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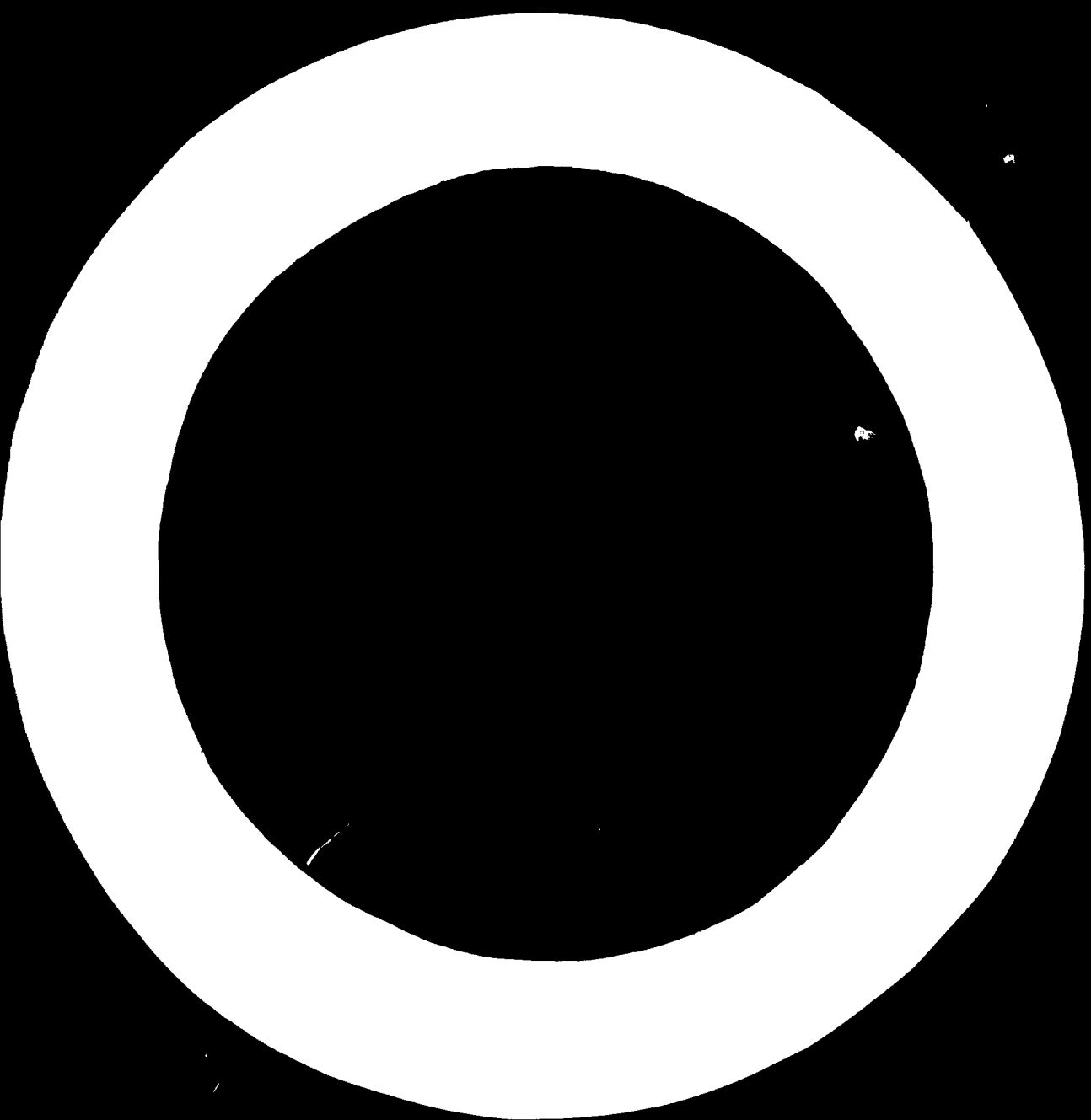
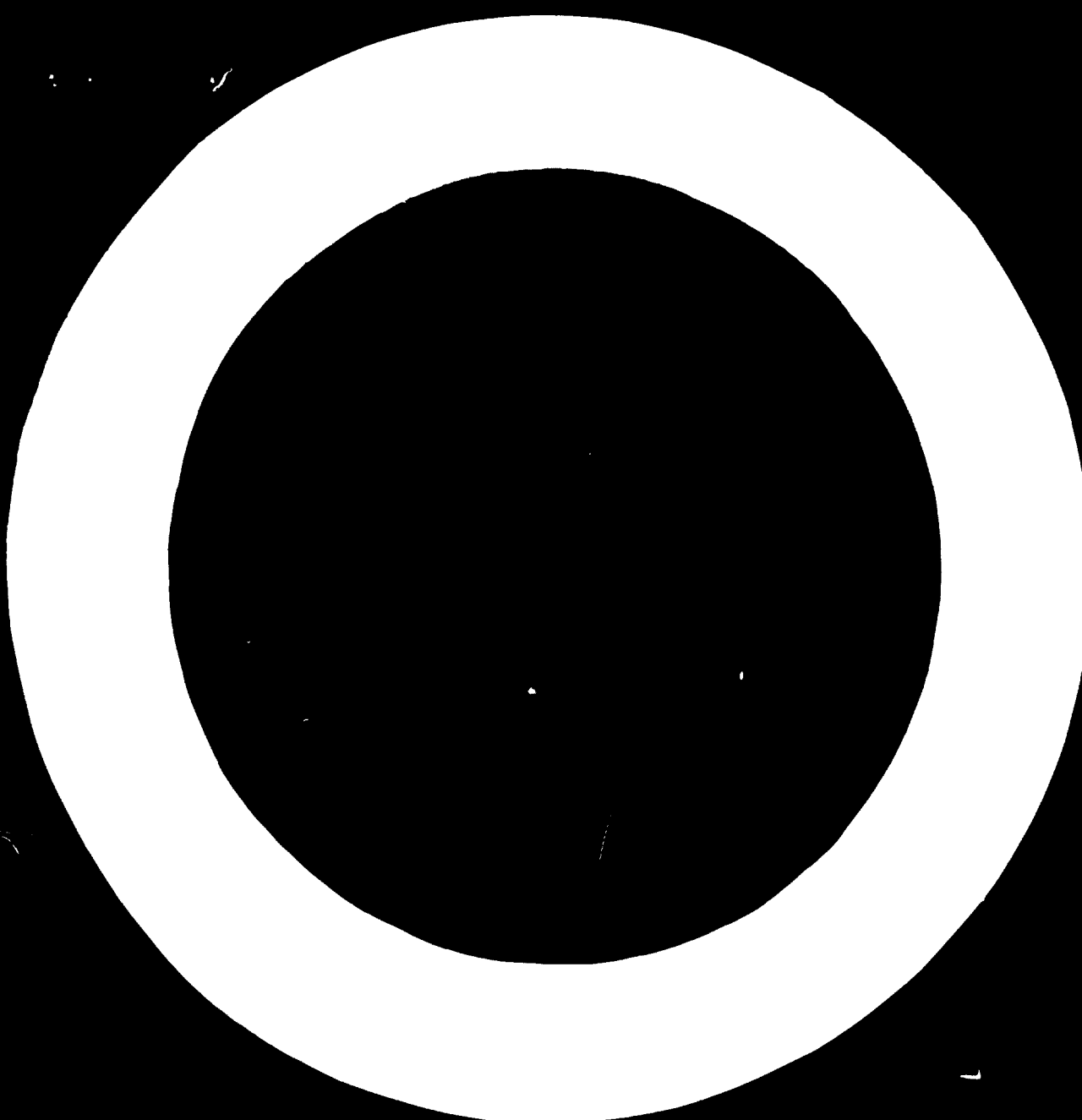
METALWORKING INDUSTRIES AS POTENTIAL EXPORT INDUSTRIES IN DEVELOPING COUNTRIES

