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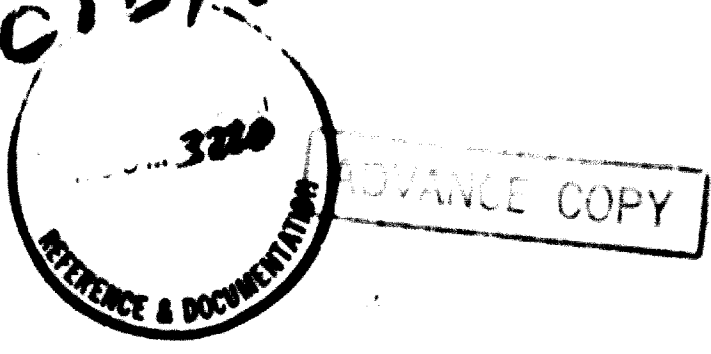
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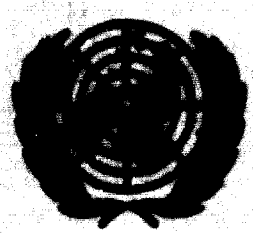
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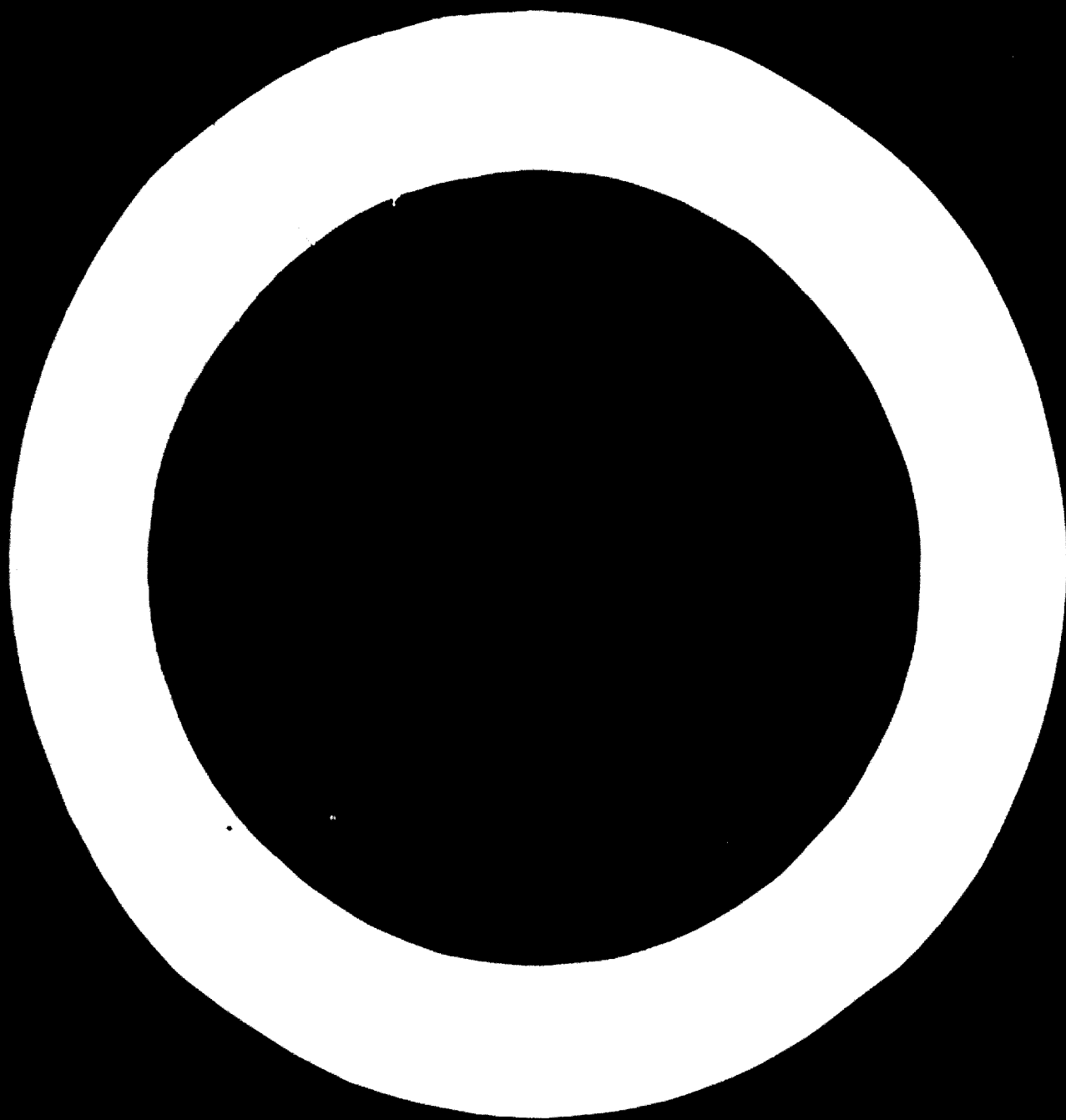
**REPORT OF EXPERT GROUP
ON SECOND-HAND EQUIPMENT
FOR DEVELOPING COUNTRIES**

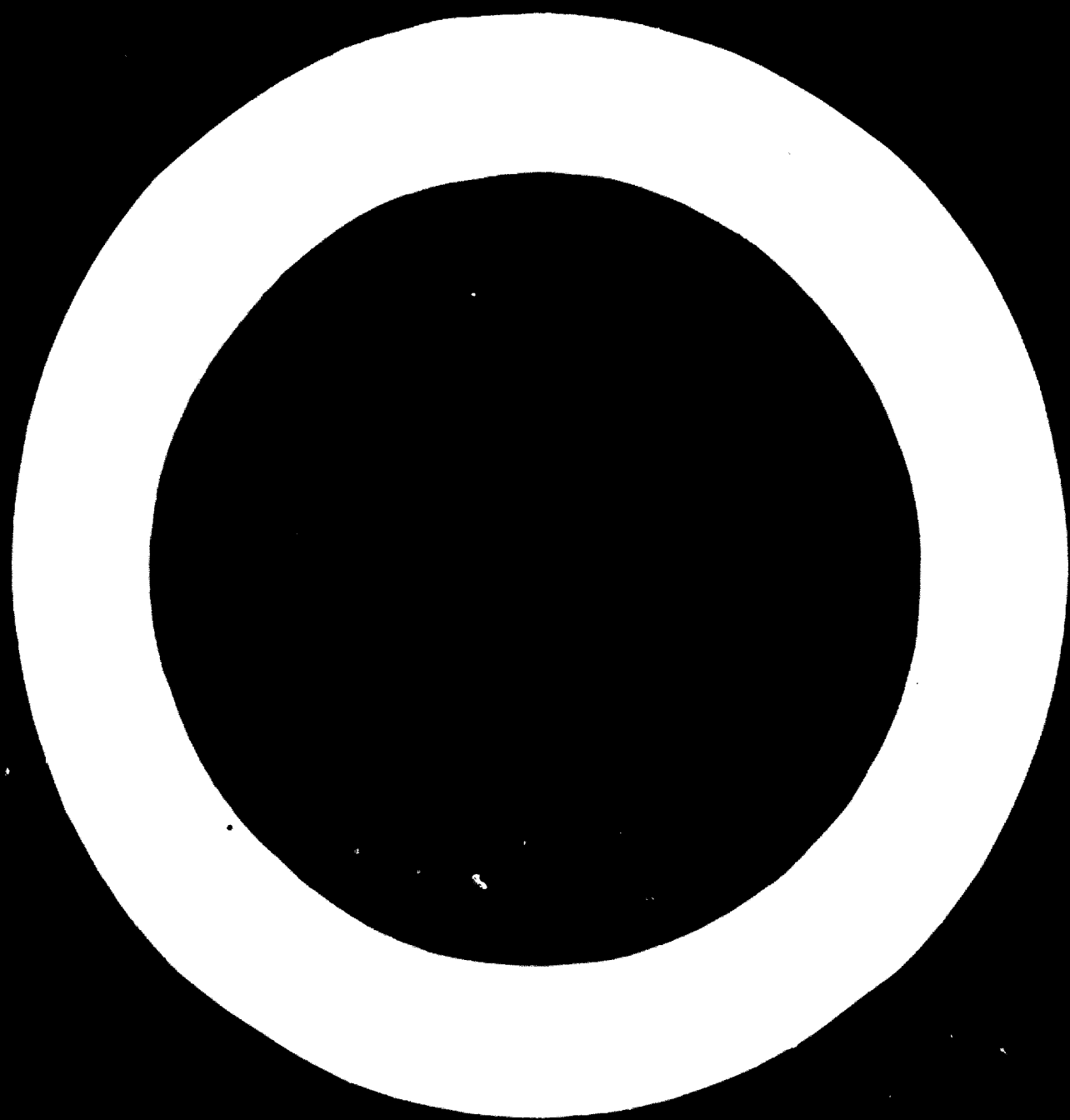
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7-22 December 1965



UNITED NATIONS





Centre for Industrial Development

**REPORT OF EXPERT GROUP
ON SECOND-HAND EQUIPMENT
FOR DEVELOPING COUNTRIES
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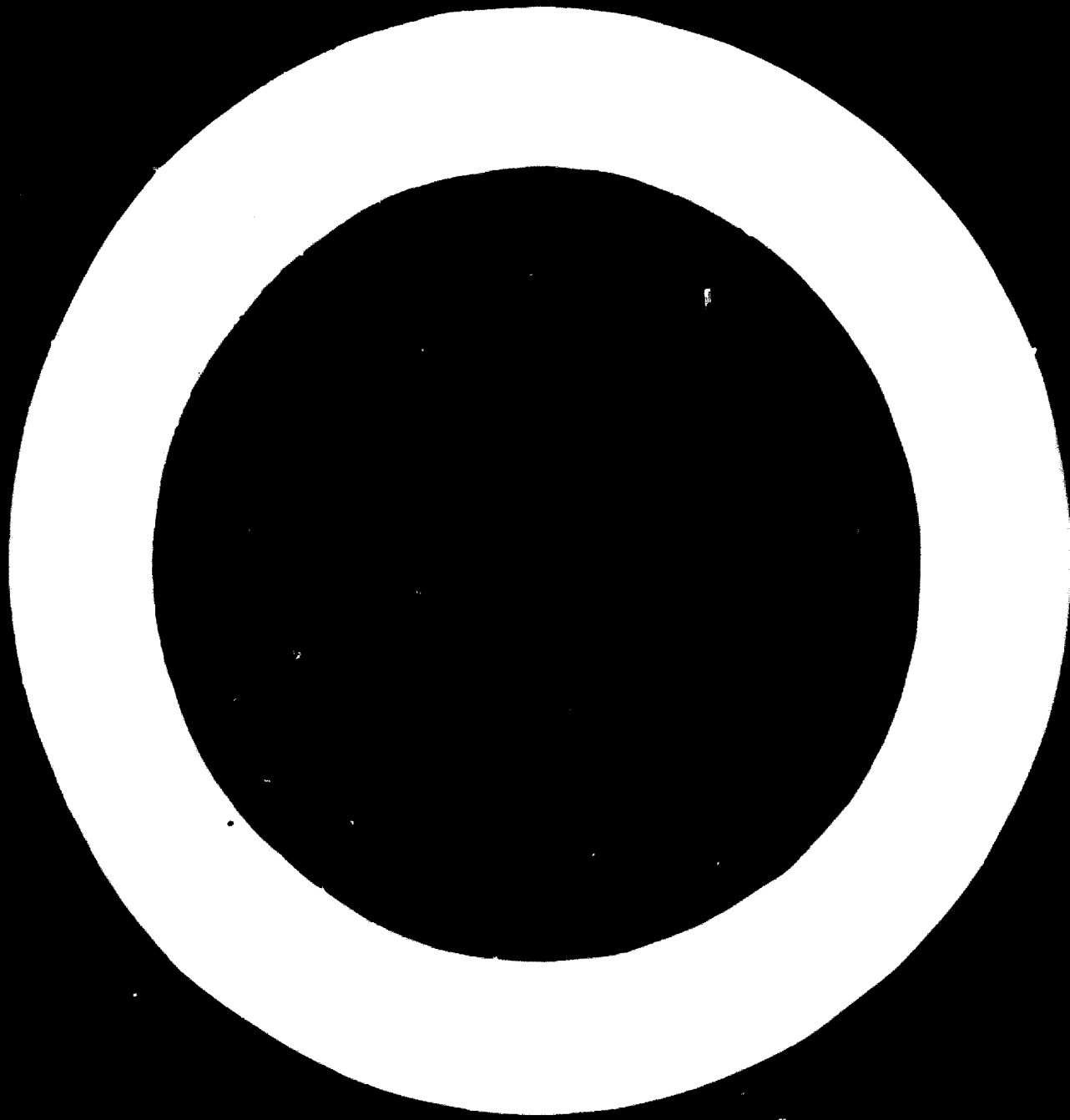


