Organizational structure and the manner in which manufacturing control is exercised (including, for example, quality-control procedures and maintenance performance);
- (c) An appraisal of the environmental circumstances and their effect on industrial development.

183. The government of a country may be aware that, while there may be other serious problems in the industry, such as shortages of available facilities, or of foreign exchange, neither good facilities nor the availability of capital for further investment will bring about immediate environmental changes which require many years for proper development. The basic problem is to start training potential managers at thirteen years of age (even earlier if ordinary schooling is included) and to continue this training without interruption until middle age in the proper environment.

Industrial maturity

184. Industrial maturity in the motor industry implies that a country may design, manufacture and market a unique vehicle in profitable competition with international firms. This is where the technological gap and the diseconomy of scale are felt more strongly. The capability for designing a competitive motor vehicle does not rest exclusively with the design department of an international firm. Such a department is merely the co-ordinating point of a technological competence which can be found in every aspect of the nation's life, in public office, in education, in scientific research and in industrial life. The annual volume of production for a unique vehicle necessary to support a passenger-vehicle product design and a manufacturing and marketing complex in competition with world markets is generally accepted as 300,000 units per year. Usually this is also supported by a substantial income and profit from the sale of spare parts. Diseconomy of scale is not a relationship of 300,000 to, say, 10,000 units per year, which is an approximate volume for a developing country. The latter is not making a unique vehicle and is concerned only with the manufacturing end of the total effort. Diseconomy of scale is a source of trouble only when the manufacturing method forms part of design and requires capital

investment disproportionate to the volume. Usually this is true only in part. For example, in developing countries, assembly processing and equipment are tailored to the volume required and, at plant capacity, manufacturing costs compare reasonably with high-volume assembly costs. Inherent high cost in the manufacture of parts and assemblies can be minimized in two ways:

- (a) By developing manufacturing processes suitable to low-volume production;
- (b) By product-design changes (often of minor significance) which permit the use of manufacturing methods suitable to low-volume production.

185. International firms have the capability of re-designing and re-processing production operations to achieve low costs in low-volume production. To some extent this is already being done. As a general statement, it can be said that whenever an international firm is involved in a manufacturing venture in a developing country and exercises considerable control, the cost of production (at planned capacity), insofar as it can be controlled by the international firm, is at a level which bears reasonable comparison with the cost of production in a developed country.

186. It is not surprising, therefore, that such a long time is necessary for the development of a motor industry, nor should this be a cause for discouragement. There is relief also in the knowledge that for many years the efforts of developing countries will be restricted to manufacturing. These efforts can be advanced considerably by the co-operation of international firms.

187. The guide-lines for the national planner are the following:

- (a) To provide the needed training in technical schools, apprentice-training establishments and the like;
- (b) To protect the industrial environment by avoiding unplanned and ill-equipped industrial ventures;
- (c) To seek agreements with international firms that include provisions for personnel training;
- (d) To avoid action that could lead to high tariff walls and ultimately to an over-protected industry and all the resulting problems;
- (e) To improve the government statistical services;
- (f) To develop industrial legislation parallel with the industrial development;
- (g) To encourage regional co-operation;
- (h) To negotiate for a greater involvement on the part of international firms in the training of men and in the establishment of the supply industry.

The role of the international firm

188. Chapter III and the statistical annexes of the paper by J. Baranson referred to above (footnote 4) discuss the relationship of international firms with all the countries of the world by size and resources.

189. These statistics evaluate the industrial relationship between developed and developing countries and their respective vehicle parks. The two most important statements are perhaps:

- (a) In 1966, the vehicle park in developing countries was 12 per cent of the world total (excluding countries with centrally planned economies);
- (b) The average annual growth rate of developing countries is 11.7 per cent, as compared with the figure of 6.2 per cent (1950-1966) for developed countries.

190. The paper also suggests that the potential of developing countries exceeds that of developed countries, particularly in annual consumption of new vehicles, although the realization of this potential may take many years.

The nature of the market

191. Almost all the developing countries are irrevocably committed to the policy of developing an automotive-industry manufacturing complex within their own boundaries. A proper understanding of the limitation and implications of this objective and the policies it engenders is essential if there are also to be policies and objectives on the part of the international firms for promoting the growth of the motor industry and its markets in developing countries. Almost without exception, the technological gap and diseconomy of scale make it impossible for a developing country to enter the world market with a unique vehicle which has been developed, designed, manufactured and marketed by its own nationals. The transplantation of manufacturing operations from developed to developing countries is both achievable and viable. However, even this possibility seems impractical (measured by standards of reasonable accomplishment) without the assistance of international firms. In developing countries there is a scarcity of men in the skilled trades and of qualified people who can assume technical responsibility. The reason for this insufficiency is that very many people are required who have had technical and special schooling, as well as apprenticeship, development and experience in an industrial environment.

192. It may be thought that international firms are providing adequate assistance to the manufacturing plants they have established in developing countries.

However, this is only a small part of the total effort required. In the international markets, all firms accept complete responsibility for their products. A manager could not blame a supplier's product as the reason for high cost, poor quality or customer dissatisfaction and feel absolved of all responsibility. A partial list of the responsibilities attached to the manufacturing department of an international firm includes the following:

Process engineering

- (a) Approve machine layouts of suppliers;
- (b) Assist in correction of production difficulties (including assistance to purchasing department on items obtained from suppliers).

Machine and tool design

- (a) Approve vendor machine and tool designs, including related electrical, hydraulic, pneumatic and lubrication circuits and diagrams;
- (b) Assist in correction of production difficulties, including assistance to purchasing department on items obtained by suppliers.

Materials and equipment engineering

- (a) Approve equipment designs of suppliers;
- (b) Review supplier capability.

Materials-handling engineering

Review containers and packaging on incoming materials.

These statements refer only to vendor suppliers.

193. In many instances, the responsibility of international firms in a developing country is restricted to the assembly plant. Mandatory legislation for manufacturing integration is rarely, if ever, followed up by the international firm with enough vigour and attention. This legislation, however, is being enforced at present and will be inevitably enforced more strictly in the future.

194. If an international firm intends to remain in the market of a developing country, it should recognize several fundamental factors. For example:

- (a) In most instances there are too many manufacturers participating in the small markets of developing countries. As many as twelve assembly plants are operating in a country with a total annual production (including trucks, buses and passenger cars) of little in excess of 1,000 vehicles. This creates a problem in the development of a vehicle-parts manufacturing industry and in the provision of spare parts, vehicle repair and service.
- (b) The development of a vehicle-parts manufacturing industry starts most logically with the manufacture of spare parts, accessories and after-market products.

- (c) Developing countries do not save in foreign exchange or in total vehicle cost by employing knocked-down parts during vehicle assembly. To do so does not make a significant contribution to the country's industrial development, although it is deceptively easy to accomplish. It is, however, a prerequisite of manufacturing integration.
- (d) It is not in the international firm's interest to sponsor the development of an industry of spares and vehicle parts which, because of a lack of know-how and resources, will result in poor-quality products, high cost and uncertain production, all of which are a burden to the industry and a barrier to industrial progress.
- (e) Developing countries do not want an industry which is imposed upon them and for which they are only slightly responsible; they want equal partnership in the industry's control and development. Admittedly, this is a big problem, for these countries lack available personnel with the proper training, experience and industrial maturity. The compromise must be a package deal, which is comprehensive and factual in its provisions for training, apprenticeship schooling and management development and participation.
- (f) In the high-volume markets of developed countries, industrial success can be measured by marginal advantages in marketing, product offering, company image and after-sales service. In the future, success in the markets of developing countries may depend on the co-operation of an international firm in the development of a country's total industry, in which it identifiably accepts a partnership role. Marginal superiority of the product may be of little importance.
- (g) An understanding of the problems of a developing country and a greater participation in total industry development require a concentration of management effort quite disproportionate to the size of the market. What is probably needed is an overseas division specifically concerned with the efforts of developing countries.

Chapter 12

RECOMMENDATIONS OF THE SEMINAR

195. The following recommendations made during the seminar for possible action by UNIDO, in co-operation with other United Nations bodies, are presented below.

Recommendation No.1

196. It was recommended that UNIDO, in co-operation with the industry, establish an institute for the general purpose of assisting developing countries in the establishment and further growth of their automotive industries. In particular, the institute should provide the following aids.

Planning assistance

- (a) Advice and assistance of expert personnel in the development of national automotive plans and projects in all aspects of planning, whenever they are requested;
- (b) Training courses for nationals of developing countries in the principles and practices of working towards the growth of the automotive industry and in the techniques of planning and presentation, whenever they are appropriate.

Manufacturing control procedures

- (a) Developing and publishing simple manufacturing procedures and reporting systems suitable to low-volume production manufacture, including the ancillary and parts industries;
- (b) Advice and assistance of expert personnel in the implementation of manufacturing procedures and reporting systems;

- (c) Seminars of instruction for nationals from developing countries in manufacturing control through the use of working procedures and reporting systems in the fields of manufacturing engineering, plant engineering, production planning, and quality and cost control.

Production methods

197. Advice and assistance of experts in the techniques of production methods suitable to low-volume production, including the ancillary and parts industries.

Adaptation of product designs

- (a) Advice and assistance of experts in the adaptation of product designs for low-volume production, as, for example, the use of glass-fibre-reinforced plastics in body construction; the ancillary and parts industries could also be covered;
- (b) Instruction seminars on design adaptation, with special reference to the necessity for maintaining product quality and engineering excellence.

Library

- (a) Suitable bibliographical material;
- (b) Information for developing nations on the availability of new literature, with recommendations as to its scope and applicability;
- (c) English, French and Spanish translations of extracts of particular interest and technical value, whenever this seems desirable;
- (d) Publishing information on the latest developments in the motor industry, and encouraging, whenever appropriate, the development of special techniques in the use of new materials, manufacturing processes, product designs and any other modern methods which can have a beneficial influence on the automotive industry.

Seminars

198. Seminars can be organized whenever specific subjects make it advisable to disseminate useful information to developing countries.

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Recommendation No. 2

199. At a group meeting concerned with the shortage of spare parts in developing countries, and especially in Latin America, the following points were established as some of the causes of this condition:

- (a) In some cases vehicles are as much as 20 years old, and no spare parts are available from any source;
- (b) In some cases vehicles only 5 years old are also short of spare parts;
- (c) Dealers do not order certain spare parts because of quota restrictions or because they are unwilling to pay high import duties or to tie up their capital in slowly moving items;
- (d) There is no co-ordination of demand from numerous separate dealers and no central spare-parts depot;
- (e) Some car manufacturers have discontinued production and, in consequence, their dealerships have been abandoned;
- (f) In some instances there are special CKD vehicles, now discontinued, for which no spares are available;
- (g) Some countries have made barter deals, exchanging their agricultural products for cars, without including spare parts. Changes in the market situation have cut off further opportunity for bartering for spare parts.