Report of the Expert Group Meeting on Metalworking Industries as Potential Export Industries in Developing Countries

Vienna, 12 - 19 December 1969

UNITED NATIONS





UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION, VIENNA

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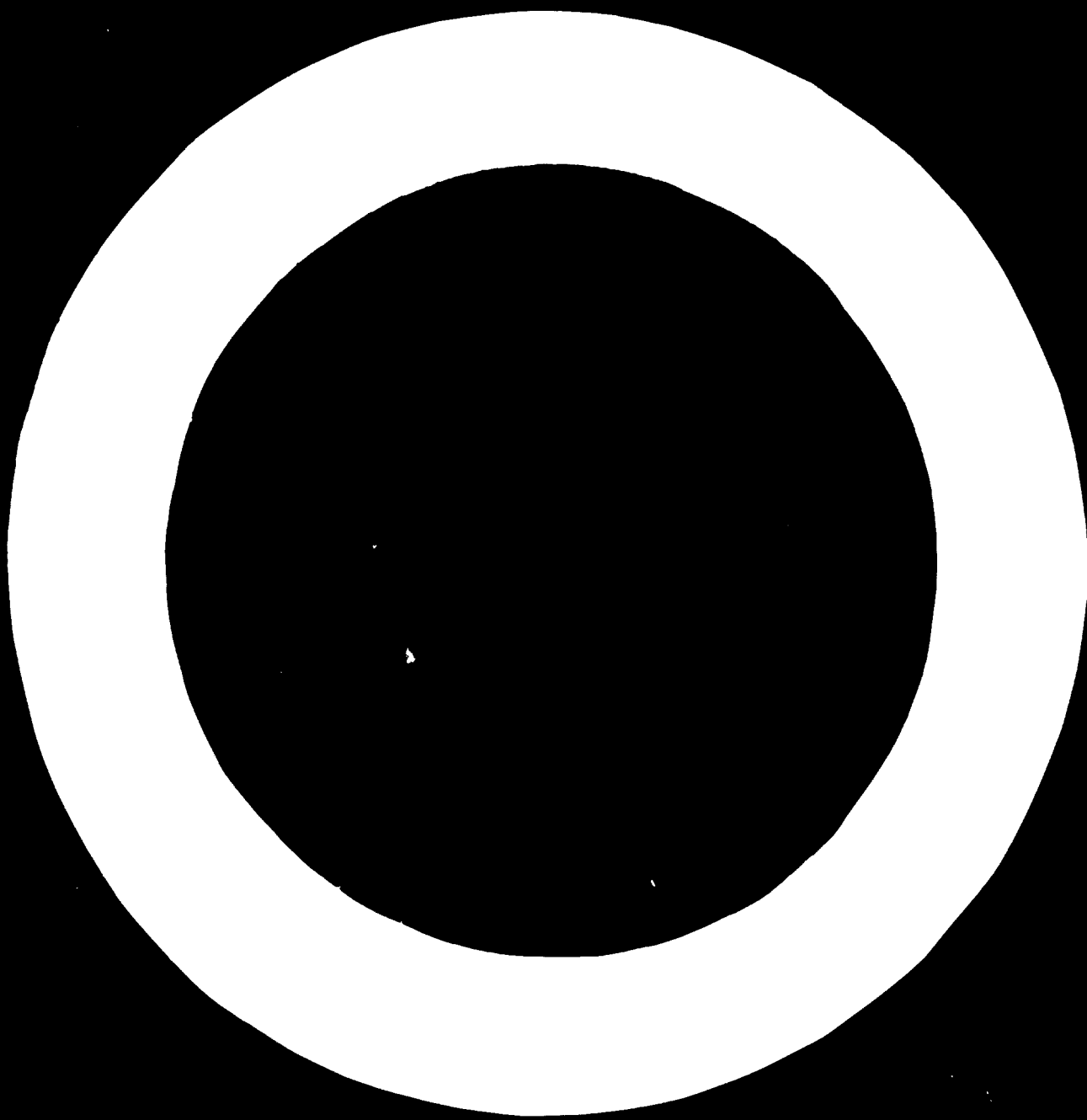