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**LETTER OF TRANSMITTAL
TO THE COMMISSIONER FOR INDUSTRIAL DEVELOPMENT**

We have the honour to submit herewith the Report of the Group of Experts on Second-Hand Industrial Equipment for Developing Countries. It was prepared during our meeting at United Nations Headquarters in New York from 7 to 22 December 1965. The Group elected Mr. Sharad S. Marathe, Economic Adviser to the Government of India, as its Chairman. The other members of the Group were:

- Mr. Fouad Hussein, Director-General, Industrial Design Administration, Cairo, United Arab Republic;
- Mr. Hans Langenskiöld, President, Industrial Coordination Bureau, Stockholm, Sweden;
- Mr. Milovan Popadić, General Manager, Invert-Import, Belgrade, Yugoslavia;
- Mr. Karel Pros, Chief Engineer, State Commission for Technology, Prague, Czechoslovakia;
- Mr. Enrique C. J. A. Sabatte, Consulting Engineer, Buenos Aires, Argentina; and
- Mr. Adam Wiener, Professor of Engineering, Nassau Community College, Garden City, New York, USA.

Staff members of the Centre for Industrial Development were assigned as Technical Secretary and Assistant Technical Secretary.

The terms of reference given us by the Acting Commissioner for Industrial Development, Mr. N. K. Grigoriev, in his opening address were to study and analyse in depth:

- (a) Definition of second-hand equipment;
- (b) Relevant characteristics of second-hand equipment market;
- (c) Generation of second-hand equipment: causes and expected future trends;
- (d) Advantages and disadvantages of second-hand equipment;
- (e) Identification of industry sectors where use of second-hand equipment is practicable;
- (f) Maintenance of second-hand equipment, spare parts and servicing;
- (g) Cost considerations in selecting second-hand equipment;
- (h) Implications of the use of second-hand equipment for the economic advancement of developing countries;
- (i) Analysis of existing mechanism for selection, inspection and testing, rebuilding, purchase and transfer of second-hand equipment;
- (j) Experience in developing countries with the utilization of second-hand equipment and import restrictions;
- (k) Financing of second-hand equipment;

and to reach conclusions and make recommendations for appropriate national action by advanced and developing countries and international action by the United Nations.

Our report follows these guidelines. We have also included some observations on complete second-hand plants recognizing some special problems in this area.

In submitting this Report, we have acted in our personal capacity and not as official representatives of the organizations or Governments to which we have the honour to belong.

We wish to express our gratitude to the following people who by participating in our discussions have contributed valuable data and insight into the special problems in this area: Mr. Frank Laurens, Chairman, Foreign Relations Committee of the Machinery Dealers National Association, USA; Mr. Jack K. Woll, Director, Government Property Resources Division, Agency for International Development, Washington, D.C., USA; and Mr. Sydney P. Krieger, Secretary-Treasurer, Industrial Plants Corporation, New York, USA. We thank the managements of the Ballard Co. and J. L. Lucas and Son, Inc. for the informative visits to their plant in Bridgeport, Conn., USA. We also wish to acknowledge our appreciation to the staff of the Technological Division of the Centre for Industrial Development for collecting and contributing papers that formed an indispensable background for our discussions, and for all other help that made this Report possible.

Yours respectfully,

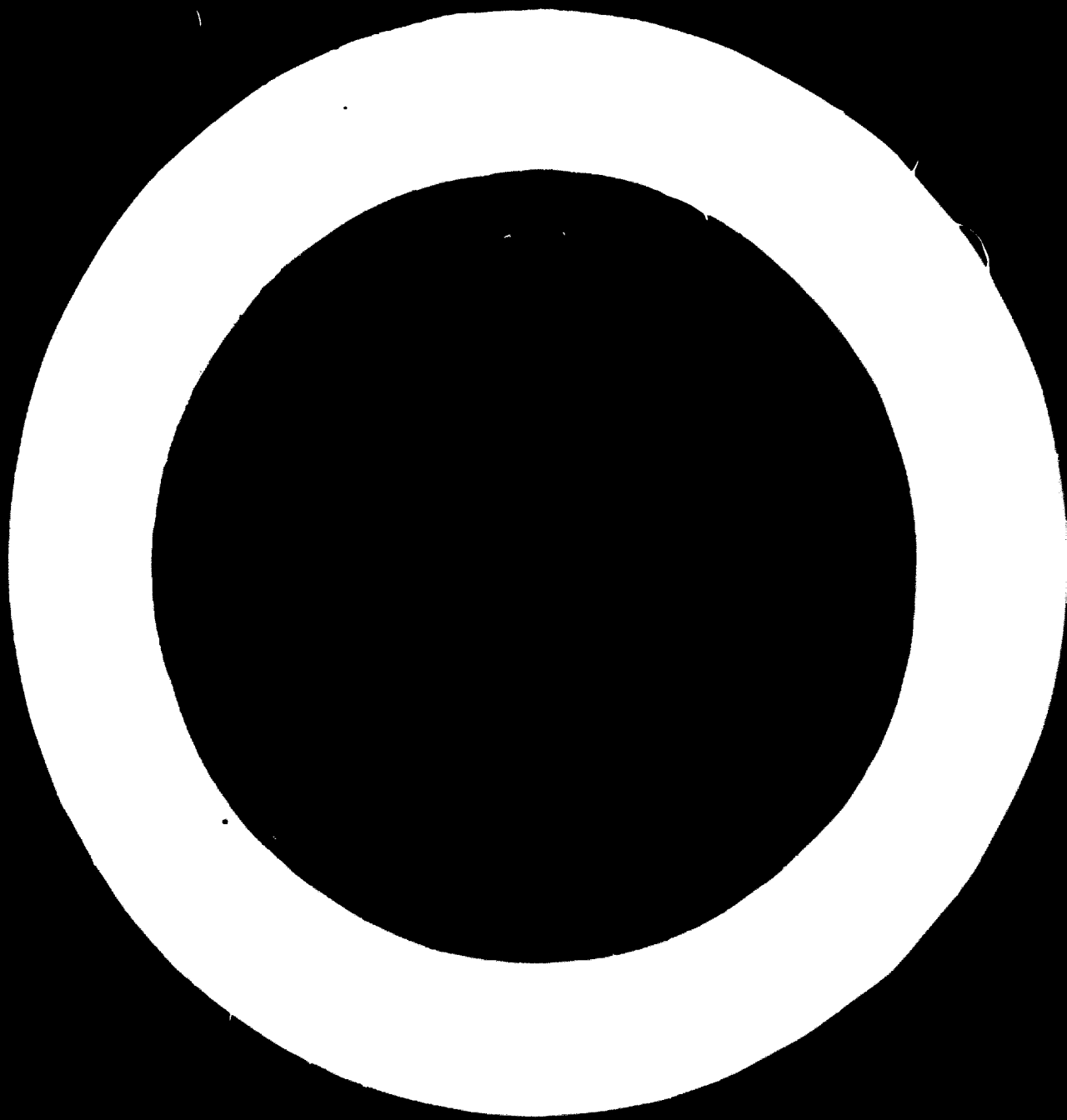
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INTRODUCTION

1. The experience in developing countries gives examples of both successful and unsuccessful utilization of imported second-hand industrial equipment. The advantages and disadvantages of the utilization of this category of equipment in furthering the process of industrialization of developing countries are, consequently, the subject of considerable controversy. This is well reflected in governmental policies concerning the importation of such equipment, which range from no restrictions at all to a complete prohibition of imports.

2. The quantities of second-hand equipment generated in industrialized countries are considerable. They can be expected to increase in the foreseeable future. No country can base its economic development on second-hand equipment; but in certain fields and with certain safeguards the use of second-hand equipment can make a significant contribution to the process of industrialization. The main purpose of the deliberations of the Group was to identify the possibilities and problems in regard to the use of second-hand equipment. The main conclusions are given at the end of this Report.

3. In its discussions the Group thoroughly examined all the relevant aspects of the main problem under consideration. It was recognized that the problems of utilization of second-hand equipment in developing countries were different, depending on their stages of development, which vary widely. On the basis of this analysis, the Group came to a number of conclusions, as a result of which they formulated recommendations for appropriate action by developing countries, industrialized countries and the United Nations concerning the utilization of second-hand equipment in developing countries. The Report follows the sequence of the above-outlined deliberations of the panel on the utilization of second-hand equipment.



Chapter I

DEFINITION AND CLASSIFICATION OF SECOND-HAND EQUIPMENT

4. As used in this Report, the term *equipment* will mean *capital equipment*, and will cover broadly the following:

- (a) Manufacturing equipment;
- (b) Electrical equipment; and
- (c) Transportation equipment.

5. *Second-hand equipment* will be defined as that equipment which had been purchased by a potential user, and resold at least once.

6. Second-hand equipment is not necessarily equipment which has been used, is obsolete, or deteriorated. It can be obtained from sources other than the equipment manufacturers or their authorized dealers.

7. Second-hand equipment appears in a wide range of physical conditions, and some organizations dealing with second-hand equipment have developed detailed and useful classifications to facilitate its description. The United States Machinery Dealers National Association (MDNA) approved, mostly for domestic use, in 1938, the "terms and definitions" for second-hand equipment given in appendix I.

8. A more elaborate classification for second-hand equipment was established by the United States Department of the Army and the General Services Administration (GSA).¹ This same classification is also used by the United States Agency for International Development (AID). It is also given in appendix I.

9. The MDNA classification is not as inclusive as the GSA classification, and both classifications pertain to individual pieces of equipment and do not cover complete plants. The classification proposed by the panel of experts is the following:

¹ Department of the Army Supply Bulletin, Washington, D.C., April 15, 1964.