200. It was recommended that developed countries make their international firms aware that the shortage of spare parts in developing countries has a serious effect on the economy of developed countries. The utilization of vehicles is often seriously diminished because of serious neglects in maintenance, owing to the fact that spare parts are not available and the cost of maintenance is much higher than is justified by the service provided. Inadequate repairs are often made in an attempt to make the vehicles serviceable. Service parts are generally available in developed countries, although they are often acquired through sources other than the original vehicle manufacturer. It is also recommended, therefore, that the developed countries encourage their international firms to co-operate with parts manufacturers in the supply of spare parts to developing countries.

201. A final recommendation to developing countries was formulated, to the effect that, during the development of their national plans, they give special

attention to the establishment of a spare-parts industry for the following purposes:

- (a) To provide spare parts;
- (b) To serve eventually as the first stage in automotive-industry development, where appropriate;
- (c) To encourage the development of a parts industry for original equipment.

202. In this last respect, the seminar constantly emphasized that vehicle assembly manufacture should not be undertaken by a developing country until suitable progress has been made in mechanical industrialization in general and, where appropriate, in the development of a parts industry. The integration of vehicle-assembly manufacture does not in itself make a significant contribution to cost reduction or to manufacturing integration and should therefore be delayed until clear evidence is available that the subsequent continuance of manufacturing integration will proceed smoothly and without excessive cost and quality problems.

Recommendation No. 1

Regional and interregional co-operation

203. Regional co-operation is often obstructed by the diversity of vehicle types and makes which are present in countries seeking co-operation. When an international firm's licensed production is common to several countries among which regional co-operation can be developed, the firm can be of assistance by developing plans for manufacturing integration which depend on the supply of parts from one country to another, and in which the volume of demand is established at its maximum. It is therefore recommended that developed countries make their international firms aware of the problems and advantages of regional co-operation and request that they co-operate in the development of regional plans for interdependence and the development of their motor industries on the basis of maximized demand. The same considerations may apply to interregional co-operation.

204. Taking into consideration the individual size of the markets in Latin America in connexion with the economic scale of production of motor vehicles and their components and parts, it is recommended that Latin American

Governments continue their efforts to co-ordinate and to complement the national development plans for the automotive industry. The seminar recognized that this would be an effective means of achieving cost reduction in the manufacture of motor vehicles in the future, as compared to the present situation. Due consideration should be given to the utilization of the existing continental, regional and subregional institutions to carry through the necessary negotiations at the Government and industry level, as well as any preparatory studies that might be required to this end.

205. In order for developing countries in different regions to achieve lower manufacturing costs and consumer prices for motor vehicles, it is recommended that the respective governments create favourable conditions for the integration, complementation or re-distribution of existing motor vehicle and parts manufacturers. These conditions should encourage large-scale production in a horizontal structure. The addition, integration and complementation of firms should be carried out at both the national and regional levels.

Recommendation No.4

Standardization

206. It was evident, during seminar discussions, that the diversity of vehicle types and makes in many developing countries where total demand is relatively low is a limiting factor in the development of the automotive industry. It is therefore recommended that the Governments of developing countries recognise the necessity to develop plans of rationalization whereby the variety of types and number of makes of motor vehicles may be reduced.

207. In order to improve uniformity in the maximizing of production volume, it is also recommended that the unification of legislation and technical standards in the automotive industry be studied on a regional and international basis by the appropriate regional authorities and within the framework of the International Organization for Standardization (ISO).

Recommendation No. 5

Manpower training

208. The seminar discussion indicated that the greatest difficulty met by developing countries in establishing their automotive industries is a shortage in skilled manpower. This shortage is particularly acute in the higher management levels of manufacturing engineering, plant engineering, production planning, and quality and cost control. It was therefore recommended that the Governments of developing countries make increased and special provision for the training of men in these fields of industrial responsibility. The elements of training which are included under these headings are:

- (a) Basic technical and scientific education, which is the responsibility of the Governments concerned;
- (b) Training with international firms, which is provided by these firms in the implementation of their overseas development;
- (c) Training which is inherent in the operation of production equipment at shop-floor level;
- (d) Supplementary and continuation training given to suitable personnel in the continued development of their skills and management ability.

209. It was recommended that the Governments of developing countries take special note of items (a) and (d), and that the Governments of developed countries should take note of item (b). In respect of item (c), while this is normally part of the motor-industry development by international firms, developing countries can assist each other (as opportunity serves) in providing this form of training.

210. The attention of the Governments of developing countries was called to the long period of training and practical experience which is necessary in the development of highly skilled product-design engineers and the higher levels of manufacturing management. It was therefore recommended that they make allowances for these long training periods in the development of their automotive industry planning. Because of the long training periods needed in the development of skilled product-design engineers, it is necessary that provisions for their training be made at an early point in a country's development. This training requires the co-operation of international firms, and therefore there was a special recommendation to the Governments of developed countries

that their international firms establish training facilities for product-design engineers at an early stage of manufacturing expansion.

Recommendation No.6

Manufacturing integration preference

211. The seminar discussion emphasized that the growth of a motor industry in a developing country begins most suitably with the manufacture of commercial vehicles, trailers and buses. The problems of passenger-car manufacture, resulting from the wide variety of requirements of its parts industry, the frequency of engineering changes and the special problems of body work, are more difficult to solve. It was therefore recommended to developing countries that, if it is economically viable, the manufacture of commercial vehicles, trailers and buses should precede that of passenger cars. The first part of this recommendation was based on the practical advantages of manufacturing these commercial vehicles as opposed to passenger cars. One of these advantages is the wide variety of commercial vehicles which are based on common engines and drive-lines, in combination with differing chassis lengths. It was also felt by the participants that commercial vehicles are a more essential element in a country's economic development.

Recommendation No.7

212. It was suggested that, in order to keep abreast of developments in motor-vehicle production and design techniques, engineers and technicians from developing countries become members of societies of automobile engineers in developed countries.

213. This would make it possible for them to take part, every second year, in the world congress for automotive engineers, where they would be able to ask questions and make suggestions.

ANNEX 1

STATEMENTS TO THE SEMINAR

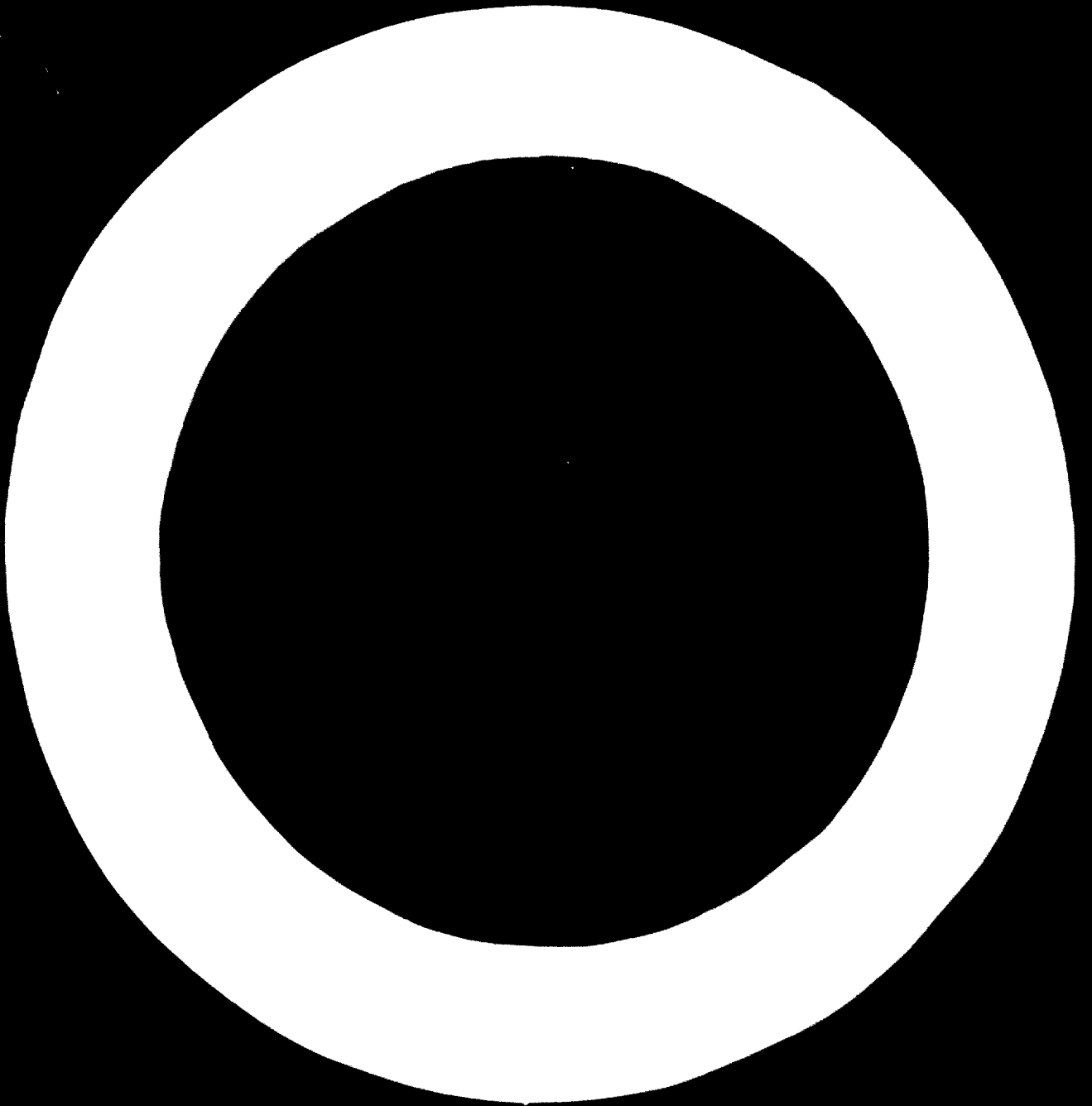
Opening address by Mr. A. Barčák, Vice-chairman, Federal Committee for Industry, Czechoslovakia

Statement by Mr. I. H. Abdel-Rahman, Executive Director of UNIDO

Statement by Mr. O. V. Soskuty, Chief, Engineering Industries Section, Industrial Technology Division, UNIDO (Director of the Seminar)

Statement by Mr. V. Keppert, Director, Motor-car Research Institute of Czechoslovakia (Co-director of the Seminar)

Opening address by Mr. J. Schulmann, Chief Technical and Economic Services, Jawa Research and Design Centre Prague, Czechoslovakia (Chairman of the Seminar)



Opening Address by Mr. A. Barčák
Vice-Chairman, Federal Committee for Industry,
Czechoslovakia

I have the pleasure, on the occasion of the inauguration of your seminar, of welcoming you all in the name of the Federal Committee of Industry of the Czechoslovak Socialist Republic. I hope that the seminar will fulfil all your expectations, and I wish especially that those among you who are in Czechoslovakia for the first time, will enjoy their stay in our country.