Introduction

1. The Expert Group meeting, convened by UNIDO, met in Vienna 12-19 December 1969 to discuss problems connected with programming the metalworking sector or its main branches in developing countries. The special object of the meeting was to find means of raising the export potential of metalworking industries, to arrive at an independent judgement on the applicability of the method suggested, and to advise on the possible scope and forms of technical assistance that UNIDO should make available to interested countries.

2. Ten experts were invited to take part in its deliberations. A list of the participants is presented in annex 1.

3. Mr. F. Le Guay, on behalf of the Executive Director of UNIDO, opened the first session of the Expert Group meeting on 12 December 1969. Mr. Eduardo Gana P. was elected Chairman, and Dr. Meir Merhav was elected rapporteur.

4. The agenda, which was adopted at the opening session, is presented in annex 2. The group had before it the documentation prepared by external consultants and by the UNIDO secretariat; these working papers are listed in annex 3.

5. The discussions provided opportunities to consider various problems related to the development and expansion of the export potential of metalworking industries in developing countries in the light of existing theoretical knowledge and of the practical experience of a number of developing and developed countries.

6. The requirements for constructing a set of data for the application of the programming methodology in this sector with a view to its export potential are spelled out in annex 4. A model for possible technical assistance projects in programming the metalworking sector with a view to raising its export potential is presented in annex 5.

I GENERAL CONSIDERATIONS

7. The discussions stressed the importance of the metalworking (engineering) sector in industrial development in general. This sector produces and maintains equipment for all productive sectors of the economy and is the locus of most technical progress. The level of development of the metalworking sector is indicative of the over-all level of a country's industrial progress and the degree of its technological independence. This sector serves a valuable function in generating new skills, particularly those associated with technological progress in the manufacturing sector.

8. The metalworking industries currently account for about one third of the world's production in terms of value added. However, the share of the developing countries in metalworking production is still limited, representing only about 4 per cent of the total value added.

9. The key role of this sector and its export potential for developing countries were recognized in resolution 1178 (XLI) adopted by the Economic and Social Council of the United Nations in 1966. The resolution specifically referred to metalworking industries in developing countries as an example of industries with an export potential in the development of which there might be achieved concurrent opportunities for import substitution.

10. Engineering products account for a large proportion of imports into developing countries; this has led to the fostering of domestic industries under import-substitution programmes. These industries are overwhelmingly oriented to supplying domestic rather than export markets. As a result, the exports of engineering products from

developing countries form an insignificant share of world exports, amounting to no more than 1 per cent of the total.

11. The Expert Group discussed the considerable difficulties that confront developing countries endeavouring to enter export markets. Particular attention was given to the need for improvements in marketing techniques, quality control, design, packaging, and training of marketing personnel.

II PLANNING AND PROGRAMMING THE METALWORKING INDUSTRIES AS POTENTIAL EXPORT INDUSTRIES IN DEVELOPING COUNTRIES

12. The Expert Group recognized the benefits resulting from import-substitution programmes, including accelerated industrialization and possible relief from balance-of-payments pressures. However, it was pointed out that there are limits to the extent to which exclusive import-substitution policies can be implemented, and that these limits have already been reached in a number of countries.

13. It was also noted that industries developed under a policy of exclusive import substitution encounter serious difficulties when endeavouring to enter export markets. Manufacture for import substitution normally tends to be spread thinly over a large number of sectors or branches, and the advantages of specialization are therefore difficult to achieve. The necessarily high level of protection for such manufactures often leads to low quality, out-dated design and high costs in the domestic industry, and these in turn result in price and quality levels that are not competitive in world markets. Finally, the extent to which economies of scale can be introduced is limited by the size of the domestic market.

14. The Group therefore emphasized the importance of incorporating an export component in the industrialization programme at an early stage. As the rate of industrialization accelerates, the export component should be gradually expanded.

15. The Group agreed that no country, and particularly no developing country, can support technological progress over the entire range of the metalworking industries. It was particularly stressed that efforts and resources should be concentrated on selected industries with export potential. It is therefore of crucial importance to

identify those branches and product lines that will benefit from concentrated promotional activities.

16. The discussion emphasized that market forces alone are insufficient to ensure the identification and development of the areas of greatest export potential. Over-all planning is required for developing the sector, particularly with regard to the allocation of research and development funds.

17. The Group reviewed a number of the planning techniques that have been implemented in the metalworking sector and listed criteria that may be used for constructing comprehensive production and export programmes. The difficulties presented by this sector, which result from the diversity of products manufactured and of equipment used, were fully recognized. There are several hundreds of thousands of kinds of products manufactured in the sector. Taking metal-cutting machine tools alone, there are an estimated fifteen hundred or more types and sizes. Moreover, a given piece of equipment normally produces a wide variety of products. When imports and potential exports are added to the planning elements, it is clear that there are a startlingly large number of combinations.