CLASSIFICATION OF SECOND-HAND CAPITAL EQUIPMENT

A. *Unused* — *Equipment never installed for service*

- A.1. Ready for use and interchangeable with new equipment delivered by manufacturer.
- A.2. Slightly impaired by handling or storage but condition not affecting utility.
- A.3. Soiled, shopworn, rusted, deteriorated, or damaged and utility slightly impaired.
- A.4. Badly broken, soiled, rusted, mildewed, deteriorated, damaged, or broken and utility impaired.

B. *Reconditioned* — *Used equipment repaired and not used since*

- B.1. Rebuilt. Completely disassembled, all worn or broken parts replaced, and tested for performance.
- B.2. Tested for performance, broken parts repaired or replaced, cleaned and painted.
- B.3. Broken parts repaired or replaced, cleaned and painted.
- B.4. Cleaned and painted only.

C. *As is* — *Used equipment offered for sale as taken from service*

- C.1. Tested for performance, no repairs required.
- C.2. Tested for performance, minor repairs required.
- C.3. Somewhat deteriorated, requiring minor repairs.
- C.4. Requiring major repairs.
- C.5. Scrap. No value except for its basic metal content.

Chapter II

SECOND-HAND EQUIPMENT MARKET

10. The principal causes for the generation of second-hand equipment are:

- Modernization
- Automation
- Obsolescence
- Closing of plants and mergers
- Old age and physical deterioration
- Government surpluses

11. *Modernization.* The process of industrialization involves a constant adaptation of production techniques and equipment for greater productivity, the introduction of new production processes, and the appearance of new products. Some of the available equipment, while not becoming obsolete, will as a result of these developments be either kept only in a stand-by capacity or sold as second-hand.

12. *Automation.* Automation is a type of modernization, but deserves particular mention as one of the most important single causes for the generation of second-hand equipment. Much of the second-hand equipment generated through automation is not obsolete, and is satisfactory, both from the technological and economic point of view, in smaller-scale plants or for conditions of lower labour costs.

13. *Obsolescence.* Equipment becomes obsolete when replaced by other equipment which performs the same function better or at more economic rates, or both. Such equipment is usually either kept on a stand-by basis or sold as second-hand. Obsolete equipment need not be old or worn, and may, in fact, never have been used. Obsolescence is a term of relative meaning, and equipment obsolete in one set of conditions may still be both technologically and economically adequate under a different set of conditions. Obsolescence, as a cause for generating second-hand equipment, overlaps in parts with modernization and automation, and cannot be completely separated from them.

14. *Closing of plants and mergers.* The liquidation of plants for economic, technical or other reasons accounts for a significant part of the equipment on the second-hand market. In the United States, in 1964 alone, there were 2,254 business failures in the manufacturing and mining industries. Plants are usually sold in "as is" condition, and second-hand machinery dealers are the main buyers. A number of companies specialize in plant liquidation, e.g., the Industrial Plants Corporation in the United States. Mergers, and the elimination of duplication of facilities which often follows, is also one

of the major causes for the sale of equipment on the second-hand market.

15. *Old age and physical deterioration.* Most of the equipment discarded for this reason is sold for scrap, and is only occasionally used for odd jobs. It should not be considered for possible use in developing countries.

16. *Government surpluses.* The main source of this category of second-hand equipment is the United States Government. Second-hand equipment becomes available as the result of modernization, obsolescence or completion of contracts for which government equipment was used. Government-owned equipment listed as surplus is first offered to government departments and then to the public. Its physical condition ranges from new to scrap, and it is listed in excess-property catalogues published by the United States General Service Administration. Equipment from this source is highly diversified and includes metal-working machinery, agricultural machinery and equipment, motor vehicles, construction and mining equipment, measuring tools, etc. A substantial part of the equipment sent through the United States Agency for International Development to developing countries comes from this source.

17. A number of other causes exist for the generation of second-hand equipment, but they are mostly restricted to special situations or to special types of equipment. For instance, trucks may appear on the United States second-hand equipment market as the result of changes in road laws.

18. The supply of second-hand equipment will be determined in the future by two main factors: technological innovations and trends in plant modernization in industrialized countries (the number of which will gradually increase). In the United States, of the 3,300 grey-iron foundries, 1,500 have gone out of business in the last ten years, partially as the result of castings in many machine components being replaced by welded parts, by precision casting, and by other substitute materials. In the metal-working field a number of new processes and materials may be expected to cause the replacement of a considerable amount of the equipment now in use. Such innovations are, for instance, Electrical Discharge Machining (EDM), Electro-Chemical Machining (ECM), Chemical Machining, High Energy Rate Forming (HERF), Ultrasonic Machining, Numerically Controlled (NC) Machining, etc.

19. The quantities of second-hand equipment generated through technological innovations can only be roughly estimated. It is estimated that NC will account for 10 per cent of the value of all new machine tools sold

in the United States in 1965, and one estimate predicts that by 1985 75 per cent of all machine tools will be NC operated. Due to the industrial application of other innovations enumerated above, the proportions by type of equipment in the total equipment inventories should also show considerable changes. As an example, a United States Air Force study forecasts substantial decreases in value of conventional machines and increases in value of new type equipment in its inventory by 1975. The value of boring machines will decrease from 18.5 to 10.3 per cent, and of lathes from 15.2 to 5.5 per cent. Electrochemical machining equipment, on the other hand, is expected to increase from 0.1 per cent in 1964 to 8.3 per cent in 1975. In 1964 there were 31,500 machine tools in the United States Air Force equipment inventory with an acquisition value of \$653 million. In industrialized countries the trend is from standard to specialized machinery, particularly for machine tools. As a result of this, it is certain that in the future this latter category will represent a larger percentage of the total amount of second-hand equipment sold. The demand in developing countries for some types of specialized equipment, such as, e.g., NC machine tools, may, however, lag behind the supply.

20. Apart from technological innovations, a large amount of second-hand equipment will be generated as the result of normal plant replacement programmes. According to the Ninth American Machinist Inventory of Metalworking Equipment, 64 per cent of the machine tools in the United States in 1963 were ten years old or older. Comparable figures for that same year were: 99 per cent for the United Kingdom, 98 per cent for France, 57 per cent for Italy, 55 per cent for the Federal Republic of Germany, and about 50 per cent for the USSR. A number of expert opinions agree that industrial equipment on the average ten years old should be replaced by new (or reconditioned) equipment in order not to slow down increases in productivity and not to increase production costs. On the basis of such criterion there are about 1,300,000 metalworking machines already slated for replacement in the United States alone. Today, the second-hand equipment market in the United States is approximately \$900 million annually in metalworking equipment, but it can be expected to increase substantially as the result of more liberal depreciation regulations and of intensive plant replacement programmes now under way. As a comparison, it can be added that the 1965 estimated demand for metalworking equipment in developing countries is approximately \$1,200 million. The demand by manufacturing industries of the developing countries for all capital equipment is expected to increase from \$3,500 million in 1961 to \$7,500 million in 1975.

21. No data are available on the magnitude of the world trade in second-hand equipment, either in terms of units sold and bought or in terms of value. An indication of the importance of this market is given by information compiled on some sectors of the second-hand machinery market in the United States, the single largest source of this category of equipment. Western European industrialized countries represent, as a group, the next most important source of second-hand equipment.

Among the Western European countries, the largest source is Great Britain, where the size of the second-hand market can be estimated at about 20 per cent of the one in the United States. Much of the second-hand equipment in Great Britain is exported to the countries of the Commonwealth. In the Federal Republic of Germany the supply of second-hand equipment is limited by the fact that the bulk of the equipment now in use is of late vintage. The USSR and industrialized countries of Eastern Europe have been redeploying the used equipment in the domestic manufacturing industry, and have not entered the international market for used equipment.

22. In a highly industrialized country such as the United States, there is an established second-hand market for virtually every type of industrial equipment. For instance, the September 1965 issue of the American monthly magazine *Used Equipment Directory* lists 576 used equipment dealers and 17,000 pieces of equipment for sale. The Directory covers the following categories of equipment:

Air moving (fans, blowers)	Mining
Chemical	Plastic
Controls	Plating
Construction	Power
Electrical	Refinery
Fabricating (shears, level- lers)	Rock products (concrete block machines, crushers)
Food	Rubber
Foundry	Steel mill
Heat treating	Testing
Inspection (gauges, micro- meters)	Tooling
Machine tools	Welding
Maintenance	Wire
Material handling	Woodworking
Metal forming	

23. Among the categories of second-hand equipment listed above, the most important are metal-cutting and metal-forming machinery. The United States Machinery Dealers National Association (MDNA) estimates 1965 sales of its members (accounting for approximately three-quarters of all United States second-hand equipment sales), consisting largely of metal-cutting and metal-forming machinery, at \$380 million. If all dealers are included, the total amounts to about \$500 million annually. While the dollar value of new metal-cutting and metal-forming machines sold exceeds that of the second-hand, the annual turnover in number of units sold is greater for the latter than for the former (the ratio is currently about 2:1). It is estimated that the United States Defense Department will generate about \$270 million of excess industrial equipment for each of the next 10 years, of which about \$210 million will be metal-working machinery.

24. Most of the commercial transactions in second-hand equipment are within the industrialized countries themselves. Export sales represent only a small fraction of the total sales. For instance, the United States Machinery Dealers National Association reports that export sales for its members in 1964 represented only \$22.4 million or 5.5 per cent of the total sales figures.

25. In the United States, sources of second-hand equipment can be divided into two categories: private companies and governmental agencies (particularly the Department of Defense, the single largest source of this type of equipment). Many large companies operate permanent surplus equipment departments, while the Government disposes of its surplus equipment through its Defense Industrial Plant Equipment Centre (DIPEC). Both individual pieces of equipment and entire plants (or large plant components) are handled by these organizations.

26. Equipment obtained by developing countries through commercial organizations dealing with second-hand equipment in industrialized countries is paid for at normal commercial rates. Machinery dealers accounting for about three-quarters of the total sales of second-hand equipment in the United States are organized in the Machinery Dealers National Association (MDNA). The MDNA is interested in promoting the export of second-hand machinery and at its annual meeting in 1963 it decided to draft a code of ethics and procedures to be followed by all member firms interested in exporting to developing countries.

27. Equipment obtained through non-commercial organizations such as Self-Help or Tools for Freedom in the United States can be acquired at considerably reduced cost. Self-Help is a private organization which rebuilds and sells farm equipment to farmers in developing countries. All equipment is fully checked before being sold at one-fifth to one-third of the original price. The Tools for Freedom Foundation makes available machinery and equipment to technical and vocational schools in developing countries, at no expense to them.

28. The United States Agency for Industrial Development (AID) exports excess United States Government equipment to developing countries but deals only with Governments, and not with private interests. In 1964, approximately \$30 million (original acquisition value) was exported under three programmes described below.

29. Under the advanced acquisition programme, AID selects and overhauls excess equipment in its own repair shops, warehouses it, and circulates an AID catalogue of available equipment to the developing countries. It is available for approved projects and programmes at no charge for the property itself. There is a 15 per cent surcharge for accessorial costs incurred by AID. This charge is based on the original acquisition cost of the property. The recipient must be a government agency or wholly owned corporation.

30. Under the direct acquisition programme, excess equipment is selected by the developing countries from a United States General Services Administration (GSA) catalogue. It can be reserved for the recipient who has 30 days in which to inspect and accept the equipment. On acceptance, the equipment is legally taken over from GSA by AID, overhauled, crated, and shipped to the recipient, all at AID expense.