As regards developing countries, the concept of this seminar is in full agreement with the policy of Czechoslovakia. Our Republic participates in the aid extended by UNIDO to developing countries. In our country, we are aware of the fact that the development of the Third World is a grave international problem, and that all countries must help to solve it. The main point here is industrialization. Ours is a small country, and we realize that we must concentrate on the most effective forms of aid. We believe that one such form may be participation in UNIDO activities in all fields which stimulate the process of industrialization, thereby multiplying the economic potential of developing countries. One way of doing this is the exchange of experience by means of seminars such as this one. Czechoslovakia is organizing a three-month training course on all types of engines for the benefit of personnel from developing countries. At the request of UNIDO, this course will be repeated every year. Our country has recently become a federation of two nations, the Czech and the Slovak nations. Therefore, it is one of our tasks to achieve economic plans in our country as soon as possible. As soon as we are able to make full use of our economic potential, we shall be able to extend our aid to other countries, especially to those whose unfortunate historic development has hitherto made it impossible for them to take full part in the industrial revolution.

As a result of technical development, man is no longer governed by nature; on the contrary, man is now starting to govern natural forces and laws. Without human intervention in industry and industrialization, it would be impossible to bridge the gap between developing and developed countries. It is to no one's advantage that this gap should widen and eventually become unbridgeable. This seminar is one attempt to find ways and means to bridge this gap while there is yet time.

While the automotive industry of the United States of America has had great influence on its national economy, it has also become a centre of interest of all European countries. After 1945, it was the automotive industry of Europe that helped to start the wheels of economy turning again after the Second World War. I see no reason why the automotive industry should not also be a stimulating force for general economic development in the countries of the Third World.

The seminar programme indicates that you will not overlook the basic conditions which must be fulfilled before the automotive industry can be developed in any country. This means that sufficient industrial bases must be established. Automobiles are very complicated machines; they must be built from a very large number of components and a wide range of materials. Success in developing the automotive industry will therefore be greatly influenced by the growth of all other basic industries. Thus, all automobile factories are very complicated and must be utilized to the utmost. There must be a great deal of co-operation and a division of labour, not only between European countries but between continents, if the highest degree of efficiency is to be achieved everywhere.

While the term "economic gap" represents the differences between countries and groups of countries, it seems to be most marked in the automotive industry. Developing countries wishing to start their own automotive industries must co-operate with highly developed countries. Much will depend on the extent to which we shall be able to reduce the gap between them. Certainly, no real results can be achieved without sufficient dissemination of technical knowledge. Czechoslovak policy in this area is based on concrete experience.

The seminar programme indicates that you will try to answer all of the basic questions which necessarily arise when one is seriously considering the development of an automotive industry. It is my conviction that you will be able to achieve the purpose of your seminar, and I hope that the results will be of lasting value to individual seminar participants, as well as to your respective organizations and countries. I wish you and your seminar much success.

Statement by Mr. I. H. Abdel-Rahman
Executive Director of UNIDO

It is a great pleasure to welcome to the seminar so many recognized experts in academic knowledge and practical experience from industrialized countries, together with those from developing countries experienced in pioneering in industrialization. The balance of representation augurs well for the success of your work. For, while the industrially advanced countries have the know-how of technology and management, there is value on the other hand in the direct experience of the developing countries with the establishment of industries under difficult conditions.

There is no doubt about the important role the automotive industry plays in the economy of a country. In the first place, few other industries cover such a wide range of technology and manufacturing processes or use so many different raw materials. Also, few other industries require so many differing tools, machines, and production equipment. Finally, because of the wide variety of products that are needed for the manufacture of a motor vehicle, there is an inherent stimulus to the development of many other supporting or related industries.

Yet another benefit will accompany the establishment of automotive industries, namely the effect this industry has on the people engaged in it. Teamwork and co-operation must be all-pervasive in the wide field of industrial effort that is set in motion by this industry. We believe it is in this co-operation, at all levels of authority - whether in manufacturing and plant engineering or in tool design and process engineering, whether in work-measurement, quality-control or cost-accounting - that competence and adequacy will be assured. Such competence will bring about customer satisfaction, good quality, low cost and an assurance of added value in the manufacturing process.

Your terms of reference are indeed broad, covering, as they must, the whole spectrum of problems connected with the establishment of an automotive industry. I am pleased to note that you will devote most of your time to questions that have a direct bearing on the development of this industry. Yet there are other aspects, too, and I see that they have not been neglected. Where men use tools, we must begin with the repair, servicing and maintenance of the existing vehicle fleet. It is here that many a young man will come first under the discipline of the industry. It is important that he should learn his trade in a well organized environment.

Towards the end of your agenda, you will be concerned with regional co-operation. The very terms of UNIDO's charter cause us to hope that this co-operation at the international level will receive the required attention. In fact, I believe that there is a great opportunity in the development of the automotive industry to diversity manufacture so that countries may co-operate with one another to their mutual advantage.

These are some of the practical aspects of the development of an automotive industry. However, the motor vehicle itself has a unique contribution to make in the social evolution of a country's development. The motor vehicle is a means of communication, bringing people together, whether they come from the small villages and country towns or from the big cities and centres of work, culture and education. As we know, not all of these moves are necessarily beneficial; there is much in them that may be harmful. Nevertheless, by the interchange of people and ideas brought about by these moves, the barriers of ignorance, bigotry, intolerance and isolation are slowly broken down.

To the common man, the motor car is the "seven-league boots" of legend. It is in a sense a magic carpet for individuals and communities, to transport them out of a primitive past to a future of higher standards of living, improved medical services, higher education and better recreation.

Progress is something that comes from within; it cannot be imposed upon men from without. Men must want to progress before they can move forward. Travel, first-hand acquaintance with conditions and values elsewhere and a look at other ways of living can bring about the realization of men's dreams. Men and women from hitherto, relatively unchanging environments will respond to tangible practical examples. They will want to reach out for the opportunities which they see unfolding before them. In this lies much of the hope that sustains us in what we are doing.

It is, therefore, with great sincerity that I extend my good wishes to you for the work you have before you and for the fulfilment of the purposes of this seminar.

Statement by Mr. O. V. Soskutý
Chief of Engineering Industries Section
Industrial Technology Division, UNIDO

This seminar has been organized by UNIDO in conjunction with the Government of the Czechoslovak Socialist Republic. The subject and principal interest of the seminar is how automotive industries can be started or expanded in developing countries.

The seminar is part of the work of UNIDO. I would like to explain to those who are not familiar with our Organization that UNIDO is an agency of the United Nations under the jurisdiction of the General Assembly, which created it in November 1966. It must carry out its function essentially on the basis of meeting urgent needs of the developing countries, in accelerating their industrial development through operational and promotional activities, supported by relevant research. The Industrial Development Board - the governing body of UNIDO - has asked the Executive Director, among others, to help in the formulation of industrial development plans and programmes; to identify those industries which should be developed to help developing countries in the efficient utilization of new and existing capacity; to promote co-operation among developing countries; to assist in the dissemination of technological innovations and to organize appropriate seminars and other meetings on specific aspects and problems of industrial development. The present seminar was organized according to these terms of reference.

The seminar is concerned with the preparation of guide-lines and recommendations for developing countries, for industrialized countries, and for UNIDO in the development of the automotive industry. The agenda includes eleven specific items, each supported by a list of documentation and separate discussion items. Not all of the items are of equal importance; there may be others that occur to you, and I should like you to feel free to ask for their inclusion if you wish to do so. However, there are so many interests that have important bearing on the development of the motor industry that you will probably not be able to do full justice to all of them.

A preliminary report has been prepared which is intended as a framework or which to construct the final report. This preliminary report was developed from the papers which many of you have submitted and which are valuable contributions to the sum of knowledge and expert advice which are being brought

to this seminar. I am sure that you will also wish to expand and develop this framework in fulfilling the purpose of the seminar.

Thus, there are eleven main subjects for discussion; then there are lists of more specific items for discussion to which you may wish to add; and finally, as a result of your discussions there will be recommendations you will want to make: to developing countries; to industrialized countries; and to UNIDO. Perhaps these recommendations are the most important aspects of your work, as they will represent the views of a cross-section of authority from developing countries in response to the experience and knowledge of experts from industrialized countries. What you discover in the course of your discussions will be of very real value. Your final report must not fail to record this aspect of your work.

The report will be prepared by the rapporteur in co-operation with the discussion leaders at the end of each session. Towards the end of the seminar, a final report will be prepared and submitted to the seminar, to be transmitted with your approval to the Executive Director of UNIDO.

The task before us is not an easy one, but we hope that, with the help of many recognized authors, and through the presence and contributions of so many distinguished experts, a fruitful exchange of views and sound recommendations will emerge.

Statement by Mr. V. Keppert

Director, Motor Car Research Institute of Czechoslovakia
Co-Director of the Seminar

Allow me, on behalf of the preparatory committee, and of all the technicians and economists from the automotive industry in Czechoslovakia who are taking part in it, to welcome you to the opening of this UNIDO international seminar. It is a great honour for the Automotive Research Institute to have been entrusted by the Ministry of Industry with organizing such an important meeting, attended as it is by the leading experts from Europe, America, Asia and Africa. We have among us eminent scientific workers who have prepared lectures for this seminar embodying a wealth of experience, not only from the technical but also from the economic point of view. I thank them most warmly for their willingness to pass on the best results of their many years of work to all of us taking part in this seminar.

The goals of the seminar are well known. It is designed to promote a thorough understanding in the developing countries of the complex conditions that are necessary for the establishment of an automotive industry. Naturally, the discussions at this seminar will also benefit those countries which have already started the establishment of this industry.

This seminar includes a large number of participants from different countries of Europe and of other continents, as well as experts from our own country. Czechoslovakia is a country with a long tradition in the automotive industry. You are all familiar with the pioneering Tatra cars, which first appeared seventy years ago. The Skoda tradition is also well known. I am convinced that the technicians and economists from our enterprises will be able to contribute ideas which may be useful when we come to drafting the conclusions and recommendations of the seminar. We are very happy that the UNIDO secretariat entrusted several of our experts with preparing basic lectures for this seminar.

Great understanding has been shown by the managers of our enterprises in organizing visits at the close of the seminar. We shall visit enterprises where it will be possible to see very modern production equipment and progressive production methods as, for instance, in the Skoda works at Mlada Boleslav. The Jawa motorcycle assembly plant is also extremely modern, as is the new hall for performance tests for large diesel engines at the LIAZ-Skoda plant at Jablanec. We shall also see enterprises working under difficult conditions and

faced with various problems. We hope that these visits will give all our guests an idea of the structure of our industry, and we believe that some of the equipment will also be of interest.