18. There are two levels of approach to programming for the sector: at the macro-economic level through input-output analysis, mathematical programming and material balance methods; and at the micro-economic level through individual feasibility and engineering studies. The necessity to provide a link between over-all economic planning and planning at the project level is readily apparent. The sectoral methodology suggested represents an attempt to bridge this gap effectively.

III CHARACTERISTICS OF THE METHOD PROPOSED FOR PLANNING AND PROGRAMMING THE SECTOR WITH A VIEW TO ITS EXPORT POTENTIAL

19. The objectives of the proposed programming of the sector are to assess the potential of the metalworking industries to improve the balance of payments through import substitution and export promotion, to achieve an economically sound structure of the industry, and to identify branches, lines or product groups within the sector on which available resources should be concentrated, with a view to reducing the degree of technological dependence.

20. In the short run, the proposed method is directed to identification of export opportunities that can be exploited immediately or at least fairly quickly. In the long run, it aims at constructing a comprehensive programme for selective investment in new productive facilities and in the technological upgrading of the sector, including research and development, design improvement and rationalization of manpower and manpower training, always with regard to the specialization required for exports. If these aims are to be achieved, the innate diversity of the sector should be taken into account in such a way that the planning and programming tasks required become technically manageable and economically rational.

21. The method that was considered by the Expert Group is expected to answer such questions as: what kinds of investments are economical, what branches and what product assortments within these branches should receive the main emphasis, and what export branches deserve serious promotional efforts. The method should also help to determine the minimum scales of output and the relative proportions of production for domestic and foreign markets, that would be required to facilitate domestic production on a competitive basis.

22. This method, as described in two of the working papers presented to the group,[1/] cuts across the great diversity of the sector, in terms of equipment and of products, by representing each production process by a limited number of standard tasks, defined by size of workpiece and length of production series. Each of these tasks is in turn associated with one or more standard shops or resource elements that have a typical machine park. The resource-element concept permits the reduction of the great variety of actual production facilities to a limited number of typical shops. On the demand side, a number of sample products that are typical of the sector in terms of physical characteristics and production processes involved are selected in order of importance in total demand. On the basis of the resource requirements obtained from these sample products, total sector inputs are estimated for sector-wide product lists.

23. The technical description of the sector proceeds in different levels of detail. Semiquantified programming data aim primarily at defining lists of products and productive processes and at establishing incidences between them, i.e. specifying whether or not a given process is used in the manufacture of a particular product. Fully quantified programming data would quantify, in sufficient detail, the pattern of physical inputs and outputs associated with the production of a particular product. Fully quantified data would therefore represent an intermediate position between the two extremes of semiquantative data and the final stage of project-engineering data and are intended for techno-economic description of the sector. On the basis of input and output patterns, approximate estimates of production costs could be undertaken. Estimates of domestic and of export demand will then complete the quantification process.

1/ ID/WG.10/1 and 2. See annex 3.

IV APPLICABILITY OF THE METHOD

24. The Group examined the proposed programming method and considered its applicability for planning and programming the metalworking sector (or its branches) with a view to raising its export potential in developing countries. It was recognized that this method could serve, in the short term, as a valuable tool to assist in generating immediate balance-of-payments benefits and, in the long term, to identify the most promising areas within the sector for the concentration of promotional efforts for exports. The Group agreed that the methodology represents a useful link between over-all economic planning and planning on individual project level, thus bridging the gap between these two approaches.

25. The Group noted the experience accumulated in the early stages of implementing this methodology in the Israeli and Mexican metalworking industries; these findings should be made available to all developing countries interested in the method. It agreed that certain correctives may be needed in the light of the experience gained in these two countries. Further correctives may be needed in the process of full-scale implementation of the project in the first developing country to receive this type of assistance from UNIDO. Simultaneously with the implementation of the first technical assistance project, a manual describing practical and detailed use of the suggested method should be prepared for the benefit of all interested countries, to guide planners and facilitate the introduction of the method into other developing countries.

26. The method applied in Chile, which is aimed at identifying the product groups with export potential in the metalworking industry and assessing the requirements for critical inputs for the sector, was

brought to the attention of the Group. This method was closely related to the proposed semi-quantitative method, and it was recommended that a summary of the Chilean method be made available to those who may become interested in the proposed method.

27. The Group concluded that the proposed methodology was suitable for introduction in developing countries.

28. The discussions emphasized the urgent need of developing countries to improve the level of design and technology in their metalworking sectors. Training in these areas is required if the products of the sector are to compete effectively in international markets.

29. At the same time, it was noted that the proposed method stressed mainly the production aspects and the identification of potential export products and product clusters in the light of the productive resources of the respective countries. For a successful export effort, special attention would have to be given to market research studies to pin-point the export opportunities for the products identified through the programming activities. It would also be necessary to formulate effective export incentives and other policy measures to facilitate export expansion in this sector.

30. The attention of the Group was drawn to the body of information already available which could be of assistance in programming this sector with a view to its export potential. Particular mention was made of the reports of United Nations technical assistance experts on metalworking industries in certain developing countries. It was suggested that UNIDO collect such information to assist in servicing programming teams in developing countries.