31. Under the non-AID financed programme, the developing country also selects equipment from the GSA catalogue. In this case the recipient must pay for overhauling, crating and shipping, or arrange for these services on his own.

32. The United States Department of Commerce, when notified by a United States Embassy of the specific interest of a foreign buyer, will try to put him in touch with a reputable dealer of the second-hand equipment he seeks.

33. In the Federal Republic of Germany, the Government, under its foreign aid programme, supports the export of second-hand equipment to developing countries by providing financing and through its tax policy. The Government's policy is to ensure that the equipment coming under this programme is technically sound and economically acceptable, and that the constant availability of spare parts is assured. The German machine tool builders, however, are opposed to this programme. They claim that it might destroy their reputation for quality products and service.

34. Second-hand machinery (excluding the United States AID programme) generated in industrialized countries and exported to developing countries is usually purchased by private interests, particularly by machinery dealers in developing countries. Public sector organizations in developing countries are seldom the purchasers of second-hand equipment on the open market, though some of them avail themselves of the second-hand equipment offered through AID programmes.

35. The second-hand machinery market is noted for lack of price stability. Prices fluctuate widely as the result of marked changes in supply and demand. This can be explained by the fact that the second-hand equipment market is supply rather than demand oriented. Changes in demand are not followed by corresponding changes in supply, which results in a considerable volatility of prices. This makes it very necessary that intending purchasers should be sufficiently familiar with the market conditions, to enable them to make the purchases at the most attractive prices.

Chapter III

SUITABILITY OF SECOND-HAND EQUIPMENT FOR DEVELOPING COUNTRIES

36. The most frequently cited advantages of second-hand equipment are: lower operating costs, shorter delivery periods, suitability for small-scale of operation, simpler maintenance, greater ease of manufacturing parts locally, less skill needed for operation, a more flexible replacement policy.

37. The disadvantages of second-hand machinery most often listed are: shorter economic life, increased risk of obtaining a machine in unsound technical condition, increased risk of breakdown, higher maintenance costs, lack of spare parts, lower ability to work to fine tolerances, lower product quality and increased spoilage, greater difficulty in locating the precise equipment needed, and financing difficulties.

38. In our view, both the advantages and disadvantages mentioned above are debatable, their being valid in one set of circumstances, and invalid in another. One definite advantage of second-hand equipment on which, however, there is general agreement, is that they can be acquired at a cost often considerably lower than the cost of new equipment. For instance, \$100,000 worth of used automatic screw machines, lathes and millers were bought in the United States for a gear plant in South America. The cost of rebuilding the machines was \$30,000, but the cost of equivalent new machinery would have been \$300,000. Such savings are of particular importance for developing countries with severe foreign exchange shortages. The costs of inspecting, crating, transportation, and installation are a higher percentage of the total costs of getting a machine in an operating condition with second-hand equipment than with new equipment. Consequently, they tend to reduce the price advantage of used equipment. Because of these costs, the price advantage will often remain only if the equipment (be it individual machines or a complete plant) is expensive and the price differential between the new and second-hand equipment is considerable.

39. Second-hand equipment, be it an individual machine, a group of machines, or an entire plant, must always be evaluated on its own merits. There is no existing reliable method for determining, *a priori*, the types of second-hand equipment suitable for use in developing countries, or industry sectors lending themselves to advantage to the utilization of second-hand equipment. At best, only some indications can be given as to what second-hand equipment may be advantageous for countries undergoing industrialization. The selection of proper equipment requires knowledge of equipment as well as the exact purpose for which it will be used. This knowledge is available from the supplier and from engineering organizations. In all cases, the supplier

should be aware of the exact purpose for which the equipment will be used.

40. Where technological innovations have not been considerable, there is a greater probability that older equipment can be put to profitable use in a developing country than when improvements in the newer machines also result in improvements in the product made. Machinery incapable of producing a product which is, at least, competitive with existing local facilities is uneconomic to acquire at any price. Equipment which is not deteriorated and does not make a product of inferior quality, but has been replaced only as the result of a change to a larger scale of operations or in order to reduce labour costs, is often still adequate for use in developing countries with limited market demand and lower labour costs.¹

41. In selecting equipment for use in developing countries, it is conditions in these countries, and not those in developed countries, that must be kept in mind for determining their suitability. For example, equipment to be used in tropical countries must be adapted for the conditions in those countries. In the United States and Sweden, paper mills must operate at speeds of 700 to 1,000 metres per minute to be competitive. Mills operating at 350-400 metres per minute are uneconomical and available second-hand. These slower mills may be economical in developing countries due to smaller demand. In addition, these slower mills require simpler maintenance which is more readily available in the developing countries.

42. Complete plants or a number of integrated machine units are often a better buy than single machinery units. The characteristics of complete plants are dealt with later in this text in the chapter on complete plants.

43. Long-lived second-hand equipment (such as most of the manufacturing and electrical equipment) can be used to better advantage than short-lived second-hand

¹ An example of profitable utilization of second-hand machinery in a developing country for a product which has not been subject to any improvements is that of a semi-automatic machine for making wood screws. Such machine was purchased from a European company for a country in Asia, where it not only undersells the European product but also exports to neighbouring countries at a lower price than the European company which uses more sophisticated production equipment. Another example is that of some old casting equipment shipped from the United States to South America. Although the steel for castings had to be shipped from the United States, it was found that castings made in South America could be delivered in the United States (a round-trip distance of 7,000 miles, including 700 miles of inland transport) at a lower cost than could be produced with modern equipment in the United States.

equipment (e.g., transportation equipment, with such exception as railroad rolling stock) in developing countries. The remaining economic life of the latter may be very short. It should be noted at this point, however, that the terms long-lived and short-lived as used here are of relative value. The average life for the same type of equipment varies from country to country. For instance, currently the life of equipment is generally shorter in the United States than elsewhere, partly because of quicker replacement.

44. Large pieces of second-hand equipment for intermittent use and some specialized types of equipment with very high initial prices appear particularly suitable for the needs of developing countries. Price savings are often considerable, and the fact that such equipment may not incorporate the latest design innovations is of comparatively little importance. Examples of such equipment are special grinding machines, special honing equipment, cranes, etc., which are only occasionally used.

45. Second-hand equipment to be used for maintenance is also suitable for developing countries. The productivity of maintenance equipment is not a factor of great importance since most of it is used only part of the time, and even if obsolete for production purposes, it can still be useful for repair and maintenance.

46. Standardization problems should also be given proper consideration in determining a policy for the import of second-hand equipment in developing countries. A great variety of makes, no matter how sound individual pieces of equipment may be, multiplies the already difficult problems of spare parts, maintenance and repairs. The advantage of a limited number of makes has been demonstrated in countries which have been the recipients of large numbers of United States military surplus trucks. The small number of makes has greatly facilitated truck maintenance problems in these countries.

47. In the chemical industry in industrialized countries equipment is often made available on the second-hand market not by product changes but by a changeover from batch to continuous production, due to increased market demand. This used equipment can be quite satisfactory for the needs of developing countries, with their smaller markets.

48. In the textile industry of the United States, it has become unprofitable for manufacturers, with a very few exceptions, to produce specialty fabrics. A case in point is worsted fabric, or corduroy, which can often be imported as finished fabric for less than the domestic manufacturing costs. As a result, integrated plants manufacturing such fabric have been disposed of in their entirety in the United States. Such plants can often be used to economic advantage in developing countries.

49. Among machine tools, equipment which is in sound technical condition, and in addition can be retrofitted with numerical control, is also often a bargain obtainable at a much lower cost than that a buyer would have to pay for a new numerically controlled tool. Care must be taken that the metalworking equipment considered for purchase is equipped with the standard accessories. If the machine is being purchased for a specific application, the necessary jigs, fixtures and dies should also be procured. Without these, the equipment is useless. At the same time it must be kept in mind that dies, as well as many of the jigs and fixtures, are not adaptable, and can be used for the production of only one specific piece.

50. The installation of electrical equipment often requires skill in short supply in developing countries. Installation services are both easier and comparatively cheaper to obtain with the purchase of large electrical installations than with the purchase of smaller pieces of electrical equipment. Gas driven equipment, because of the cost of fuel in many developing countries, is uneconomical for use in these countries. Second-hand small motors, because of cycle differences from region to region and costs of conversion, are also often unsuitable for export to developing countries.

51. Measuring tools and equipment, the accuracy of which is not impaired through use (e.g., scales) represent also suitable second-hand equipment for use in developing countries.

52. Some types of used equipment should clearly not be considered for use in developing countries. A good example of such equipment is first-generation computers which use a large number of vacuum tubes, the life of which is limited and which are often difficult or impossible to find replacements for. Only computers with solid state circuit elements, the life of which is quite long, can be considered as adequate. Another example of second-hand equipment inadequate for export to most developing countries is that of United States-made passenger cars, the majority of which are equipped with automatic transmissions. Facilities for the repair and maintenance of these transmissions exist in very few of the developing countries.

53. The correct and thorough identification of second-hand equipment, by type of equipment or by industry sector, suitable for use in developing countries requires a detailed analysis by experts with a specialized knowledge of various types of equipment or of various industries. A number of such analyses has been made but the need for additional analyses is considerable and they should be undertaken as soon as possible to provide guidelines in equipment purchases for developing countries.

Chapter IV

MAINTENANCE OF SECOND-HAND EQUIPMENT

54. *Maintenance* of second-hand equipment, compared with that for new equipment, can have both advantages and disadvantages. There is no clear-cut difference in the magnitude and nature of maintenance problems between new and second-hand equipment. However, a knowledge of electrical control circuits, hydraulics, pneumatic systems and electronics is often necessary for the maintenance of modern machinery and such modern machinery may stand idle for long periods of time in developing countries where these skills are still in short supply. On the other hand, the older the machine, the greater are the risks of breakdown and consequent losses from reduced production and larger repair costs. Also, it is true that in many cases second-hand equipment is available without maintenance manuals, schedules, and other necessary data for the efficient performance of the maintenance function.

55. While all equipment requires more maintenance with age, the increase in maintenance costs is not proportionate to age. For instance, one study on textile machinery shows maintenance costs rising from 1 per cent of the original costs after one year to 2 per cent after 10 years. One large chemical company reports that it has no record of any piece of equipment being replaced due to high costs of maintenance, but that replacement due to obsolescence occurs daily. The experience of the trucking industry in the United States indicates that while parts replacements increase with time, repairs costs do not dramatically increase with the age of the vehicle.

56. Maintenance and repair capabilities are indispensable for the adequate utilization of industrial equipment, be it second-hand or new. Maintenance and repair shops at the plant level, particularly in the case of larger plants, are indispensable, but the need for larger centralized maintenance and repair shops, with some spare parts production capabilities, also exists in countries undergoing industrialization.

57. *Spare parts* availability for second-hand equipment, when compared with that for new, has also both negative and positive aspects. In general, spare parts are more easily available for new than for old equipment. But in many cases where technological improvements have been few or where deterioration of parts is negligible (process equipment used in the chemical industry, such as vessels and tanks which have no moving parts) spare parts present no greater problem in the case of second-hand equipment than in the case of new. In addition, producers of machinery generally stock repair parts for machines of their manufacture for at least ten years. In the case of textile machinery, some manu-

facturers continue to make spare parts for machines they produced forty years ago.