Here in Karlovy Vary, we shall see some products at a small exhibition at which several enterprises that produce automobile accessories will be taking part, and our Automotive Research Institute will display a special apparatus for measuring and recording for testing purposes. These instruments have been developed and produced in our Institute. In addition, Czechoslovak and foreign enterprises will show films they have made to illustrate production and testing.

We think you will enjoy your stay in Czechoslovakia, despite the fact that the seminar is taking place during the winter.

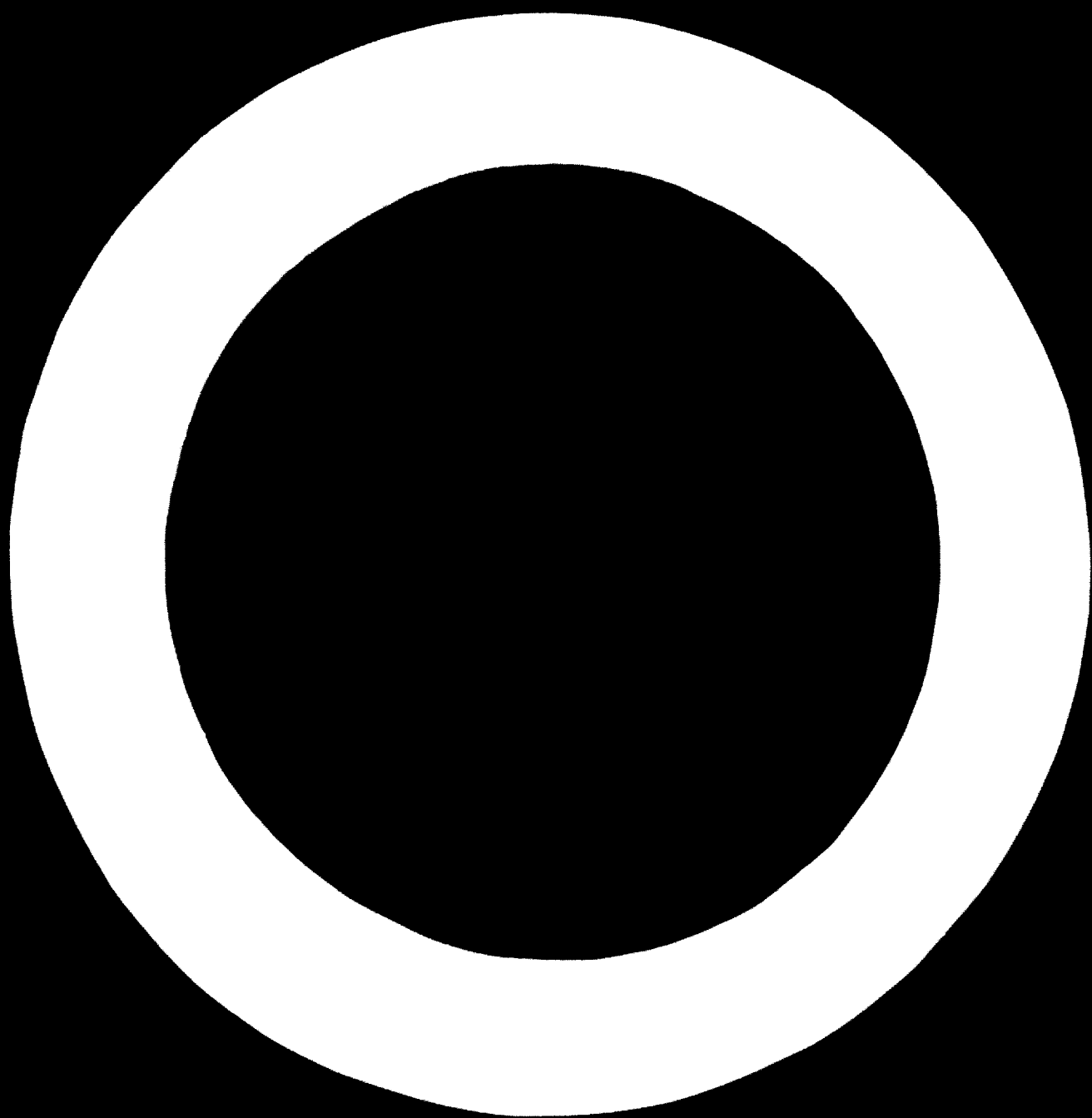
Allow me to express my thanks and the thanks of my colleagues on the preparatory committee for the excellent co-operation we have received from the UNIDO secretariat in Vienna, especially Mr. Grigoriev, Mr. Soskuty, Mr. Gonzalez-Hernandez of UNIDO and also Mr. Gabriel of the Czechoslovakian Mission in Vienna.

May you have a very pleasant stay in our country and may our seminar be a success.

Opening address by Mr. J. Schulmann
Chief, Technical and Economic Services,
Jawa Research and Design Centre, Prague
Chairman of the Seminar

It is an honour for me to serve as chairman of the Seminar on the Establishment and Development of Automotive Industries in Developing Countries. I wish to thank you for the confidence you have placed in me and in my country, and to assure you that I shall do my best to carry out my duties to your satisfaction, with a view to reaching our objectives.

You are all familiar with the general programme outlining the individual sessions and the subjects to be discussed. Because all of you, or at any rate a great majority of you, have seen the papers to be discussed at the seminar, little useful purpose would be served if they were now to be read here. The papers will therefore serve as basis for discussion of the principal topics set out in the general programme as well. The authors of these papers, and those taking part in the discussion will thus have sufficient opportunity to elaborate any points that they may have made. However, in view of the complexity of the problems to be discussed, let us not dwell on details but rather deal with essentials. It is only in this way that we shall be able to reach our objective, which, bearing in mind the diversity of problems of the individual countries, should be a guide or a set of recommendations for those who will face the task of planning the establishment and development of the automotive industry in the developing countries. If we achieve this objective, we shall have fulfilled our task, and I am certain that we shall spare no effort to do so.



1. General elements of preliminary plan
 - (a) Resources, basic industries and chemicals and plastics, electrical power supply, gas, water, oil
 - (b) Town planning, urbanization and forms of transport (rail, water)
 - (c) Road-vehicle priorities: tram, motor cycles, commercial vehicles
 - (d) Other justifications for the plan
 - (e) Preliminary assessment of vehicle requirements
2. Vehicle service plans
 - (a) Repair and maintenance;
 - (b) Accessory and spare-parts distribution
 - (c) Second-hand vehicle purchase,
3. Intermediate assessment of vehicle production
 - (a) Mandatory limitations on vehicle production preference;
 - (b) Establishment of terms of reference for manufacturers (what to ask for)
 - (c) Assembly planning and integration with industry plans and accessory manufacturing
 - (d) Second stage of manufacturing
 - (e) Final stage of manufacturing
4. Technological problems
 - (a) The technological gap between requirements and its significance and limiting factors
 - (b) The technology of assembly, major units (engines etc.);
 - (c) Manufacture of bodies
 - Sheet metal
 - Plastic materials.

EX

ANDA

anning

and forward plans: iron and steel,
trical and general light industry,
l and natural resources;

plans, road planning, plans for other
ter, pipe-lines);

actors, trucks, buses, passenger cars,
icles;

establishment of an automotive industry;
hicle demand.

istribution and storage;

, vehicle-fleet operation.

demand on a make-and-buy pattern

ety by type and manufacturing

ference for negotiations with existing
or and what to expect);

ation of easily made parts, ancillary
manufacture;

; integration;

integration.

a developing and developed countries -
; implications;

manufacture of easily made parts and

5. Cost implications, capital and expense, profitability

- (a) Assembly;
- (b) Easily made parts;
- (c) Major units (engines, axles etc.);
- (d) Sheet metal;
- (e) Plastic bodies;
- (f) The economics of low-volume production.

6. Training requirements and timing

- (a) Semi-skilled production workers;
- (b) Skilled workers;
- (c) Technicians (manufacturing engineers, plant engineers);
- (d) Cost accounting;
- (e) Production planning and control (including inventory control);
- (f) Quality control.

7. Launching problems

- (a) Pre-production training facilities;
- (b) Launching planning;
- (c) Capacity planning and production build-up;
- (d) Shift working;

Discussion of typical cases of establishment of automotive industries in developing countries.

8. Personnel relations

- (a) Safe working practices, control of toxic substances and machine guarding;
- (b) Heat, light and ventilation;
- (c) Employee services: pensions, health, recreation, security and canteens;
- (d) In-plant training and management development;
- (e) Statutory regulations.

9. Regional co-operation

Preliminary planning on joint ventures.

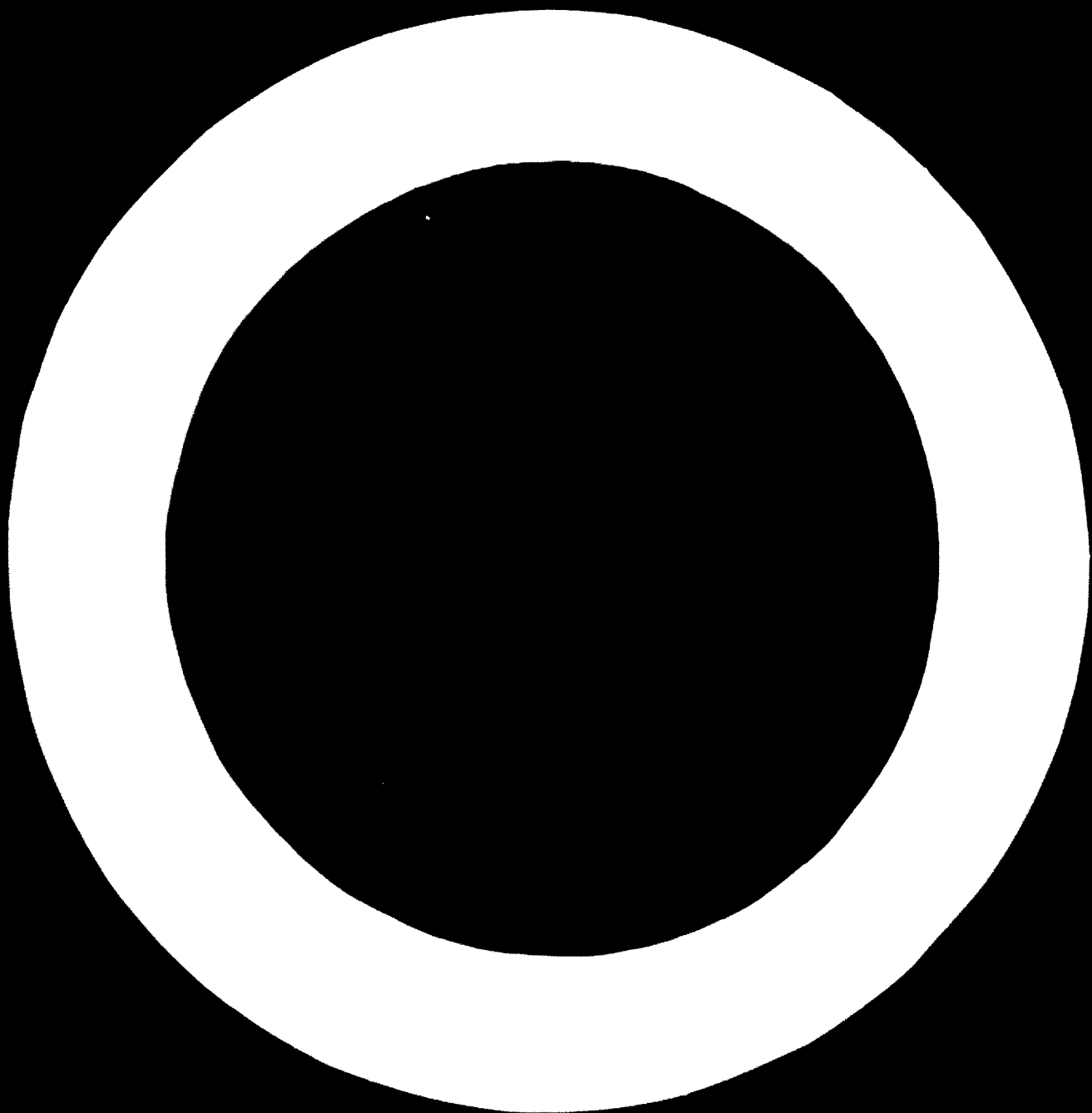
10. Completion of motor-industry planning