V DATA TO BE ACCUMULATED AND USED AS A PROGRAMMING TOOL IN IMPLEMENTING THE METHODOLOGY

31. The Expert Group agreed on the necessity for accumulating a sufficient body of engineering and economic data for programming the metalworking sector in developing countries, with a view to enhancing export potential. The data collected for this purpose should pertain to good practice in an industrially advanced country. The data required are not the usual type of programming data (e.g. those of the UNIDO series, Profiles of Manufacturing Establishments[2/]), but should in fact be engineering and economic data.

32. The Group felt that planning norms available in countries with centrally planned economies could be used if carefully collected and organized in a way that corresponds to the aims of the method proposed.

33. As to the coverage of the set of data, the Group considered that data for about 1,000 typical engineering products, including technological and design variants, might provide a good base for the programming effort concerned. Most data for typical products would be of universal use for all projects that might be undertaken in developing countries, but some additional data might be required in each case to meet the conditions of a particular developing country.

2/ Volume I (ID/Ser.E/4, United Nations Sales publication E.67.II.B.17); Volume II (ID/Ser.E/5, United Nations Sales publication E.68.II.B.13); Volume III (in preparation).

34. The Group agreed that the data to be collected should relate to product decompositions in terms of a description of resource elements, manufacturing processes and overhead, as outlined in annex 4. These programming data should be released for general use as soon as they become available, independently of their use in connexion with any specific technical assistance project.

35. Information available on alternative technologies, should be provided, wherever applicable, with respect to typical products and resource elements as well as time series. This would permit assessment of the effects of technological change and an approximation of the period of the learning process.

36. The Group agreed that data should, as a rule, be expressed in physical units that would facilitate international comparability. It was suggested that the UNIDO secretariat do some preliminary work on product and process classification to bring about international comparability of programming data. The set of data should be organized so that particular information could be easily retrieved. The data should be assembled in a uniform, machine-readable format and should be continuously up-dated.

37. Annex 4 to this report is an outline of the set of data required to support possible technical assistance projects on programming metalworking industries in developing countries with a view to their export potential.

VI POSSIBLE TECHNICAL ASSISTANCE PROJECTS TO BE UNDERTAKEN BY UNIDO

38. The Expert Group considered the ways in which UNIDO could, on request, assist developing countries in introducing the proposed methodology into their metalworking sectors. It was agreed that the most effective means would be through technical assistance projects. Recognizing the specific nature of such projects, the Group examined in depth their objectives, form, coverage and means of implementation. The Group's suggestions for a model project of this type are set out in annex 5. It was suggested that the UNIDO secretariat make every effort to secure the funds needed for preparatory and supporting work required for implementing such projects.

Annex 1

List of participants

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Annex 2

AGENDA

1. Organization of the meeting and adoption of the agenda.

2. Consideration of methodology and related issues in connexion with planning and programming in the metalworking sector, with a special view to exports:

   a) General considerations;

   b) Characteristics of the method proposed for planning and programming the sector, with a view to its export potential;

   c) Planning and programming of the metalworking industries in developing countries;

   d) Applicability of the method;

   e) Characteristics of a set of data to be used as a programming tool in implementing the methodology;

   f) Possible technical assistance projects to be undertaken by UNIDO.

3. Adoption of the report.

Annex 3

List of documents presented to the Expert Group

ID/WG.10/9	Provisional Agenda
ID/WG.10/10	Metalworking industries as potential export industries in developing countries: Introductory paper, by the UNIDO secretariat
ID/WG.10/1	The planning of production and exports in the metalworking industries, by Thomas Vietorisz et al
ID/WG.10/2	Programming of production and exports for metalworking: models and procedures by Thomas Vietorisz et al
ID/WG.10/3	Production and export planning in the engineering industry, by A. Deák
ID/WG.10/4	The metalworking industries: Semi-quantitative programming data, by Nathan Ginsburg
ID/WG.10/5	Agricultural implements and equipment: Production methods, by Van Court Hare, Jr.
ID/WG.10/6	Metalworking industries as potential export industries, by the UNIDO secretariat
ID/WG.10/7	Construction of a sampling method for equipment in Israeli industry, by Richard Lissak
ID/WG.10/8	Planning methods of engineering with special view to exports, by S. Czeitler et al
ID/WG.10/11	Survey of the stock of equipment in the Israeli metalworking industry and estimated replacement needs, by A. Ber.
ID/WG.10/12	List of documents

Annex 4

Requirements for a Set of Data for Sectoral Programming of Metalworking Industries with a View to Their Export Potential

At present little useful information is available for planning exports from the metalworking industries of developing countries. Input-output coefficients exist, but these are of an aggregate nature and there are also capacity expansion planning factors from the United States by class of industry. Other than these, there is only the usual material from industrial censuses.

The set of data proposed to be collected under UNIDO auspices would conform to a tested methodology for planning production and exports in the sector and would have the added advantage of computerization for ease of use. It is suggested that these data be collected in an industrially developed country so that they would refer to good practice in the sector. Also, instead of the aggregated information referred to above, use might be made of the concepts of typical sample product and resource element developed in documents ID/WG.10/1 and ID/WG.10/2. By increasing the level of disaggregation, a project can be evaluated by representing its output in terms of a few typical products and its inputs by process group.

Previous attempts to construct programmes of production and export for the metalworking industries of developing countries have encountered serious difficulties in securing data in sufficient detail. On the one hand, project-engineering information is far too costly for sector-wide feasibility studies that encompass many potential project alternatives. On the other hand, standard industrial

statistics, the systematic compilation of which is recommended for purposes of economy-wide analyses and projections,[1] are too highly aggregated.