58. In the case of spare parts being manufactured locally in developing countries, rather than being imported from industrialized countries, second-hand equipment with parts of simpler design and made of less sophisticated materials have often a definite advantage over new modern equipment.

59. The cost of spare parts for second-hand machines may be on the whole higher than that for new equipment, but there are exceptions, and replacement parts for old machinery can often be obtained at a fraction of the cost of spares for new equipment.

60. It must be kept in mind that the spare parts problem is not the same in developing as in developed countries. In a developed country, in a large industrial centre, a part is usually available the same day. Parts for older equipment which must be made to order may require from one week to one month for delivery. For new equipment, in developing countries, distance, customs procedures, and foreign exchange difficulties may extend the one-day delivery into three months or more for imported parts. For second-hand equipment, due to the frequent absence of operator manuals, parts catalogues, or identification plates, the difficulties in connexion with spare parts procurement are often multiplied. This clearly points to the need, for types of equipment where the supply of spares is important, to assure at the time of purchase a sufficient and reliable source of spare parts. Whatever has been said above of second-hand equipment is also true of accessories, and it is important that they be selected as carefully as the equipment itself.

61. With few exceptions, no *service* arrangements are made in the case of exported individual pieces of second-hand equipment. For major plant components service arrangements are found somewhat more frequently. For complete plants, a clause of the contract will sometimes provide for the contractor's responsibility for maintenance of the equipment for a period of time. In developing countries, with comparatively small inventories of industrial equipment, servicing is naturally more costly and more difficult to obtain than in industrialized countries with large concentrations of industrial equipment.

62. The remaining useful *life of second-hand equipment* will depend on technological changes and on the physical condition of the equipment. Rebuilt machinery of a type where no improvements have been introduced

for a longer period of time can last as long as new machinery of the same type. In an area, however, where innovations are constantly built into machinery, second-hand machinery will naturally become obsolete sooner than new machinery. The remaining life of second-hand equipment can only be estimated, and it will vary from

type to type of equipment. It should also be mentioned at this point that a clear distinction should be made between equipment and process or product innovations: equipment does not necessarily become obsolete as the result of the innovations in the latter. This is in particular evident in chemical process equipment.

Chapter V

COST CONSIDERATIONS

63. The sales price of second-hand equipment will depend on a number of factors, of which the most important are: whether equipment is sold "as is", reconditioned, or unused; its age; its physical condition; whether it is obsolete or obsolescent or not; conditions of demand and supply for new equipment; the sales source, etc. While no definite figures can be given for the cost of second-hand equipment as compared with that for new equipment, some generalization can be made for the United States, on the basis of past market experience.

64. Standard metalworking tools such as lathes, grinders, brakes, millers, and drill presses in good operating order, but not rebuilt, can be obtained in the United States at 25-45 per cent of the cost of new equipment. Rebuilt, they sell for 65-75 per cent of the cost of new equipment. Heavy and special metalworking machinery such as boring mills, forging hammers, presses and vertical turret lathes in good operating order, but not rebuilt, sell at 30-50 per cent of the cost of new equipment. Rebuilt, the cost goes up to 40-60 per cent of the cost of new equipment. The cost variations here indicated are rather wide because, among other influences, some used equipment may require only minor repairs to be operable, while some may need rehabilitation costing as much as 30 or 40 per cent of their original value. For work which requires fine tolerances, it may be necessary to rebuild the machine completely; for work where close tolerances are not essential, it may be necessary to replace only the operating parts of the machine without rehabilitating the structural parts — which can be usually achieved at a comparatively small cost. Chemical process equipment, in good operating order, but not rebuilt, will sell for as little as 25 per cent to as much as 50 per cent of the original replacement cost for mechanical equipment, and up to 70 per cent for plate fabrications (particularly tankage). Passenger cars will usually lose one-third of the original value after one model year, one-quarter more the following year, one-fifth again by the end of the third year, one-sixth the next year, and so on. In four to five years a passenger car will lose an average of 75 to 90 per cent of its original sales value, depending on make, conditions of demand and supply, etc. The above figures are for the United States. In other countries where it is more difficult to purchase automobiles because of high import duties and

other reasons, the drop-off in value is not so abrupt, but follows a more gradual curve. The general rule of depreciation for trucks (again for the United States) is one-quarter loss of original value the first year, one-fifth the second year, one-sixth the third year, one-seventh the fourth year, and so on until a level is reached below which the price never drops as long as the truck can run and can be repaired.

65. Packing, transportation and installation costs are the same for second-hand machinery as for new equipment (in cases where equipment is bought "as is, where is" dismantling costs must also be often added for used equipment). These costs often represent a significant percentage of the total cost and, particularly for comparatively low cost machinery, reduce the economic advantage of second-hand over new equipment.

66. In an industrialized country, investment in a new, more expensive machine will usually be justified by operating labour cost savings. In developing countries, where in many instances labour is comparatively inexpensive, the same investment in a new more expensive machine often cannot be economically justified because the additional cost of the new machine cannot be offset by labour savings made possible by its use. What has been said of operating costs is often true of maintenance costs as well, due again to lower labour rates than in developed industrial countries.

67. Provided all cost elements are properly taken into account comparative cost studies for alternative types of equipment are made in the same manner whether (a) only new equipment is considered, (b) only second-hand equipment is considered, or (c) both new and second-hand equipment are possible alternatives: the alternative that should be selected is the one resulting in lowest cost per unit of output. This is true of the annual cost method, rate of return method, present worth method, MAPI (Machinery and Allied Products Institute) method, or any other variation of scientific cost comparison methods.

68. It is true that in some cases the alternative not yielding the lowest cost per unit of output is selected. This selection, however, is not because of cost factors, but for other considerations such as the lack of foreign exchange, or unusually long delivery periods for equipment.

Chapter VI

SECOND-HAND EQUIPMENT AND THE INDUSTRIAL PROGRESS OF DEVELOPING COUNTRIES

69. No blanket endorsement or condemnation can be made of the use of second-hand equipment in developing countries. Every possibility for the utilization of second-hand equipment must be examined on its own merits, taking into consideration all relevant factors. The problem of economic utilization of second-hand equipment is difficult, if not impossible, to solve on the basis of theoretical generalizations, because of the very large number of variables involved, and it should be approached through actual cases. Still, a knowledge of current discussions and controversies concerning the major implications of the use of second-hand equipment on the industrial growth of developing nations should be valuable.

70. Proponents of the complete prohibition of second-hand equipment for use in developing countries affirm that used equipment will slow down economic development by saddling countries undergoing industrialization with an obsolete technology. Such technology would make impossible effective competition with industrialized countries, maintain the technological gap between developing and developed countries, slow down the training process of technical cadres, reduce possible productivity gains, and effectively relegate developing nations to a permanent second-class status as economic powers. All these objections have validity under some circumstances while under different circumstances they can be altogether unfounded.

71. Second-hand equipment which only produces goods which are not competitive in price and quality at least domestically is not a bargain at any price and should be rejected outright. But not all second-hand equipment is inadequate for the needs of developing (or advanced) nations and incapable of producing competitively priced quality goods. For instance, some machinery will appear on the second-hand equipment market due to a switchover to a larger scale of operations, caused by increased market demand. Such equipment is often still suitable for manufacturing operations on a smaller scale, either in developing or developed countries (particularly for small-scale industries). In fact, almost 95 per cent of the second-hand equipment generated in the United States is purchased by local users, and only slightly over 5 per cent of it is exported.

72. Many manufacturing companies in developed countries face liquidation every year (3,254 business failures in the United States in 1964, in the mining and manufacturing industries) often for reasons unrelated to their production operations. Production equipment belonging

to such companies and sold on the used equipment market is often still satisfactory for manufacturing purposes.

73. The high degree of automation in manufacturing operation in advanced industrial countries is not always because of advances in technology, but quite often it is the result of high labour costs. Machinery replaced in high labour cost areas by less labour intensive machinery may still produce competitively priced goods under conditions of lower labour costs. Examples of such machinery used in developing countries and competing successfully with foreign goods not only on the local market but in foreign markets as well are not rare.

74. Quality requirements for goods (particularly consumer goods) sold in developed countries are often much more strict than those found in developing countries. Equipment not capable of satisfying these requirements in the former group of countries can often still satisfy them in the latter. This, however, will vary from country to country, and from product to product.

75. Technological innovations will occasionally make available less costly substitute raw materials for some types of products, which will require a changeover to a different type of production equipment. The machinery replaced can, however, be still used to advantage in areas where original raw materials are in abundant supply and cheaper than their newly developed substitutes.

76. All equipment appearing on the second-hand market for the reasons described above can still be often economically used provided, of course, other necessary conditions (required also for new equipment) are satisfied: satisfactory physical condition, availability of spare parts, assured maintenance and servicing, etc.

77. While it is true that new machines are very often more productive than old ones, it is also true that machine productivity problems cannot be considered separately from problems of market demand: a highly productive machine or plant that stands idle much of the time due to small market demand may have no advantage over a less productive machine or plant working at capacity (in fact, the opposite is usually correct). The cost per unit of product turned out is, on the other hand, always relevant. In a developing country, with a limited market and low labour costs, a simpler, less productive machine or plant will often be more economical than a new automatic one. It can also be added at this point that fixed costs for capital intensive equipment are higher than is the case for more labour intensive operations,

and that losses due to market demand fluctuations are accordingly higher for the former than for the latter.

78. The subject of skills in relation to the use of second-hand equipment in developing countries is not clear-cut. Skills required for the operation of an old machine are often substantially different from those required for the operation of one of new design: they are not necessarily simpler skills. The opposite is often true. Maintenance skills required, on the other hand, are usually greater for modern machinery than for equipment of older design. The flat statement that the use of second-hand equipment generates obsolete skills has no more sound basis than the flat statement that second-hand equipment should not be used in developing countries. Only those skills that service obsolete equipment may be obsolete. Skills necessary for the operation and maintenance of equipment appropriate for market, labour, raw materials and other relevant conditions of a given country are the skills appropriate for that country (notwithstanding the fact that they may be deficient for some other country, with different conditions). One of the serious disadvantages of individual pieces of second-hand equipment vis-à-vis new equipment, in relation to skills, is that provisions for the transfer of operating and maintenance know-how are very often much less satisfactory for the former than for the latter.

79. The main and clear advantage of second-hand

equipment in the economic development of emerging nations is its lower acquisition cost, compared with the cost of new equipment. Apart from the savings in foreign exchange, which are of overriding importance for many developing countries, the lower costs of second-hand equipment make it possible for many entrepreneurs in these countries, who have to depend on their own limited financial resources, to start manufacturing operations on a modest scale, and thus also establish at the same time the basis for further industrial growth.

80. While second-hand equipment can be utilized to good economic advantage in developing countries, they should not make the development of their industries dependent on the supply of this category of equipment from industrialized countries. Second-hand equipment should be made use of in developing countries in cases where cost studies based on alternative techniques or scales of production (or the existence of some other restraints such as lack of foreign exchange) clearly favour such equipment over new equipment. The industrialization process will undoubtedly gradually lead to a change of conditions where the problem of utilization of second-hand equipment in developing countries will be no different from the one in other industrial countries. The judicious use of second-hand equipment, it is believed, can in the meantime contribute to the reduction of this transition period.