- (a) Timing plan;
- (b) Financial planning: calendarization of investments, production expense, importation cost, tax and import controls;
- (c) Planning revisions.

11. Review of prospects and plans for the automotive industry in the participating countries during the Second Development Decade (1970-1980)

Visits to factories

Following the seminar, the participants visited several motor-vehicle and ancillary plants. Comments on the factories visited are presented in annex 8.



ANNEX 1

COMMENT BY C. MOORE ON THE PAPER "THE WORK OF THE ILO IN
RELATION TO THE METAL TRADES", BY THE ILO SECRETARIAT^{1/}

The paper contains no easy answers to the many problems of the developing countries in such areas as labour, training, and supply and demand. However, it should be pointed out that it was submitted as an information paper on the work of the ILO and not as a working document.

It should also be understood that the ILO is not a sort of European labour exchange, nor was it established for the purpose of contributing to national planning, although the ILO, in its current activities, is deeply involved in manpower planning. The ILO is a specialized agency of the United Nations, working in the area of labour and social problems, just as UNIDO works in the area of industrial development, and so on. The ILO was founded for the continuing improvement of the standard of living of men and women throughout the world. It is originally a standard-setting organization. Much work has already been done in setting international standards in such areas as hours of work, social security schemes, industrial accidents and standards for establishing labour inspectorates. These are embodied in the conventions and recommendations adopted by the ILO, which, taken together, have become known as the International Labour Code.^{2/} The extent to which ILO's standards may influence the national laws and practice of any country depends on factors such as its economic development, constitutional structure and degree and timing of social development. The immediate effect of international standards may be limited, especially in countries in the early stages of development, but afterwards, against a background of industrial expansion and a growing demand for manpower, these standards become increasingly important. Thus, for example, newly independent nations or older nations in the process of building up a system of labour protection and labour legislation can get special benefit from these adopted standards.

^{1/} The paper was presented to the seminar as document ID/WG.13/20. Reprints are available from the International Labour Organisation, Geneva.

^{2/} The International Labour Code (1951), 2nd ed., vol.I, vol.II, International Labour Organisation, Geneva.

The ILO also exerts influence through technical co-operation programmes. Governments seek its assistance in drafting or revising labour legislation, improvement of social security schemes, and so on. For the most part, those portions of the Code that deal specifically with industry do so at the national level and are applicable to all industry, including the automotive industry. Of particular importance to the automotive industry are the conclusions and resolutions adopted by the Metal Trades Committee of the ILO. These are discussed briefly in the paper. These conclusions and resolutions offer guidance in this area not only at the national level but also at the level of the individual plant within the industry. Thus, for example, a developing country, a developing industry or an individual plant which wants to determine what has been done on the international level in setting up safety and health services, what has been done or how to go about determining minimum hours of work, or maternity protection for women, can consult the International Labour Code and the relevant conclusions of the ILO Metal Trades Committee. Since the Second World War, the ILO, like all other international agencies, has devoted increasingly more of its energies to technical co-operation, until today a major part of our resources are devoted to this area.

Generally speaking, the activities of the ILO with regard to various aspects of labour problems consist primarily of formulating labour standards, as noted above, engaging in continuous research into labour problems and directing the ILO's efforts into broad areas of human resources (including manpower planning, which is of special interest to this group), development of social institutions such as employers' and workers' organizations, building up a labour-management relationship in developing countries and improving conditions of work.

The information contained in the paper submitted is limited to a brief description of the activities of the ILO in the fields of vocational training and management development in technical co-operation. It also discusses the work of the International Centre for Advanced Technical and Vocational Training, insofar as it relates to the metal trades and, wherever possible, the automotive industry. A short description of the work of the Metal Trades Committee is also included.

It has been the policy of the ILO to plan and develop its technical co-operation projects in direct relationship with the economic plans of the countries receiving assistance and in terms of economic planning. (Further

reference to this is made below.) Consequently, its vocational-training projects are designed to fit into national schemes of this type. The paper then gives a brief summary of the ILO's activities in the area of vocational training, indicating the extent of the effort of the International Labour Office in this area which is specifically directed towards the metal trades. It should be added that these activities are aimed primarily at the vocational training of instructors, foremen, technicians and other strategic personnel in order to take advantage of the multiplying effect of their training. In other words, the task of the ILO in this respect is not to train workers but to train people who will teach. In that way, for every man that we train, provided that he remains in the area, there will be any number of additional people trained.

Of particular interest to this seminar are problems that will be encountered in the developing countries as they achieve higher levels of industrialization. From the experience of the ILO in the area of automotive training, three major problems can be pointed out:

- (1) In spite of gradual growth of an automotive industry, insufficient training is given in the area of automotive maintenance. Pre-planning for maintenance is either completely ignored or the estimate of future demand for mechanics is set far too low.
- (2) The demand for spare parts is extremely difficult to predict and, as a result, in the developing countries, the usual situation is that certain parts are abundant, while others are almost unobtainable. This problem is invariably made worse because of a lack of foreign exchange. Nevertheless, an optimal inventory of spare parts is possible and can be predicted with reasonable accuracy. Experience has shown, however, that the necessary analytical job is rarely done.
- (3) Since developing countries accept a wide range of vehicles, they lack the advantage of a standardized automotive industry. This failure to standardize aggravates the spare-parts problem and increases training problems, since mechanics must be trained to maintain a wide variety of vehicles.

When these three factors are properly considered and acted upon, both training problems and the consequent cost can be reduced.

Another area of ILO activities in technical co-operation, other than vocational training, is management development. The main purpose of ILO activities in this field is to establish permanent machinery for raising productivity and assisting in management development, while at the same time training the local staff to take over and expand the initial schemes. Here again in the paper a series of examples are given.

Of particular interest to this meeting is the International Centre for Advanced Technical and Vocational Training, located in Turin, Italy, which was opened in 1965. It had become obvious to the ILO that, in addition to the basic training which it was helping to give workers, technicians and others in the developing countries, it was also essential to provide advanced technical training to a limited number of selected individuals in a modern industrial environment to familiarize them with the conditions and tempo of modern industry.

In the main, the programmes of the Centre in Turin are arranged into three categories: those for managers and consultants, those for vocational training instructors and those for technical specialists and foremen. The length of the programmes varies from 12 to 24 weeks. The calendar of programmes in 1967 and 1968 included, for example, courses in management of medium-sized enterprises, production operations, marketing operations, export marketing, maintenance and management development; training for vocational training instructors and technical specialists included courses in mechanical engineering, automobile and diesel engineering, training in maintenance, electricity and electronics, welding and sheet-metal work. In 1969, additional courses for personnel administration, labour industrial relations and one or two others were added.

The work of the Metal Trades Committee of the ILO already has been mentioned. This Committee was established in 1945, together with several other industrial committees, to deal with labour and social problems of specific industries. The Metal Trades Committee held its first session in 1946 and has met eight times. It should be noted that, like all of the other industrial committees and like the International Labour Office, the Committee is tripartite in structure. This means that the ILO, its industrial committees and all elements of the Office have representatives not only of governments, but of employers and employers' organizations and workers and workers' organizations. For example, when the International Labour Code was drawn up it had to be adopted by a conference of representatives of all three groups. It is therefore not a code imposed on trade unions, for example, or, in discussing trade-union rights, it is not imposed upon the employers. All three groups meet and discuss and agree to the various items adopted. Each country represented on the Metal Trades Committee sends two government delegates, two employer delegates and two worker delegates to its sessions. It is interesting to note

that, at the first meeting of this Committee, of the fourteen countries represented, only two could be considered as developing. When it last met in 1965 at the eighth session, twenty-seven countries were represented, of which one third (nine) were developing countries.

In the work of the ILO Metal Trades Committee, ever-increasing emphasis is given to the developing countries, primarily because theirs is the greatest problem that the world faces. The Metal Trades Committee is concerned with industries in, for example, the manufacture, repair and service of transportation equipment, electronics and ship-building, which are often referred to collectively as engineering or metalworking manufacturing.

The conclusions adopted by this Committee are generally applicable to a broad range of industries covered by the metal trades, including the automotive industry. In the paper a full list of the reports prepared by the Office for this Committee are listed. These reports are available from the International Labour Office.

The Committee normally adopts conclusions concerning proposed solutions to problems set and suggests action on the part of the governments or the employers' or the workers' organizations, or even by a single plant. In practice, they contain suggestions for action that can be implemented in a number of ways. Other conclusions request action from the ILO through its research groups or statistical branches. Thus, in the 1965 meeting, a resolution asked that the Office collect statistics in the automotive industry. As a result, ILO began collecting available data on employment, wages, hours of work and injuries in the automobile industry on a world-wide basis.

Some problems should be mentioned. Statistics are not comparable, even in developed countries. If France, the Federal Republic of Germany and the United States of America are compared, a certain lack of comparability will be noted. When the collection of statistics on a world-wide basis is attempted, the problem becomes immeasurably more difficult. The results of the study are not yet available, but hopes for it are not high.