Industrial statistics are collected at the industrial establishment level. An industrial establishment is a statistical unit that distinguishes, as far as is practical, between the various classes of activities in which the same entrepreneurs may engage, as well as the different locations at which these activities may be conducted. The activities and locations are, however, distinguished only as far as permitted by the records that are maintained.[2] The data collected for a single establishment do not, therefore, distinguish between the costs and inputs of the many individual products that are produced simultaneously by the typical metalworking-engineering establishment, nor between the costs and inputs associated with complementary technical processes, such as casting, machining and assembly, that make up its productive structure. The data are thus aggregates of many products and processes even though originally enumerated for a single statistical unit.

Standard published statistics do not refer to individual establishments but tabulate data for entire industrial classes. Such tabulated data are thus even more highly aggregated than the primary data gathered for single establishments. The UNIDO series, Profiles of Manufacturing Establishments, of which volume I and volume II have been published,[3] has been designed to overcome this difficulty by providing data for a cross-section of representative single establishments in different countries. This permits not only the

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1/ For example, United Nations, International Recommendations in Basic Industrial Statistics, Statistical Papers, Series M, No.17, Rev.1, 1960. (Sales number 60.XVII.8.).

2/ See Vietorisz, Data Requirements for Industry Analysis and Programming, ID/WG.33/4, section I.

3/ ID/Ser.D/4, United Nations Publication E.67.II.B.17.
ID/Ser.D/5, United Nations Publication E.68.II.B.13.

definition of "typical" or "average" data patterns but also an appraisal of the range of variation. Nevertheless, these Profiles are still based on primary data at the establishment level, with their inevitable built-in product and process aggregations.

The purpose of the sectoral programming data with which this annex is concerned is to provide disaggregated information for the metalworking sector (predominantly from engineering, rather than cost-accounting, sources) on the input structures of individual products and processes or, at least, from much narrower product and process groups than those specified for the usual statistical purposes. At the same time, these programming data must have a greater degree of generality and a much lower unit cost than specific project-engineering information. Similar compilations of programming data already exist for a number of industries of the chemical-process type.4/

The advantage of computerization of the data lies in the facility with which any particular data group can be reproduced in print-out form and in the possibility of adding a sectoral planning programme to permit the computerization of the expected results of recommended projects. Given the large number of linkages among the metalworking industries, projects that appear unattractive when evaluated in isolation may become feasible when viewed in a broader framework (possibly comprising the entire sector), and make-or-buy decisions can be clearly formulated. Without implementation of the recommendations outlined below for the compilation of a set of data, progress in the establishment of enterprises with export orientation in this sector will be limited.

4/ United Nations, Techniques of Sectoral Economic Planning: the Chemical Industries, ST/CID/14, sales number 66.II.B.17; A. S. Manne, "Programming data summary for the petroleum refining industry", Industrialization and Productivity, Bull. No.10, pp.57-73; United Nations, Studies in Economics of Industry: Cement/Nitrogenous Fertilizers Based on Natural Gas, ST/ECA/75, sales number 63.II.B.3.

OVER-ALL STRATEGY

As it is proposed to use this set of data from the early stages of technical assistance projects, initial product selection should emphasize present production in the respective countries. For example, collection of data on agricultural equipment and machinery and distribution transformers should precede data on engines, turbines, generators and the like.

The selection of the plants or enterprises to be surveyed for purposes of data compilation should be based on two factors: (a) the lot size or seriality of production; and (b) the level of technology. Although these two factors are closely related with respect to mass production, wide divergencies in the technological levels of plants can be expected in smaller lot sizes.

Data for plants that have become obsolete in developed countries will not be consistent with export orientation in developing countries. The minimum requirement for useful information is "good practice" at several seriality levels, where feasible. The country supplying the data should be able to define and classify technology by level across plants, as well as to provide indications of future trends in technological development by industry.

Another strategic objective of data collection is an attack on one of the key areas of dissatisfaction with the performance of new industries in developing countries. It is known that labour productivity in the metalworking industries is subject to strong learning effects; for example, the run-in period prior to the attainment of design capacity may be as long as ten years for certain plants. Moreover, the attainment of design capacity is only the beginning of productivity growth; continuous improvement in quality and reduction in cost are chiefly responsible for the comparative advantage enjoyed by the highly industrialized countries. Data to be collected in this area should indicate: (a) the growth of productivity over time (or with the number of units produced); (b) whether breaks in productivity

growth occur when new techniques are introduced, and if so, to what extent they retard the beneficial effects of the change; and
(c) whether there is long-term growth of productivity for various product and process classes in the aggregate within the same establishment. An effort should be made in these time series to separate effects associated with capitalization (degree of automation and vintage of capital equipment), with the quality of the labour force and internal management, and with problems external to the firm (e.g. late deliveries, licensing delays).

CRITERIA FOR THE COLLECTION OF DATA

1. Classification of the standard resource elements

   (a) A set of data for standard shops or departments comprising similar processes or similar products (elements, parts, sub-assemblies) manufactured will be developed.5/

   (b) The weight of the work-piece and labour qualification criteria will be indicated for the individual standard resource elements classified.

   (c) The total number of standard resource elements in the classification system will run from 100 to 120.

2. Description of the standard resource elements6/

   (a) Output: amount and assortment (unit of measurement will always be man-hours but also, whenever possible, tons or other physical units). Capacity limits under one-, two- and three-shift operation and technical minimum downtime for maintenance will be given;

   (b) Composition of machine tools and equipment (percentage of number and value);

5/ Highly specialized (one-purpose) units may be aggregated in a limited number of classes. The share of one-purpose machine tools will be indicated in 2 (b).