Chapter VII

EXPERIENCE IN DEVELOPING COUNTRIES WITH SECOND-HAND EQUIPMENT

81. The experience in developing countries with the utilization of second-hand equipment gives numerous examples of both successful and unsuccessful applications. A number of these examples are good illustrations for the major topics of the subject matter of this report.

82. A good illustration of an older and less productive plant still being capable, because of lower labour costs in this particular case, to successfully compete with modern plants operating in industrialized countries is the already cited example of a foundry in South America exporting castings to the United States. Another example is that of a private firm in Asia, affiliated with a larger European concern, from which it bought a used semi-automatic machine for making wood screws. The Asian firm, working under conditions of low labour rates, not only undersells the European company in its own country, but also exports to neighbouring countries at a price lower than its European associate. When, however, the productivity gap between the older second-hand machine and the new machine of modern design is considerable it often cannot be compensated by low labour costs. For instance, used machinery imported from Africa was installed in a paper-board factory in the West Indies. Despite low wages this plant was not able to compete with United States factories which, with their more modern machinery, were turning out a less expensive product.

83. Because of different market requirements, a plant which manufactures a product of a quality unacceptable in one country can still operate successfully in another country. For example, used batch-dyeing equipment in a textile plant in a Central American country could not be made to reproduce the exact shade of colour from one batch to the next. Still, it operated successfully because local consumers did not object to variations in the shade of the material they purchased. The case of a steel mill in Latin America was less fortunate: the choice for this plant was either to buy a few stands of a semi-continuous mill with a view to adding more stands in the future, or to install a used reversing mill of the Steckel type. Because of the somewhat lower price, the latter was selected. As a result of this selection the steel plate and sheet produced by the Steckel mill could only be marketed in the country with the protection of a very high tariff on the importation of similar steel products. This was due to the limitations on size, quality and price of the flat steel products. The mill could only produce steel plate and sheet of one metre width and of uneven thickness. Although the mill has

sufficient capacity to satisfy the local market requirements of flat steel products until 1975, its position as a supplier could be greatly endangered if the Latin American market is opened to other mills in the region which could supply similar products of better quality at a price of 30 to 35 United States dollars per ton lower than that produced by the Steckel mill. A plant such as the steel mill just described can, in fact, operate only in a protected market, and then only until a competitor builds a more efficient plant within the country. Thus, textile machinery built in the United States in the 1890s was first used in Europe, then in one country of Central America, and finally was installed in another Central American country during World War II for the production of coarse cloth. This textile mill was able to sell its product at a profit as long as there was a shortage of cloth, but after the war another plant with more modern equipment was built in the country and the old plant could not compete and had to stop its operations.

84. As indicated earlier in the text, a plant may become obsolete in one country due to the appearance of new, less expensive raw materials. In another country where the original raw materials are abundant and still cheaper, it can still remain competitive. Thus, a synthetic rubber plant using ethyl alcohol was made obsolete in the United States by the appearance of a cheaper process using refinery gases as raw material. The entire plant was transferred to an Asian country where ethyl alcohol was cheap and in abundant supply. The plant was put into operation a year sooner than if it were new. It has operated without any special operating or maintenance problems since its construction.

85. Second-hand equipment is imported in developing countries primarily by private interests. There are very few instances of such equipment being purchased commercially for the public sector. The imports of second-hand equipment have been by local entrepreneurs, for joint local-foreign ventures, and by foreign companies establishing subsidiaries in developing countries.

86. A study carried out by the Organization of American States in 1963 lists the following impediments to the use of second-hand equipment in Latin America and reflects, in general terms, the experience of most developing countries with this category of equipment:

(a) There is still a limited knowledge of investment opportunities in which second-hand equipment could be appropriately used;

(b) There is little knowledge among Latin American industrialists of the availability and advantages of second-hand equipment;

(c) There is not yet a sufficiently large cadre of skilled managers, technicians and skilled workers to solve the problems involved in the selection, shipment, installation, operation, repair, and maintenance of such equipment;

(d) Purchases of second-hand equipment are discouraged by the unwillingness of international lending institutions to provide credits for such equipment;

(e) In a number of countries import regulations forbid or limit the utilization of second-hand equipment.

87. Restrictions on the importation of second-hand equipment exist in developing countries such as some of the Latin American countries, India, Iran, Iraq, Somalia, Turkey, etc. The Governments of all these countries were requested by the Centre for Industrial Development of the United Nations to give information on the reasons leading to such restrictions. The answers received list as major reasons the following:

(a) Difficulties in obtaining information regarding the technical and economic aspects of second-hand machinery;

(b) The lack of technical experience in the acquisition and evaluation of second-hand equipment;

(c) Non-availability of spare parts and maintenance problems;

(d) Opportunities for smuggling out foreign currency through transactions involving second-hand equipment;

(e) Lack of adequate guarantees, as compared with new equipment.

Another reason mentioned was the possibility of low-priced second-hand equipment affecting adversely the domestic equipment manufacturing industry.

88. One of the reasons not mentioned in the replies received, but discussed in several studies on the subject matter, was a feeling in many developing countries that second-hand equipment was in some sense inferior, and that its use in the process of development was therefore derogatory to national pride. This impediment is of a psychological nature, and is an expression of value judgements which do not lend themselves to scientific discussions. It can be stated, however, that second-hand equipment is used to considerable advantage in developed countries, and that developing countries should not deprive themselves of similar advantages for their economic development because of non-economic considerations.

Chapter VIII

MECHANISM OF ACQUIRING SECOND-HAND EQUIPMENT

89. The efficient selection and utilization of second-hand machinery in a developing country requires the knowledge of the machinery needed to produce for the domestic market (or for export, as the case may be), and the know-how to obtain the necessary equipment and assure that it is operable. Few developing countries are at the present, by themselves, qualified to meet all these conditions.

90. The first requirement in the acquisition of machinery (whether new or used) is to know the exact specifications required to meet specific needs of the buyer. The more detailed this knowledge the greater the possibility of locating the equipment required. Machinery rusting out-of-doors in developing countries is often a testimony that someone was unfamiliar with what was needed. Even those with a good knowledge of industrial equipment are subject to gross errors if they are unfamiliar with market conditions in developing countries: sometimes plants built by United States companies in such countries are not of the appropriate scale.

91. In order to avoid such costly mistakes buyers of second-hand equipment in developing countries can do a number of things: they can, after a careful determination of their requirement in the light of the market they intend to supply, engage managers or consultants from abroad to help them acquire and operate usable second-hand machinery. This was the approach selected by an iron and steel mill in Latin America. Its experience with second-hand equipment was quite satisfactory. Another approach is joint business ventures in which both local and foreign interests participate. A successful example of such venture can again be found in Latin America. A United States automotive company contributed used equipment from one of its United States plants and provided all the necessary personnel to bring the plant in Latin America into full and profitable operation.

92. Many technical magazines and equipment directories list available used machinery and equipment, and trade associations of the various industries may also be able to help locate particular pieces of equipment or plants. The United States Department of Commerce, as already mentioned, when notified by a United States Embassy of the specific interest of a foreign buyer, will try to put him in touch with a reputable seller of the used equipment he seeks. In addition, under the United States AID programmes, governments of developing countries can obtain second-hand equipment by making a request through appropriate official channels. The problem in the past has been to match the equipment

requested with the one available. The waiting period until the particular item requested becomes available as United States Government excess property can be considerable, and certain types of equipment are unlikely to be available from that source.

93. In industrialized countries, particularly in the United States, there are hundreds of dealers of second-hand equipment, many of them specializing in specific types of equipment. These dealers can be of considerable help in locating and selecting the equipment required, but care must be exercised to approach only dealers who are both reputable and competent to render the specific service needed. Dealers maintain extensive mailing lists to which they keep adding the names of those from whom they receive inquiries or who they believe may be interested in their offerings. Those on the mailing lists periodically receive information on the dealers' available machinery.

94. Some manufacturers of new equipment also sell used machinery and equipment of their own make which they have reconditioned or rebuilt. Many manufacturers who sell only new machinery and equipment know which of their customers are planning replacements, and are thus in a good position to direct would-be purchasers of used equipment to potential sources of supply. The United States Government also sells used machinery and equipment on the open market. These sales are widely publicized, and anyone may have his name placed on the list to receive announcements. Under certain circumstances, negotiated sales of surplus equipment can also be arranged.

95. Since the condition of a piece of equipment may vary considerably, a potential buyer of second-hand equipment is well advised to engage an independent and qualified authority to examine the machinery he is considering for purchase. There are several well-known and reliable organizations which specialize in appraising, inspecting, testing and certifying equipment of all kinds. The valuation is based on both the market price and on the original cost minus depreciation. Also most equipment manufacturers will for a fee also send a trained factory engineer to inspect a used piece of equipment of their make and determine its present state of repair, reconditioning required, and potential operating life. In connexion with this service, they will provide lists of recommended spare parts, together with prices and lead time for delivery. For some types of equipment, e.g., boilers, insurance companies may also provide inspecting, testing, and certifying services. However, even the best experts cannot determine exactly how good a piece of equipment is from its appearance. To evaluate

properly the capabilities and shortcomings of a machine. It must be tested and put through its entire cycle of operation in accordance with a standard test pattern (such as has been developed, e.g., by the United States Defense Department) which indicates the machine's accuracy at designated important points. Testing under power is particularly important to determine the soundness of component parts.

96. The purchaser must also determine if the equipment is both capable of using attachments designed for use with it and is equipped with standard accessories and attachments. Otherwise, the equipment may be useless for the purpose which the buyer has in mind. Some of the equipment sold on a "as is" basis, including United States surplus, may have parts and accessories missing. The buyer from a developing country who wants to acquire large or special types of equipment must also be certain that it can be dismantled, packed, shipped and reassembled without injury. The fact that equipment operates well at its original location provides no assurance that it can be dismantled and reassembled at the new site, and be made to operate as efficiently as before.

97. There are three bases on which second-hand equipment is offered for sale: (1) unused; (2) reconditioned; and (3) "as is". As a generalization it can be said that if a piece of equipment is too large to move economically, or to recondition in the dealer's plant it is sold "as is, where is". Most second-hand equipment dealers have warehouses where equipment is cleaned, painted, repaired, and exhibited for sale. There are usually facilities where a buyer can test the equipment in operation. Many of the larger dealers have facilities for

completely rebuilding a machine. Equipment is also rebuilt by independent rebuilding companies and new equipment manufacturers.

98. For individual pieces of second-hand equipment the transfer of know-how for installation, operation, maintenance and repair consists at best of the original manufacturer's instruction and parts manual. For a major component, the buyer's production engineer may be brought to the industrialized country where the equipment was sold, or the exporter will send a man to install, operate, and maintain the equipment for a limited period of time. For a complete plant, the seller or a consulting engineer will perform this function as well as train local staff; or the entire supervisory staff will be sent for training to a similar plant which is in operation.

99. There are all kinds of guarantees given with used equipment, such as the guarantee that the equipment conforms to specifications "to the buyer's satisfaction", or that defective parts will be replaced, etc. However, the best guarantee from the standpoint of a buyer in another country is one in which the seller certifies that the equipment will either do a specified job or will be replaced by another piece of equipment that will. Manufacturers of new equipment who sell reconditioned equipment of their own make are a particularly desirable source of used equipment, since the buyer usually gets a warranty or guarantee with his purchase and can expect to get repair parts for the rehabilitated equipment. The members of the United States Machinery Dealers National Association give a 30-day money back guarantee on most sales in the United States with the buyer paying the cost of the return transportation.