The conclusions adopted by the Metal Trades Committee are extremely varied. They cover the same area as the International Labour Code but at the industry level: hours of work, social security, training, job classification, systems of wage payment, labour management and relations, safety and health, and other items.

The paper reviews briefly the work of this Committee in the various areas at its various sessions. The emphasis is, of course, on the developing nations and what the Committee has done in this area. Some of the items specifically taken up are production and employment, technological change, productivity, and automation as related to the metalworking industries. On this subject I would like to quote from the paper. Too often ILO is accused of being anti-management - this is not true. These paragraphs show the attitude of the Metal Trades Committee:

"It should perhaps be stressed at this point that the Committee has always been in agreement that a prosperous and efficient enterprise was essential especially to ensure security of employment and a high standard of living for workers. Technological progress, being inevitable, necessary and desirable, deserved the support of governments, employers and workers. However, the Committee has felt that while all members of the community should benefit from the gains resulting from technological progress, an equitable sharing of these gains would not necessarily take place automatically and the economic and social goals of workers, employers and governments in each country should determine the way in which these gains were distributed."

Possibly the most significant successes of the Metal Trades Committee and its greatest achievement are to be found in serving as an international forum for exchange of views between delegates of governments, employers and workers. The participation of employers' and workers' organizations in the Committee's work provides the best guarantee that the solutions worked out are realistic guidelines for the industry within each country.

To return to the subject of planning, which is of major interest to this seminar, the ILO has realized for a number of years now that while manpower training programmes exist in some developing countries, in most instances, by the time the Organisation has received requests for experts to assist with vocational training and management-development programmes, it is already too late. Plants have been built and machinery for them has been ordered and is on its way and, at this point, it is discovered that no one had been trained to operate it. Consequently, ILO devotes ever more of its resources to manpower planning. Without going into details about this complex problem, it should be made clear that manpower planning is essential to ensure that the supply and demand for manpower will correspond, not only in the major sectors of the economy but also in specific occupations.

As is the case with other areas of economic and social planning, manpower planning can be divided into three basic phases:

- (1) Evaluation of past trends and assessment of future prospects;
- (2) Determination of objectives and setting of targets;
- (3) Selection of policies and measures to reach the targets.

In practice these three phases overlap somewhat.

In the first, phase as a starting point, comprehensive statistics of the labour force, by various characteristics, and particularly by geographical sub-divisions, industry, occupation and training attainments are needed. Unfortunately, occupational and educational classification are of recent origin, and the relevant statistics in many developing countries are at an early stage of development and are still of limited usefulness. Additional requirements at this first stage are a growth model of industry, data on past trends in productivity, and analytical studies, all of which are needed to derive estimates of manpower demand. Finally, the demand for manpower by occupational categories must be translated into categories that specify the kinds and duration of education and training involved, since it is only by planning these things that an adequate supply of the requisite skilled manpower can be assured.

In the second phase, alternative sets of estimates based on key variables, including output and investment and their distribution, are worked out for employment and skill formation. By exploring the various possibilities and by a process of reciprocal adjustment of these variables it is possible, on this basis, as part of the elaboration of a comprehensive national development plan, to select a target that will provide for the most favourable combined growth of output, employment and skills. A common failing is that planning has often been confined to certain categories of manpower. While a comprehensive approach has been precluded by the limited data available, it is a goal towards which efforts should be directed.

Once the manpower targets have been set, manpower planning enters its third phase, which comprises the adoption of specific policies and measures with regard to investment and remuneration and the development of appropriate machinery such as vocational-training facilities and manpower services for attaining the targets.

In conclusion, attention should be directed to the fact that manpower planning is an integral part of national planning. National planning cannot develop unless manpower planners work in full co-operation with general-development planners and with other specialized planners in such related fields as education. Moreover, to ensure that questions of human resources, which are generally of concern to a large number of public agencies and private bodies engaged in the development and utilization of manpower, are dealt with in full knowledge of the issues and interests at stake, it is desirable to have at the national level a broadly representative and authoritative body for planning, policy-making and co-ordination purposes. However, it must be recognized that, on the whole, even in countries where planning has made headway, the supply of manpower from educational and vocational training systems still remains largely unrelated to development needs in both quality and quantity, and only limited action has been taken to improve the utilization of available skilled manpower. This comment is not applicable only to developing countries; in the developed, modern, industrialized nations throughout the world it will be found that a great deal of time is being spent on manpower planning. This is because these nations now find themselves with shortages in various areas of skilled and semi-skilled labour. They have allowed educational and vocational training to proceed without any direct plans, and they discover, for example, that they are training too many welders and perhaps no mechanics at all.

ANNEX 4

SUMMARY OF THE PAPER "THE MOTORCYCLE, ITS PRESENCE AND FUTURE"
BY V. JANSAL^{1/}

"The motorcycle is the first link between transport by human power, the bicycle, and powered transport, and therefore will always be an important means of motorization throughout the world as a first step towards the motor car.

Its versatility gives the motorcycle a firm position complementary to the motor car even in the most highly developed countries such as the United States.

A few figures presenting the picture of the scale of the motorcycle production in the world and of the practical use of the motorcycle provide convincing proof that it is worth while to study the problems connected with motorcycle manufacture and operation and their contribution to the economy:

In recent years motorcycle production in the world reached about 7 million machines a year (as compared to less than 2 million in 1951); the ex-works value of the production amounts to approximately US\$1 billion.

There are about 50 million motorcycles in operation in the world; they cost their owners about US\$15 billion to purchase.

Every seventieth inhabitant of the world rides a motorcycle.

Both the world production and international trade in motorcycles show steadily growing trends. There is a constant tendency towards concentration of production in the hands of large manufacturers.

The probable perspective of the trend of manufacture appears favourable for a number of years to come. Motorcycles play their role in the development of motorization, serving as means of transport as well as for pleasure and sport.

Just as with the manufacture of these vehicles, the necessary research and development are not simple matters. They require a considerable degree of specialized knowledge, experience and scientific approach in consequence of

^{1/} The paper was presented to the seminar as document ID/WG.13/18.

the rising technical standards of motorcycles. Information about these standards is available from the leading motorcycle manufacturers.

Motorcycles are of significant importance for the economies of developing countries as means of transport accessible in price to the wider public and as means for technical education of their users, contributing at the same time to the improvement of living standards.

It is advantageous to developing countries to take up motorcycle production in stages. The first stage should consist in the manufacture of simple components and the assembly of motorcycles from imported parts. The next stages in the manufacture of more complicated parts can lead, in some cases, to the manufacture of complete motorcycles in developing countries."

ANNEX 5

STATEMENT ON REGIONAL CO-OPERATION, BY J. BECKEL

It has already been stated that, in the majority of the developing countries, only limited local markets exist. As a matter of fact, however, the scales of production required to achieve an economic manufacture of vehicles with a significant content of nationally produced parts are generally very much greater than the actual size of the markets. Furthermore, in many countries that are engaged today in the automotive industry, the market is divided among several manufacturers and a large variety of models, a fact which greatly affects developing countries in which the national production as a whole is relatively important. Consequently, the production costs and consumer prices of the manufactured vehicles are high, and smaller countries in the first stages of the motor-vehicle industrialization encounter considerable difficulties in increasing the national content of their products.

It is mainly for these reasons that the developing countries have hoped to establish a regional co-operation that will allow them either to expand their production under more economic conditions or to establish their motor-vehicle industry on a firmer basis from the very beginning.

It might be convenient, in the first instance, to refer to the different experiments that countries and enterprises have made in regard to regional co-operation. Analysis of these experiments shows that each government and each enterprise will be able to draw the conclusions that may seem more appropriate to the orientation they wish to give to their motor-vehicle development policy. As a matter of fact, during the sessions of a seminar such as this, it would really be too ambitious to expect to find a universal formula that would be adaptable to the diversity of all the countries and regions undergoing development. Furthermore, because of the complexity of this problem, it would be necessary to examine it from different points of view and in its full scope. However, it is evident that the necessary background information for many countries is not available.

Reference is made to the situation in Latin America, although other cases should be mentioned, such as the regional co-operation envisaged by the countries of the Maghreb and the proposals passed in the meeting of African

countries in Cairo,^{1/} in addition to the proposals on regional co-operation made in the working document submitted by Mr. T. Yoshiki, Vice-President of the Society of Motor-Vehicle Engineers of Japan.^{2/} A case of co-operation between two Latin American countries is illustrated by the paper of Mr. G. L. Malleret, director of Citroën, which describes in some detail the co-operation between the motor-vehicle industries of Argentina and Chile.^{3/}

However, before describing some cases of regional co-operation that exist or that have been attempted in the field of motor-vehicle industry between Latin American countries, it is necessary to mention briefly the situation of these countries in relation to their economic and industrial co-operation in general. At present there are four agreements of economical co-operation which, in chronological order, are the following:

- (1) The treaty of Montevideo, or Latin American Free Trade Association (LAFTA), comprising Mexico and all of the South American countries, except French Guiana, Guyana and Surinam;
- (2) The Central American Common Market, comprised of: Costa Rica, El Salvador, Guatemala, Honduras and Nicaragua;
- (3) The Caribbean Free Trade Market, formed by some Caribbean countries;
- (4) The Andean Group, or the countries which have signed the presidential declaration of Bogotá, which are: Bolivia, Colombia, Chile, Ecuador, Peru and Venezuela. A treaty is under negotiation.

In addition, the statement of the Presidents of American States, who met in Punta del Este in 1967, urged the formation of a Latin American Common Market, between 1970 and 1985, which would integrate the LAFTA countries and the Central American Common Market. The Andean Group intends to reach basically the same goal as the Latin American Common Market, but in a shorter time. The treaty of the Latin American Free Trade Association, as well as the agreement of the Andean Group, which is not yet in force, provide, as means of co-operation, specific agreements on industrial sectors to be negotiated by the member countries. According to the provisions, these sectoral agreements may

^{1/} Symposium on Industrial Development in Africa, organized by ECA and CID, Cairo, Jan.-Feb. 1966.

^{2/} "Problems of integration, specialization and interregional co-operation in the automotive industry", presented to the seminar as document ID/WG.13/5.

^{3/} "Importance and practical applications of technical co-operation in establishing or developing an automotive industry", presented to the seminar as document ID/WG.13/28.

stipulate a reduction of customs duties between the signatory countries in order to increase their reciprocal trade. Furthermore, they may include a proposal for a common customs tariff structure and provide for the co-ordination of the economic and fiscal policies that influence the competitiveness of the different countries. The outline of the Andean Group includes, as an additional feature, the Andean Development Corporation (Corporación Andina de Fomento), an agency destined to provide technical assistance and strategical investments to the countries of the Group that are temporarily in an unfavourable competitive situation with relation to the others.