6/ Alternatives should be given for different serialities, scales (that is, different first-shift capacities) and for different degrees of automation for given degrees of seriality. Functional relations between different alternatives should also be indicated wherever possible.

(c) Size indication in terms of number of machine tools, floor space (minimum, maximum, actual, optimum and so on);

(d) Capital investments data per square metre of floor space (machine tools, construction);[7]

(e) Fixed costs data (in physical units) on power, water, personnel and so on;

(f) Labour input requirements on yearly basis by skill class;

(g) Approximate changes in (e) and (f) as output changes.

3. Typical products selection

An effort will be made to cover all the major branches or product lines of metalworking (engineering) industry, with concentration on those of major importance to countries in Groups I and II as classified by the Interregional Symposium on Metalworking Industries in Developing Countries.[8]

Major design alternatives of a given product will be treated as separate typical products.

4. Description of typical products

(a) Descriptive information: Technical standards, comparable foreign-made products, fields of use, spare parts and type of technical service.

(b) Scale of production: Number produced, the lowest recommended scale of production, with what other products it can be produced jointly.

(c) Other information: Organizational resource elements may be related to the line or branch - for example, research and development.

(d) Component tree and design tree: Sub-assemblies and components at several levels of depth will be given for each product as required. Major design alternatives will be indicated where appropriate. Probably make-or-buy

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7/ On the basis of the price level of the individual developing country.

8/ See Report of the Interregional Symposium on Metalworking Industries in Developing Countries, United Nations Publication, Sales No.E.68.II.E.9, p.9.

choices for individual sub-assemblies or components, especially as a function of total seriality (when shared between several products) will be given.

(e) Material requirements: For each component (or for each sub-assembly or component group if treated as a unit without further decomposition) gross material requirement(s) and net weight(s) will be given. Each material will be specified closely enough to permit attaching to it a world market or local price. Shapes (for example, T-sections, I-sections and tubes) will be treated as materials, and purchasing specifications and amount needed (in physical units) will be specified precisely.

(f) Manufacturing inputs:

(i) Resource-element inputs: For each kind of resource element used, amounts needed for set-up and for operation will be given in hours of labour time and also in physical units (for example, tons) if possible. (When different manufacturing input patterns are required, as with changes in seriality, the alternatives will be treated as separate products.)

(ii) Assembly: Instead of defining a great many assembly resource elements, floor space, labour and auxiliary machinery inputs may be given directly.

5. Long list of products

An average of 100 products per branch, as classified in document ID/WG.10/1, will constitute the long list of products. In respect to the listed products, the following information will be given:

(a) Names of products;

(b) Fields of use;

(c) Number produced (or the share in production volume);

(d) The share of sub-assemblies and components between groups of specified products;

(e) Major specifications (as factors of deviations from the typical product and from standard resource element);

(f) Recommendations for extrapolation of typical product data to the listed products.

Annex 5

A MODEL FOR POSSIBLE TECHNICAL ASSISTANCE PROJECTS

Background considerations

An export component in the development of the engineering industries is desirable from the start as a corrective to the tendency towards low-quality, high-cost production that characterizes the sector when it grows in protected national markets purely on the basis of import substitution. With progressive development, as the emphasis shifts from the output of simple metal products to the manufacture of machinery, an export orientation becomes even more essential to the attainment of economic scales of production by combining domestic and foreign demand and to the maintenance of satisfactory levels of technological proficiency and quality. If these levels are allowed to deteriorate under a pure import-substitution policy, they will affect the export potential of the country, not only in the engineering sector proper but, through the decline in quality of the stock of machinery, in many other productive sectors as well.

Purpose of the project

The purpose of the project is to assist the Governments of interested developing countries in building up the domestic institutions and pools of skilled personnel required for the continuing assessment of the role of the metalworking (engineering) industries in the course of economic development. This assessment must include, first, the investigation of the potential of these industries for improving the balance of payments through both import substitution and export promotion; second, the programming of the sector as a whole and of its most promising branches with a view to achieving an economically sound structural composition of the industry; and third, the identification of branches, lines, or product groups within the sector on which resources available for

research, development, design improvement and rationalization of management should be concentrated in order to help these portions of the sector to reduce, gradually but substantially, their degree of technological dependence.

More specifically, the functions of the project will include the following:

(a) To undertake a detailed technical and economic survey of the productive facilities and their utilization within the sector; to develop a classification of resource elements along the lines indicated in the methodological paper ID/WG.10/1,[1] and to organize a data bank in accordance with the outline presented in annex 4;

(b) To construct a short-run comprehensive programme for the sector that concentrates on the identification of missed export opportunities available under the existing productive structure or with the aid of merely marginal additions, and that will be ready for implementation at an early stage of the field work;

(c) To construct a long-run comprehensive programme of investments in new productive facilities as well as in technological upgrading of the sector, including research and development, design improvement, rationalization of management, and manpower training. In defining this long-term programme, particular attention will be paid to the desirable extent of concentrating the effort of technological upgrading on selected branches, lines or product groups within the sector in order to create the required specialization for exports, and on the identification of these branches, lines, and product groups in line with both domestic supply potential and projections of domestic and foreign demand.

Mode of implementation

The UNIDO contribution

UNIDO would provide expert services and fellowships and technical data to be used as a programming tool. It would also provide computer services to support the activities of the team if such services are not available in the assisted country.

1/ See annex 3.

Expert services would be provided by a team of experts. The services of the following professional personnel are envisaged (The number of experts and the professional composition of the team will vary in each specific case, depending on the scope of the project):

An industrial economist or engineer (project manager or team leader) who would be responsible for the over-all implementation of the project. He should be experienced in planning and programming the metalworking (engineering) industries.