Chapter LX

FINANCING OF PURCHASES OF SECOND-HAND EQUIPMENT

100. An important factor limiting the use of second-hand equipment in developing countries is the difficulty in financing the purchases of such equipment. Financing in this context has two aspects — the provision of credit to the seller of the machinery so that he can in turn offer extended payment facilities to the foreign purchaser, and secondly the provision of credit in the developing countries to entrepreneurs purchasing second-hand equipment. The problem of financing purchases of second-hand equipment is, with very few exceptions, linked up with the general problem of shortage of foreign exchange and the need for credit.

101. Most of the developing countries have been facing, in varying degree, foreign exchange difficulties. Where acute foreign exchange shortage exists, almost the entire imports of capital goods in a country are financed through inter-governmental long-term credit arrangements in one form or another or through private foreign investment. In such cases the non-availability of aid for financing second-hand equipment would seriously limit the possibilities of using second-hand equipment in the process of industrialization. In other countries where the foreign exchange problem is not acute (or, in rare cases, does not exist) there may be greater scope for using second-hand equipment and paying for it in cash.

102. Some of the aid-giving countries do not, as a matter of principle, export second-hand equipment against their aid funds. In certain other cases, although in principle there is no bar to the aid funds being used for importation of second-hand equipment, the procedural requirements make it much more difficult in practice to use aid funds for importation of used equipment. Certain sources of funds, such as direct project loans or loans made by export-import banks or similar organizations, can be used for buying second-hand equipment, usually in the form of complete plants.

103. The difficulty arises mainly in cases where the assistance takes the form of fairly long-term deferred payment arrangements (e.g., the long-term suppliers' credits given by some of the West European countries to India and Pakistan under the respective consortium arrangements) or deferred payment arrangements financed through export credits and guarantee corporations in different countries. Wherever such credits are given, they are intended to enable the manufacturer to provide longer term credit to customers overseas. In order to reduce the financial strain on the exporting manufacturer, it is

also customary for supplementary banking arrangements to be made in the exporting country, which enable him to receive in cash the bulk of the value of the export order at the time of shipment. In general, arrangements for suppliers' credits are intended to assist exports of new equipment, and it would appear that such suppliers' credit is not normally available for export of used equipment, a main reason therefore being the restrictions imposed on the governmental export credit insurance organizations, particularly in Europe, to cover credits for the export of second-hand equipment.

104. The provision of adequate finances in local currency both to the seller and the purchaser also poses certain special problems. Many industrial banks or development corporations consider that the use of second-hand equipment introduces an element of uncertainty in assessing the economic viability and security of the firm. In the case of second-hand equipment it is usually more difficult to determine the resale price, partly because there is no organized market and partly because, as pointed out earlier, it is a supply-oriented market with very high fluctuations in prices. For these reasons, an industrial bank lending against hypothecation of goods will be generally more cautious in lending against used machinery than against new machinery. In cases where loans are to be made against used equipment, banks usually require certification from a reliable source that the equipment is in perfect operating order, that it will last at least as long as the time of the loan and that spare parts will be available if needed.

105. The problems of financing are greatly reduced when, as in the case of the United States AID Programmes for Excess Property, governmental arrangements exist to provide the foreign exchange to the developing country. Commercial purchases of second-hand equipment either by private entrepreneurs or by governmental agencies run into much greater difficulties partly because of the financing problem and particularly the shortage of foreign exchange, and partly because the seller of used equipment, whether a manufacturer or a dealer, cannot afford to keep the equipment on offer for any length of time. The short time within which to make financial arrangements, the difficulty in arranging for bank credits, and the non-availability or greater difficulty in getting the foreign exchange necessary for importing used equipment — all these have tended to limit the possibilities of using second-hand equipment in developing countries.

Chapter X

ACQUISITION OF COMPLETE SECOND-HAND PLANTS

106. Complete second-hand plant is here defined as a production unit including equipment, drawings, jigs and fixtures, dies, cutting tools, etc. required to make a product or a service. The equipment may be entirely second-hand or a combination of new and mainly second-hand. The equipment may derive from one factory or consist of individual pieces of second-hand equipment, including the necessary tooling, that have been assembled from different sources to meet the specific requirements of a customer.

107. Complete second-hand plants become available in industrialized countries from both private and public sectors. Almost every type of plant is offered second-hand, although usually it is not possible to know when a given plant will enter the market. Complete second-hand plants become available through mergers, consolidations bankruptcies and liquidations. These in turn are caused chiefly by economies of scale, but also by improvements in manufacturing process, changes in product demand, changes in raw material prices and other factors. The supply of complete second-hand plants can be expected to increase in the future.

108. Firms operating unprofitable or marginal plants are often induced to sell the plant by actual offers to purchase. Tax incentives would also induce these firms to offer plants for sale. The firm disposing of a second-hand plant will, as a rule, first offer the plant as a complete unit through trade and banking channels. If this fails, a main reason heretofore often being the short time set for locating a buyer, the plant will be sold to dealers specializing in plant liquidations. Once in the hands of a dealer, a plant is usually available for sale as a complete unit only for a very short time. The plant may be sold by the dealer as a unit, but more frequently the individual pieces of equipment are sold separately. The putting together of complete tailor-made plants consisting of equipment from different sources is handled by second-hand equipment dealers or consulting engineers and today accounts for a small volume of sales. It would increase in importance if there were established means for disseminating information about the exact requirements of entrepreneurs in the developing countries.

109. The desirable conditions for the transfer of complete second-hand plants to the developing countries can be summarized as follows:

The equipment should be geared towards the production of a specific product for which the drawings,

dies, jigs, etc. are also included in the sale of the plant;

The seller, be it an already established industry or a second-hand machine dealer, should be prepared to assist in the installation and commissioning of the plant. To ensure a proper functioning of the plant, the seller shall preferably be prepared to assume an equity position in the plant. Should this not be desired by the buyer, or the seller not be prepared to do so, a reasonable part of the sales price should be paid only after a satisfactory start-up of the plant.

The seller should be prepared to provide or arrange for training of the personnel of the plant.

Usually, the former users of a complete production unit, who in most cases remain in the same business, are in a better position to fulfil the above requirements than a second-hand equipment dealer.

110. Most complete second-hand plants in the United States find today buyers within the country either as complete units or broken up into individual pieces of equipment. The possibilities to find buyers for second-hand equipment in Western Europe are not as good as in the United States and plants in Europe are often scrapped for lack of buyers. No international mechanism exists for bringing together suppliers and potential users of complete second-hand plants. As a result few complete plants from the industrialized countries are presently sold to the developing countries or form the basis of joint ventures between suppliers from industrial countries and users in developing countries. It is, however, customary that companies in the industrialized countries use equipment that has become redundant in their operations at home when establishing subsidiaries in developing countries. This tendency is particularly evident in the automotive industry. Credit for transfer of second-hand plants to developing countries is more readily available when the supplier retains an equity position in the plant. A supplier who has actually owned and operated the plant is more likely to meet this condition than a dealer in second-hand plants.

111. It would be desirable to have a clearing house for the dissemination of information about complete second-hand plants both in developing and industrialized countries, and whenever possible, operating through already existing channels. The clearing house should be sponsored and financed by an international organization acceptable to both buyers and sellers, and it should, when it is in full operation, be self-financing from the

fees charged for its services. The role of the clearing house can be summarized as follows:

To collect information about complete second-hand plants that are available for sale and circulate this information to Development Banks, Industry

Associations, Ministries of Industry, etc. in the developing countries;

To draw up the guidelines for the transfer of second-hand plants and, whenever requested, to assist in their implementation.

Chapter XI

CONCLUSIONS AND RECOMMENDATIONS

112. The examination of the various aspects of utilization of second-hand equipment in developing countries leads to the following major conclusions:

(1) Considerable quantities of second-hand equipment with potentialities for use in developing countries are generated every year in advanced industrial countries. The supply of such equipment will almost certainly increase in the foreseeable future.

(2) There is little knowledge in developing countries of the availability and sources of second-hand equipment; and quite often the entrepreneurs in developing countries are not aware of the areas in which second-hand equipment could be particularly useful.

(3) The utilization of second-hand equipment is an economic and technological problem. The utilization of such equipment is usually only an alternative to the use of new equipment, and it is important that any decision to use second-hand equipment should be taken only after a careful scrutiny of costs and benefits.

(4) Second-hand equipment which is uneconomical under a given set of conditions can still be used to economic advantage under a different set of conditions. There are several examples of this in both developed and developing countries.

(5) The principal advantage of second-hand equipment over new is the lower capital cost; and the scope for using such equipment depends upon the extent to which second-hand equipment is cheaper than new equipment. In certain circumstances, immediate availability of second-hand equipment can be an additional advantage.

(6) The well-known shortage of managers and technicians in developing countries makes it more difficult than in the case of new equipment to tackle the problems involved in the selection and installation of second-hand equipment.

(7) In selecting second-hand equipment particular care should be taken to ensure the availability of spare parts and of all the necessary information for the operation and maintenance of the equipment (e.g., manuals, spare parts lists, etc.).

(8) Second-hand equipment for use in developing countries should be purchased only after thorough inspection and after satisfactory reconditioning, wherever necessary.

(9) Major pieces of equipment, integrated units, and complete second-hand plants offer particular advantages under proper safeguards.

(10) Equipment, whether new or second-hand, which is not capable of producing goods of acceptable quality at prices which are at least competitive on the domestic market, should not be acquired under any circumstances.

(11) Second-hand equipment which is subject to rapid obsolescence should also not be considered for long-term investments.

(12) *Or. balance*, it appears that the use of second-hand equipment for certain production programmes in developing countries can be advantageous, but great care is necessary in choosing the right technology and equipment in order to safeguard the interests of developing countries.

113. On the basis of the conclusions regarding the scope of the use of second-hand equipment in developing countries, there are a number of steps which can be taken to enable the developing countries to judiciously use such equipment on a more extensive scale. The recommendations which are divided into actions to be undertaken by (a) developing countries, (b) the industrially advanced countries, and (c) the United Nations system represent a minimal programme of action which in the opinion of the panel is both desirable and feasible.

A. *Developing countries*

A.1. Development of expertise in location, transfer and utilization of second-hand equipment.

Arrangements to collect and disseminate information on the availability and sources of second-hand equipment and about fields in which second-hand equipment could be used with advantage. In certain cases, it may also be desirable to consider the establishment of purchasing missions in industrialized countries. The developing countries should avail themselves of the services which the United Nations and its specialized agencies can provide in this field by way of experts, consultants, etc.

A.2. Elimination of discriminatory restrictions on the import of second-hand equipment.

There should be no special restrictions on the import of second-hand equipment which are not applicable to the imports of new equipment, except to the extent that such restrictions are deemed necessary in order to protect the interests of the domestic machinery manufacturing industry in some developing countries.

- A.3. Carrying out of periodic surveys to determine the possibilities of utilizing second-hand equipment in the implementation of industrialization programmes.

For this purpose, it would be necessary to establish a two-way flow of information: on the one hand, information about availability of second-hand equipment should be received and collated by the planning authority or the Ministry of Industry from the available sources including the purchasing missions abroad; on the other hand, the purchasing missions and other supply sources in industrially advanced countries should be kept informed of equipment needs of the industrial development programmes.