As far as the motor-vehicle industry is concerned, the countries of the Andean Group held a meeting in 1967. The conclusions and recommendations of this meeting highlights the support the motor-vehicle industry has received from some of the Latin American Governments. They also outline the forms of regional co-operation that are envisaged. The representatives of this meeting concluded, for instance, that "the establishment of a motor-vehicle industry on an efficient and economic basis requires a production scale which exceeds the demand of the respective local markets". Some of the recommendations are as follows:

- (a) To grant mutual concessions in order to achieve a regular increase and uniform distribution of the production activities designed to meet the demand of motor vehicles in the associated countries;
- (b) To set up a permanent co-ordination and consulting committee that will establish the basis for the unification of motor-vehicle policies in the respective countries;
- (c) To incorporate, to the highest possible degree, the local private sectors in the preparation, co-ordination and execution of the programmes by setting up committees, mixed consulting groups or similar institutions;
- (d) To adapt the programmes of the individual manufacturers to the combined markets of the countries of the Andean Group;
- (e) To promote the installation and enlargement of those plants, manufacturing parts and components, which will guarantee the highest production efficiency and quality;
- (f) To guarantee maximum efficiency in the motor-vehicle industry in avoiding diversity of models and standardizing, to the highest possible degree, the parts and components.

The treaty envisaged by the countries of the Andean Group has not yet been fully negotiated. This is why, up to this time, an agreement on the motor-vehicle industry has not been enforced. As already mentioned, however, the

meeting on the motor-vehicle industry constitutes an instructive example of the objectives that have been considered by some Latin American countries with regard to regional co-operation.

As for LAFTA, no sectoral agreement relative to the motor-vehicle industry, on a multi-lateral basis, has yet been reached. However, several bilateral agreements are in force in Latin America. These operate between the following countries: Argentina and Chile, Chile and Mexico, Colombia and Mexico, and Colombia and Venezuela. Furthermore, agreements between the industries of other countries have been drafted, but have not been ratified. The agreement reached in 1967 between the Argentine and the Brazilian motor-vehicle manufacturers should be mentioned in this connexion. Because of the situation of the parts and components manufacturers who might have been affected under the operating provisions of the agreement, the Governments of the respective countries refused ratification.

Concerning the bilateral agreements that are in force, they appear to operate according to the same principles. Consequently, the operation of these agreements can be illustrated by the example of the co-operation between Argentina and Chile. In both of these countries, existing legal regulations oblige the motor-vehicle manufacturers to incorporate into their production a certain percentage of locally manufactured parts. In Argentina the required proportion of national integration is about 90 per cent of the value of a vehicle, and in Chile at present, this proportion is about 60 per cent. Both countries consider as locally made those parts which are imported from other countries of LAFTA, provided that imports of parts are compensated by exports of parts of the same value. To encourage this type of exchange, customs charges have been suppressed in both countries for transactions that comply with this condition. Because the levels of production costs and prices are not the same in Argentina as in Chile, the customs value is taken into account for balancing imports and exports. The customs value itself is roughly based on the f.o.b. value of the parts in the licensor's country of origin. Another feature of the agreement lies in the fact that the export-import transactions can only be accomplished by the motor-vehicle manufacturers, with no direct intervention of the manufacturers of parts. Consequently, this system can be applied only to the makes of vehicles produced in both countries.

The agreement, enforced about three years ago, has shown its advantages. First of all, in both countries it allows the manufacture of some components

in larger series and, consequently, at lower production costs. This advantage is particularly felt in the country with the more limited market, in this case Chile, because, owing to the size relation between the Argentine and Chilean markets, it can produce a much larger quantity of products than if it were supplying only its home market. Moreover, because of the same effect of size, Chile can compensate a large variety of imported parts with a corresponding smaller number of exported parts. Evidently, this provision promotes a certain specialization of the country with the smaller market.

Another advantage of the compensation systems lies in the fact that the balance of payments remains unaffected. That is to say, there is no drain of foreign exchange from any of the countries in question. Moreover, it can be noted that Chile has benefited by foreign investment, as regards both the parts industry and the final-assembly plants, which were attracted mainly by the prospect of higher earnings.

Also, a few Argentine parts manufacturers established their industries in Chile in order to penetrate the Chilean market and, on occasions, have increased their share of the Argentine market through exports from Chile. To understand this more clearly, it is necessary to point out that, with regard to the limited size of the domestic market, Chilean authorities may support the establishment in the country of only one plant for each specialized part or component. Consequently, an established parts manufacturer who can meet the requirements of his customers, relative to quality and prices, has a quite stable position in his home market in addition to the possibility of exporting to Argentina. It should be mentioned in this connexion that the variety of parts and components which are presently manufactured in Chile is not yet very large. Thus, the motor-vehicle manufacturers are quite eager to buy parts in Chile to export them to Argentina in order to compensate the imports of other parts required to comply with national integration content.

In certain cases the development of parts manufacture in Chile could affect the position of some parts manufacturers in the Argentine market. The Argentine Government was therefore compelled to apply certain measures to limit the access of other countries to the local market. These measures restrict, inter alia, the imports from the LAFTA countries to 30 per cent of the domestic demand of motor-vehicle manufacturers. Finally, it must be pointed out that the agreement between Argentina and Chile has been in force for only a few years, and it is therefore too early to draw definite conclusions.

To indicate its actual importance, however, it may be mentioned that, according to unofficial information, the annual value of parts exchanged is about US\$10 million.

Anyone not fully acquainted with the Latin American situation will wonder why regional co-operation has not yet been translated into terms which would allow a keener competition between the firms established in the various countries. It is therefore relevant to point to a few aspects of the Latin American situation and to stress some of the difficulties that obstruct industrial integration under more liberal conditions.

One of the participants in this seminar mentioned that one of the prerequisites for the establishment of a motor-vehicle industry in a given country is an infrastructure of mechanical industries. In Latin America the mechanical industries^{4/} represent an annual gross production value of roughly US\$10 billion. Approximately five sixths of this production is more or less concentrated in Argentina, Brazil and Mexico. Five other countries, Colombia, Chile, Peru, Uruguay and Venezuela, represent approximately one sixth; the other Latin American countries contribute only a very minor proportion of the total regional production.

It is therefore evident that such structural differences between groups of countries seriously impair the possibilities of the regional co-operation on the basis of a free competition. Actually, the smaller countries would have little or no possibility to compete against the bigger ones in the region.

Should such an approach be adopted, the few existing enterprises in the smaller countries would be rapidly ruined or absorbed by those of the bigger ones, thus increasing unemployment. Structural differences of this kind are not the only ones that impair the conditions for fair competition between countries; differences in fiscal and economic policies between countries should also be mentioned.

Although it seems extremely difficult to judge what will happen in the motor-vehicle industries in the field of Latin American co-operation, some possible trends in the next few years might be indicated. It seems that the

^{4/} They comprise the following groups of the International Standard Industrial Classification of All Economic Activities (No.4/Rev.1; 58.XVII.7) adopted by the United Nations: Gr.35: Manufacture of Metal Products; Gr.36: Manufacture of Machinery, except Electrical Machinery; Gr.37: Manufacture of Electrical Machinery; Gr.38: Manufacture of Transport Equipment.

main effect of bilateral compensation agreements similar to those existing between Argentina and Chile will be to contribute to the extension of such agreements in Latin America and lead to an increase in the volume of exchange between the countries. Eventually the bilateral agreements will give way to a multilateral scheme.

The international motor-vehicle manufacturers will progressively feel inclined to adopt an over-all programme for their plants in Latin America. Thus, the outcome in the long run may be a certain specialization of countries concerning different models and makes. Another consequence of an extension of agreements between countries would be that each country involved would refrain from establishing its own autonomous and fully integrated motor-vehicle industry. Obvious exceptions would be Argentina and Brazil, since these countries have already reached this stage.

Furthermore, the Latin American Governments will possibly establish programmes of technical and financial assistance in order to aid and support the parts manufacturers who, as in the case of the agreement between Argentina and Chile, would suffer from the effect of competitive imports made under bilateral agreements.

It is evidently not a matter of subsidizing these enterprises but of helping them in the diversification or conversion of their production programme so that they can maintain their level of activity and find new outlets for their products. The technical- and financial-assistance programmes could be administered either through the existing governmental authorities or through specialized agencies to be set up for this purpose.

In accordance with the bilateral or multilateral features of the agreements, bi-national or multinational institutions could be established for providing technical and financial assistance. An example of such an institution is the Andean Development Corporation, although the activities of this agency will not be restricted to the motor-vehicle industry.

The compensation agreements will constitute a system of co-operation that will be valid only during the transitional period. It seems obvious that, with the progress in the creation of the common market of the Andean Group and the establishment of the Latin American Common Market, the conditions of competition between the countries will have to be liberated. At that stage of regional

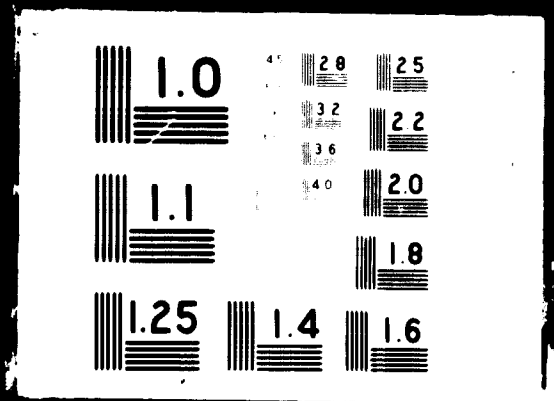


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co-operation, the technical- and financial-assistance agencies will also have to play an important part because, in addition to their other problems, they will have to avoid excessive industrial concentration in the larger countries of the region, so as not to impair the individual possibilities of the smaller ones.