An industrial engineer who would be responsible for undertaking technical and economic surveys of the sector and for advising on investment decisions. He would participate in surveying the sector and in identifying the branches or product lines that should receive greatest emphasis. He would also advise on government policy measures conducive to raising the effectiveness of the sector.

Mechanical, electrical and other engineers, who would participate in surveying the sector, in identifying the branches or product lines that should receive greatest emphasis and provide promotional advice to existing metalworking plants with a view to raising their technical level and export capabilities.

A cost analyst, who would be responsible for the application of programming data in concrete programmes and for profitability analysis.

A marketing expert, who would be responsible for matching local production with domestic and world market requirements and for advising on all export-promotion measures at the plant, national and world market levels.

A computation and statistical expert, who would be responsible for establishing and maintaining the set of data needed for the project and for providing full services with respect to computer calculations and planning models of the sector.

Other experts: Persons with specific expertise in certain branches of the sector would probably also be required on a short-term basis.

All of these experts, together with their counterparts, would work as a team in accordance with the Work Programme established jointly with relevant Government institutions. The training of the counterpart officers with a view to their future independent work on programming the sector is envisaged as well as provision of an appropriate number of fellowships in industrially advanced countries.

A set of technical data required for programming the sector will be prepared by UNIDO in the framework of the project. These reference data will be based on good practice in an industrially advanced country. They will cover about 1,000 typical products, including technological and design variants, with respect to manufacturing information, material inputs, machine park and overhead.

The Government contribution

National counterparts of each member of the team of experts would be appointed.

Non-professional services would be provided to support the work of the experts and their counterparts.

Office space and supplies would also be provided.

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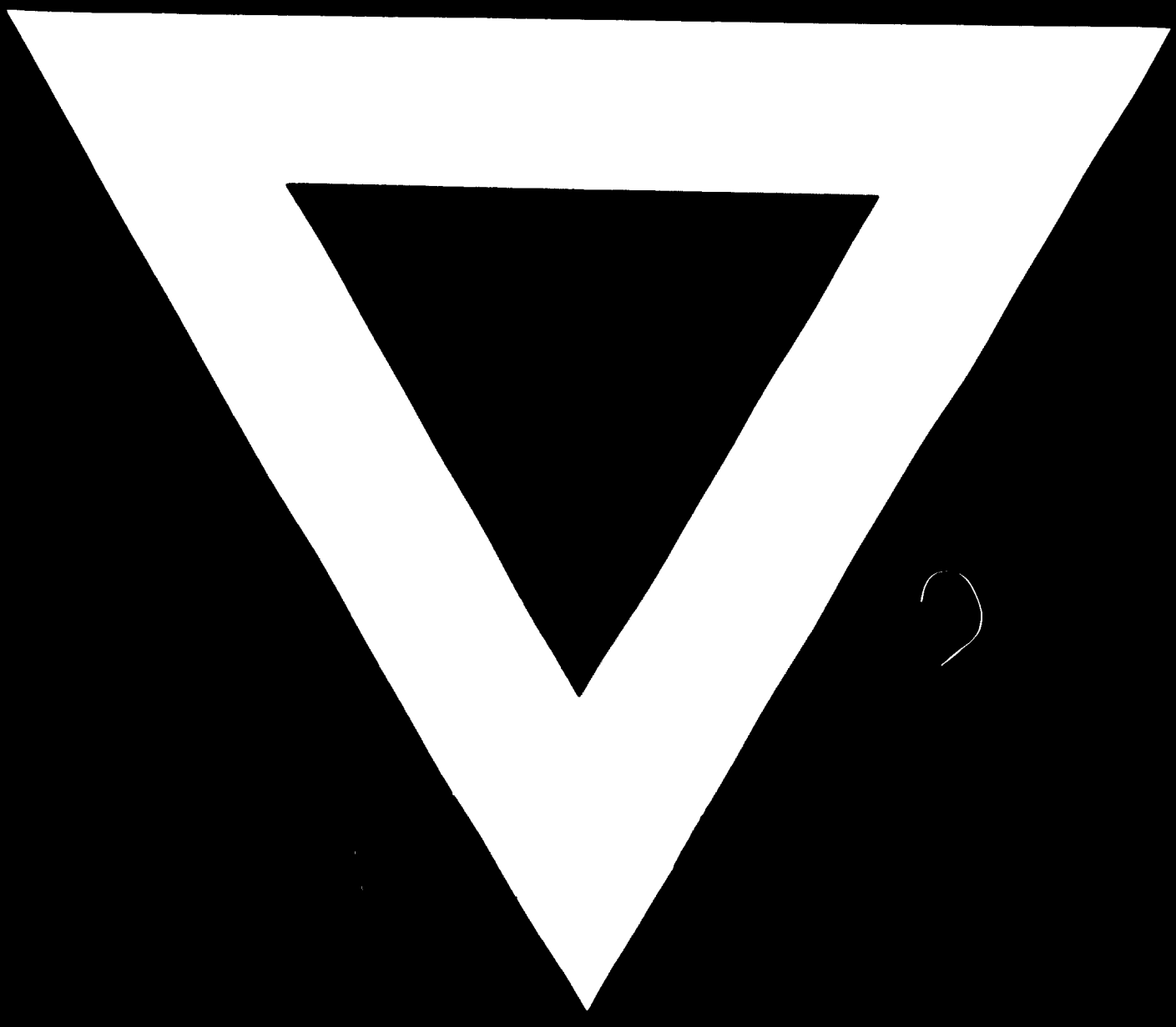

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