B. *Developed countries*

- B.1. Collection and dissemination of information on availability of second-hand equipment.

Arrangements for collection and dissemination of information on the availability of second-hand equipment, and particularly complete plants, should be made through suitable institutions and publications so that intending purchasers in developing countries will find it easier to locate suitable equipment.

- B.2. Widening of the scope of aid programmes to include and increase the economic utilization of second-hand equipment.

Without reduction in the volume of assistance and at the request of developing countries, it would be desirable to explore the possibility of supplying second-hand equipment to accelerate industrial development in developing countries. At present the aid programmes, with very few exceptions, do not make use of the productive equipment rendered surplus in industrially advanced economies. It would also be beneficial to review the present arrangements regarding the use of governmental credits for financing second-hand equipment.

- B.3. Make governmental export credit insurance available for second-hand equipment.

The granting of suppliers' credit for second-hand equipment is today hampered by restrictions imposed on export credit insurance organizations to cover such equipment. By

making available the same insurance coverage for second-hand as for new equipment, possibilities to get suppliers' credit for second-hand equipment would be greatly enhanced.

- B.4. Review existing tax arrangements to provide incentives for the transfer of complete second-hand plants to developing countries.

While complete second-hand plants with potentialities for use in developing countries become available every year in advanced industrial countries, very few of these are actually exported to developing countries. Only if there is a specially favourable tax treatment, accorded to exports of complete plants, will such export become attractive as compared to domestic sales. To further their programmes of plant modernization and export promotion, the industrially advanced countries should devise specific tax measures to increase the transfer of complete second-hand plants to the developing countries.

C. *United Nations*

- C.1. Circulation of the present Report to the appropriate legislative organs of the United Nations as well as to individual Governments and other interested organizations in developing and advanced countries to obtain comments and views on same.

- C.2. Preparation of additional studies on the suitability of second-hand equipment, by industry sectors and by type of equipment.

- C.3. Increase Technical Assistance to developing countries, at their request, in the selection and purchase of second-hand equipment from the advanced countries.

- C.4. Consider the convening of an inter-governmental working party to undertake the following tasks:

(a) The adoption of a standard classification of second-hand equipment so that there is uniformity in nomenclature;

(b) The organization of services in connexion with the evaluation and inspection of second-hand equipment; and

(c) The establishment of a clearing house to facilitate the transfer of second-hand equipment.

APPENDICES

APPENDIX I

Classification for equipment

MACHINERY DEALERS NATIONAL ASSOCIATION (MDNA)		Condition Code	Definition
New	Machine never used and never installed for service		since reconditioning and is only in fair condition. Further repairs or renovation required or expected to be needed in near future
Unused	Machine never installed for service		
Rebuilt	Machine completely disassembled, all worn or broken parts replaced, excessive wear compensated for, tested under power and subject to standard MDNA 30-day guarantee	E.4. (Used, Reconditioned, Poor)	Used property which has been repaired or renovated and is in poor condition from serious deterioration such as from major wear and tear, corrosion, exposure to weather, or mildew
Reconditioned	Machine operated under power, cleaned, painted, broken parts repaired or replaced	O.1. Used, Usable without Repairs, Excellent	Property which has been slightly or moderately used, no repairs required and still in excellent condition
As is	Machine offered in its present condition with no warranty or guarantee expressed or implied	O.2. (Used, Usable without Repairs, Good) ..	Used property, more worn than O.1 but still in good condition with considerable use left before any important repairs would be required
GENERAL SERVICES ADMINISTRATION (GSA)			
Condition Code	Definition		
N.1. (New, Excellent) ..	New or unused property in excellent condition. Ready for use and identical or interchangeable with new items delivered by a manufacturer or normal source of supply	O.3. (Used, Usable without Repairs, Fair) ...	Used property which is still in fair condition and usable without repairs; however, somewhat deteriorated, with some parts (or portions) worn and should be replaced
N.2. (New, Good)	New or unused property in good condition. Does not quite qualify for N.1 (because slightly shopworn, soiled, or similar), but condition does not impair utility	O.4. (Used, Usable without Repairs, Poor) ...	Used property which is still usable without repairs but in poor condition and undependable or uneconomical in use. Parts badly worn or deteriorated
N.3. (New, Fair)	New or unused property in fair condition. Soiled, shopworn, rusted, deteriorated, or damaged and its utility is slightly impaired	R.1. (Used, Repairs required, Excellent)	Used property, still in excellent condition, but minor repairs required (repairs would cost not more than 10 per cent of standard price)
N.4. (New, Poor)	New or unused property badly broken, soiled, rusted, mildewed, deteriorated, damaged, or broken and its utility is seriously impaired	R.2. (Used, Repairs required, Good) ...	Used property, in good condition but considerable repairs required. Estimated cost of repairs would be from 11 per cent to 25 per cent of standard price
E.1. (Used, Reconditioned, Excellent)	Used property but repaired or renovated and in excellent condition	R.3. (Used, Repairs required, Fair)	Used property, in fair condition but extensive repairs required. Estimated repair costs would be from 26 per cent to 40 per cent of standard price
E.2. (Used, Reconditioned, Good)	Used property which has been repaired or renovated and, while in good usable condition, has become worn from further use and cannot qualify for excellent condition	R.4. (Used, Repairs required, Poor) ...	Used property, in poor condition and requiring major repairs. Badly worn
E.3. (Used, Reconditioned, Fair)	Used property which has been repaired or renovated but has deteriorated		

<i>Condition Code</i>	<i>Definition</i>	<i>Condition Code</i>	<i>Definition</i>
	and would still be in doubtful condition and dependability and uneconomical in use if repaired. Estimated repair costs between 41 per cent to 65 per cent of standard price		reasonable prospect of use for any purpose as a unit (either by the holding or any other Federal agency) and its repair or rehabilitation as a unit (either by the holding or any other Federal agency) is clearly impracticable. Repairs or rehabilitation estimated to cost in excess of 65 per cent of standard price would be considered "clearly impracticable" for purposes of this definition
X (No further value for use as originally intended but of possible value other than as scrap).....	Salvage. Personal property that has some value in excess of its basic material content but which is in such condition that it has no re-	Scrap.....	Material that has no value except for its basic material content

APPENDIX B

List of background studies and documents submitted to the Expert Group on Second-Hand Equipment for Developing Countries

(a) Studies prepared or commissioned by the Centre for Industrial Development

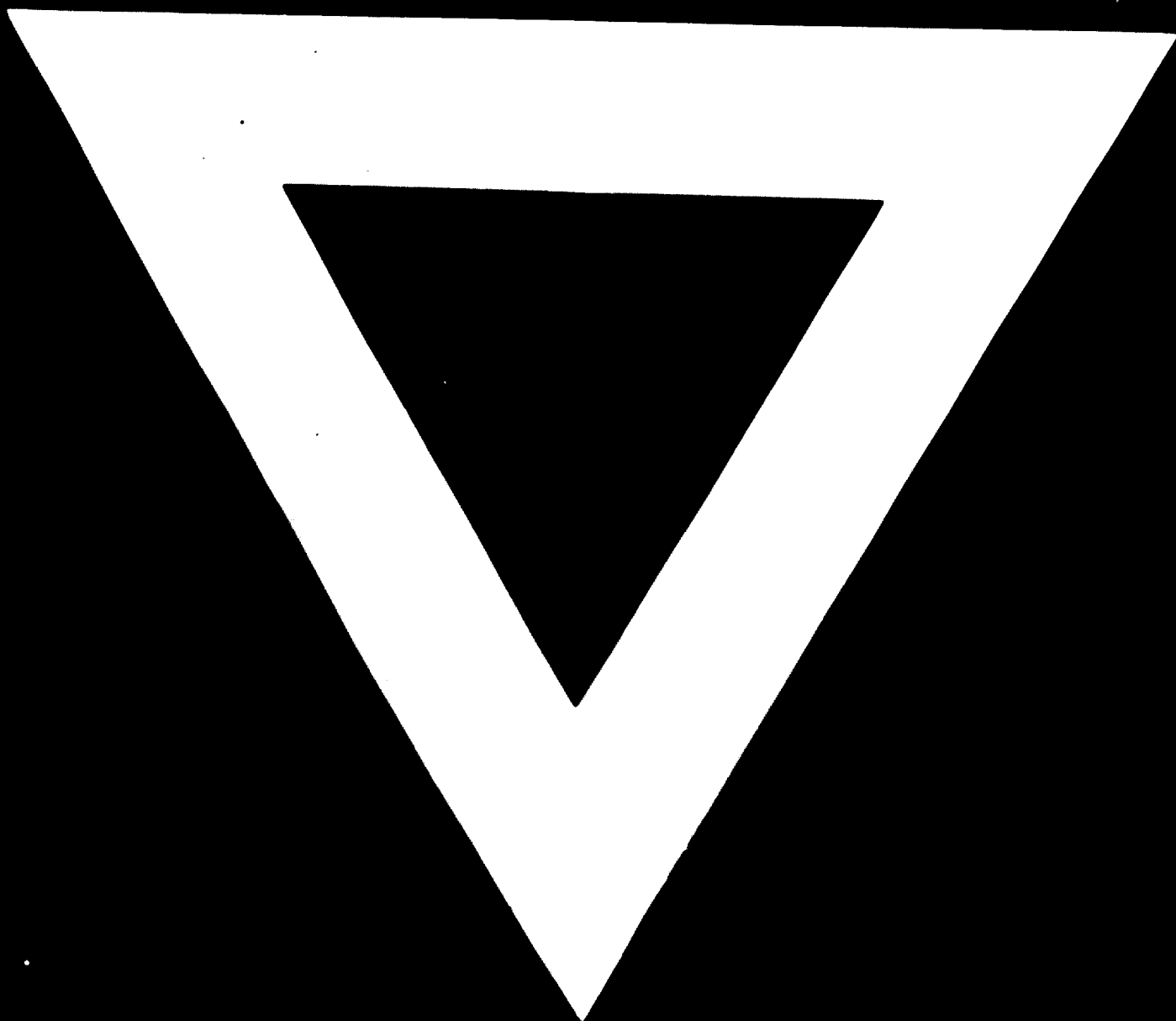
1. The use of second-hand equipment in developing countries, by the Technological Division, Centre for Industrial Development
2. The use of second-hand equipment in developing countries. Summary of comments and suggestions on the Centre's preliminary paper on "Use of second-hand equipment in developing countries" and reasons for import restrictions, by the Technological Division, Centre for Industrial Development
3. The potential of second-hand equipment in the industrialization of developing countries, report by Prof. A. Wiener
4. A general survey of the used tools market in the United States, by M. M. Rubenstein, Warner Turtis Consultants
5. An analysis of the used machine tool market in the United States, by C. A. Simmons, Jr., President, Simmons Machine Tool Corporation

6. Use of second-hand computers in the developing countries, by L. D. Wilson, Auerbach Corporation
7. Second-hand automotive equipment with special reference to use in developing countries, by M. Alth
8. Used chemical process equipment sources. Use, selection criteria, with particular regard to its application in developing countries, by N. H. Parker

(b) Other studies and documentation

1. Second-hand machinery and economic development, prepared by the Netherlands Economic Institute
2. The use of second-hand machinery in developing economies, by A. Waterston, International Bank for Reconstruction and Development
3. Country replies concerning restrictions on imports of second-hand equipment





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