ANNEX 6

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ANNEX 7

LIST OF DOCUMENTS PRESENTED TO THE SEMINAR

ID/WG.13/1	Quality control in foundry operations for automotive parts manufacture	L. E. Komarov Union of Soviet Socialist Republics
ID/WG.13/2	Significance of the automobile in the national economy: its influence on and relation with other industry sectors	W. P. Ricart Spain
ID/WG.13/3	The rationale of the gradual development of the automotive industry in developing countries: From assembly of imported parts to complete local production	F. L. Picard France
ID/WG.13/4	Maintenance of heavy duty commercial automotive equipment	W. F. Eaton United States
ID/WG.13/5	Problems of integration, specialisation and interregional co-operation in the automotive industry	T. Yoshiki Japan
ID/WG.13/6	Problems related to the production and supply of automotive components	E. F. Gibian United States
ID/WG.13/7	The establishment and development of the automotive industry in Brazil	C. Nebelung Federal Republic of Germany
ID/WG.13/8	Automotive research and development	F. J. Hooven United States
ID/WG.13/9	The state and development of the USSR automotive industry; its role and significance in the national economy	V. Pobedonostsev Union of Soviet Socialist Republics
ID/WG.13/10	Establishment and development of the automotive equipment industry in India	K. T. Merchant India
ID/WG.13/11	Planning of facilities for the manufacture of automobiles and trucks with special reference to developing countries	A. Ríha, O. Csívis Czechoslovakia
ID/WG.13/12	The establishment and development of the automotive equipment industry in Yugoslavia	P. Raković Yugoslavia
ID/WG.13/13	The establishment and development of the automotive equipment industry in the UAR	A. Gazarin United Arab Republic
ID/WG.13/14	The use of old and second-hand road transportation equipment	M. Alth United States
ID/WG.13/15	Application of the pressure die-casting process to the production of light metal castings in the automotive industry	J. Valecký Czechoslovakia
ID/WG.13/16	Some aspects of automobile body building	Z. Kejval Czechoslovakia

ID/WG.13/17	Some problems involved in the establishment of the automotive lighting industry	L. Zajíc, J. Jirotko Czechoslovakia
ID/WG.13/18	The motorcycle, its presence and future	V. Jansa Czechoslovakia
ID/WG.13/19	Automobiles and computers in Czechoslovakia	S. Kotoš Czechoslovakia
ID/WG.13/20	The International Labour Organisation and the metal trades	ILO secretariat
ID/WG.13/21	The establishment of an automotive industry in developing countries	A. S. El Darwish IFC
ID/WG.13/22	Automotive industries in developing countries ^{1/}	J. Baranson IBRD
ID/WG.13/23	Automotive demand in developing countries	A. G. Nowicki IBRD
ID/WG.13/24	Some questions concerning the planning of buses with chassis	P. Michelberger Hungary
ID/WG.13/27	The latest development in Japanese automobile industry and some suggestions for developing countries	S. Yamamoto Japan
ID/WG.13/28	Importance and practical applications of a technical co-operation in the process of the establishment or the development of an automotive industry in foreign countries	G. L. Malleret France
ID/WG.13/29	The "Package Deal" motor industry concept	D. J. Page United Kingdom
ID/WG.13/30	Motor vehicle regulations and their effect on the evolution of motor industry in countries undergoing development	J. Sanz Navio Spain

^{1/} Since published (1969), under the same title, as World Bank Staff Occasional Papers Number Eight. Distributed by The Johns Hopkins Press, Baltimore, Md.

ANNEX 8

DESCRIPTION OF FACTORIES VISITED

Following the seminar, the participants visited several motor-vehicle and ancillary plants. The factories visited and the information gleaned at each of them are given below.

"Jawa Research and Design Centre", Prague (motorcycles)

This plant was founded in 1929 and developed the Czechoslovak school of motorcycle design. It presently designs motorcycles of both road and special sports types. The Centre has 300 employees, of whom 100 are non-technical personnel. Of these, 60 are highly skilled, 30 are skilled, and 10 are unskilled.

Over-all employment at all Jawa plants is more than 3,000 and production amounts to 80,000 motorcycles per year, 85 per cent of which is exported to more than 100 countries. Czechoslovakia imposes a purchase tax of 300 per cent on motorcycles. From 10 to 15 per cent of the company's expenditures are for research and development; 3.5 per cent of the cost of each motorcycle represents research and design costs.

"Jawa Production Plant", Tyneč (motorcycles)

The Jawa company has six plants in Czechoslovakia, three of which do assembly work. Total production is 300 motorcycles daily. In the plant visited, 2,600 persons are employed, on a two-shift basis.

"PAL", Kbely (electrical accessories)

This company serves as an ancillary industry to the motor-vehicle and aircraft industries and produces all of the electrical equipment and accessories for them. More than 1,000 different items are manufactured. Among the items produced are dashboard instruments, wind-screen wipers, push-button switches and automobile heaters. The company has four other plants in the vicinity of Prague. During the five years 1964-1968, production increased at the rate of 10 per cent yearly; in 1969 this rate was running at 18 per cent.

At present this factory is working two shifts on parts production and one shift on assembly. Of its production, 6 per cent is for direct export, although actual figures, including equipment mounted on vehicles, is somewhat higher. The company has investment plans for the next two years which are in line with the over-all expansion plans of the motor-vehicle industry.

PAL does applied research work, but basic research is done at a special institute set up by CAZ (Ceskoslovenské Automobílové Závody), the Czechoslovak automobile trust. PAL has 4,500 employees, 3,000 of whom work at the plant visited. Of these, 500 are technical employees, 15 per cent of whom are graduate engineers.

"LIAZ", Kbely (electrical accessories)

This company manufactures diesel engines and chassis for buses and trucks. At the time of the visit, a new plant was being set up for the production of a diesel engine of new design. At the old factory, which was not visited, yearly production of a 165-horsepower, two-stroke, six-cylinder engine is 10,000 units. The new plant will produce a 200-horsepower, two-stroke, six-cylinder engine which, with a turbo-charger, can be rated from 240 to 300 horsepower.

The scrap rate for castings is 4.5 per cent. Of total production, 54 per cent is for export, of which 7 per cent is to non-socialist countries.

The new plant will have two automatic transfer lines: one for cylinder heads, the other for engine blocks. It is hoped to reach by 1973 a production cycle that will produce a completely machined block every six minutes, or 25,000 blocks yearly, on a two-shift basis. Only 8 per cent of the machine tools in this new plant will be imported. The rest, including the new machine-test cells, will be of Czechoslovak design and origin.

"Skoda", Mlada Boleslav (production and testing of diesel engines)

In this plant, production of the model 100MB Skoda automobile exceeds 500 vehicles daily, on a two-shift basis. In the early 1950s, only 50 Skoda automobiles were produced daily, but the goal for the 1970s is 1,000 daily. In 1968, 40 per cent of production was for export.

In Czechoslovakia, a model 100MB Skoda automobile costs 45,000 Czechoslovakian crowns, and there is a two-year waiting period for delivery. Sixty per cent of the purchase price of the vehicle consists of purchased elements, including raw materials as well as certain parts.

The engine of this model has an aluminium block, made by the pressure die-casting process, and a cast-iron head. The pressure die-casting machines were made under licence in Italy, while the aluminium smelters (Siemens) were made under licence in Austria. Among the conveyors used are those of Fisher and Ludlow of the United Kingdom and of the Compagnie Française des Conveyeurs of France, while the crankshaft balancing machine is a product of Schenck in the Federal Republic of Germany. It was noted that a great deal of the sheet metal used is imported from Austria.

"Metas", Tyneč (iron and aluminium foundry)

This plant manufactures a wide range of iron and aluminium castings, primarily for the automotive industry but also for industry in general.

The iron-casting facilities have a yearly capacity of 13,000 tons and employ about 500 workers. Four electric-induction furnaces and one arc furnace are used.

The aluminium-casting facilities have a yearly capacity of 3,000 tons and employ 260 workers. The largest cast part weighs about 100 kg. There are separate sections for sand-casting and die-casting. Neither section has an automatized casting system.



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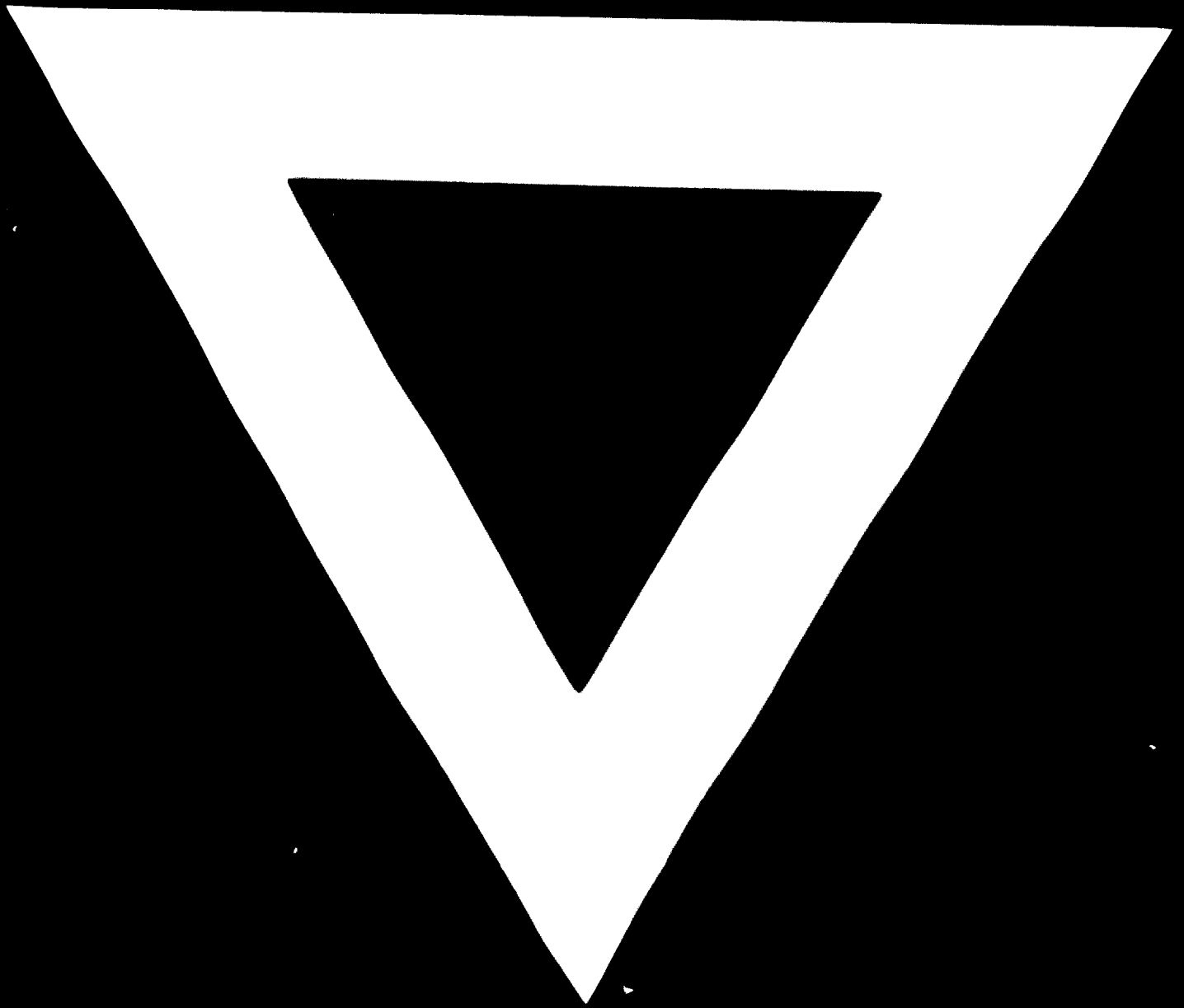
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