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Proposal for

**TECHNO-ECONOMIC STUDY
OF THE VEGETABLE OILS
INDUSTRY IN ALGERIA**

**INTERNATIONAL BECHTEL, INC.
May 1973**

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Section I
Introduction



Section 1

INTRODUCTION

This proposal is submitted in response to the Request for Proposal from the United Nations Industrial Development Organization (UNIDO) dated March 19, 1973 and entitled, "Techno-Economic Feasibility Study of the Vegetable Oils Industry in Algeria," DP/ALG/72/005, as modified by telegram dated April 18, 1973.

Bechtel has successfully completed a variety of studies in marketing, economic development, and chemical process industries. Additionally, Bechtel would engage F. E. Sullivan, president of Frank E. Sullivan Company, specialists in the design and operation of vegetable oil processing facilities, as a consultant for this project. The combined capabilities of the two companies will assure timely execution of the proposed work in a highly professional manner. Bechtel is currently engaged in other work in Algeria and maintains an office in Algiers. This experience and presence in the country will aid the project team.

The team nominated for this project represents a high level of academic training and professional experience in engineering and research. It will be able to draw upon additional capabilities in the home office staffs of the two companies, which include process engineers, construction engineers, cost estimators, economists, and financial specialists.

SCOPE OF THE STUDY

This offer covers Phase I of the requested study, plus certain other work believed by Bechtel to be necessary before Phase II can be considered.

The Request for Proposal has been studied carefully by Bechtel and its consultant. A serious attempt has been made to estimate the man-months that would be required to complete the indicated scope of work for both Phase I and Phase II. Based on our understanding of the requested scope of work for Phase II and our experience in engineering design, it has been concluded that the variables affecting the nature of the plants for which specifications and cost estimates are requested are such as to preclude a firm estimate of study costs at this time. It is certain, however, that the level of effort required for Bechtel to provide the detailed information specified for Phase II at the appropriate level of quality would substantially exceed the effort contemplated by UNIDO for the entire study, as covered by the Request for Proposal.

As an attempt to resolve this problem, we are proposing a more limited study that we believe is a necessary first step in planning the expansion of the vegetable oil industry in Algeria. This proposed study is described in Section 2, and we believe that it merits serious consideration. After this first step is taken it would be possible to choose the plant, or plants, that would best meet the needs of Algeria, to describe their characteristics in detail and accurately estimate the effort that would be required for plant specifications and cost estimates.

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Section 2
Project Approach



Section 2

PROJECT APPROACH

The demand for vegetable oil products, soap and other derivatives is growing in Algeria due to growth in population and income and as a result of industrialization. The Société Nationale des Corps Gras (SNGG) wishes to expand its capacity to satisfy most of the Algerian demand for edible oil products and soaps. To the extent that they could be produced to good advantage in the country, SNGG wishes also to supply oil products and derivatives used in Algeria as industrial materials. The objective of this study is to determine the optimum approach to increasing SNGG production capacity to meet these goals.

The study proposed here would have three major parts, each of which are discussed in the pages that follow.

- Market Study
 - Edible Products and Soap
 - Industrial Products
- Raw Materials
- Alternatives for Additional Capacity.

MARKET STUDY

A background note will be prepared describing the present situation and trends in the world market for oilseeds and unrefined vegetable oils. This will be based on available literature and on consultations with experts in the U. S. Department of Agriculture and the Food and Agriculture Organization of the United Nations. The discussion will

deal with world supply and demand in general terms and will not consider markets on a country-by-country basis.

A similar note will be prepared with respect to the European market for industrial compounds derived from vegetable oils. The discussion will be based on available literature and statistics and limited consultation with specialists in this subject. Coverage will be limited to the European Economic Community.

Present and potential markets in Algeria will be studied in detail to estimate present levels of demand and to project the growth of demand for the years 1975, 1980 and 1985. The products covered will include, but will not necessarily be limited to:

- edible oils (except olive oil)
- margarine
- hydrogenated products
- toilet soap
- household soap
- industrial oils
- fatty acids
- alcohols
- alcohol sulfates
- fatty amines
- esters.

Edible Products and Soap

The markets for edible products and soap will be analyzed in relation to growth of population and incomes in Algeria. The available historical data on consumption of these products and on population and national income in Algeria will be related to estimate the responsiveness of per capita consumption to increases in per capita income. To the extent possible, the analysis will distinguish between urban and rural areas.

A search will be made for prior studies of consumption patterns and family expenditures in Algeria, and any relevant information from such studies will be used to the extent possible. For example, a study of agricultural development and related industries, including some analysis of the vegetable oils industry, has recently been completed for the Minister of State for Finance and Planning by EASAMS, Ltd. This work would be useful background for the present study.

Population projections and income growth targets adopted by the Algerian Government for economic development planning purposes will also be used as the basis for the demand forecasts. Similarly, the planning goals of the Government with respect to locations of population and industry will be used in any geographical analysis of the market that is undertaken.

Industrial Products

The potential oil materials and derivatives that could be produced are very numerous, and they have a variety of uses in many industries. Figure 2-1 shows schematically, in a simplified way, the kinds of relationships that are involved. The oil based products are represented by generic terms, such as alcohol sulfates and fatty amines. Each such term represents a family of compounds rather than a single product. It can be seen in the figure that most of these groups of compounds are produced by multi-step synthesis, rather than being derived directly from vegetable oils.

The first step in the market study for these products would be to expand and present in greater detail the kind of information shown in Figure 2-1. This would identify the products and the potential using industries that will be significant in Algeria. The project team will review the present state of industrial development in Algeria and will estimate the potential developments by 1975, 1980 and 1985 that can reasonably be envisaged for planning purposes.

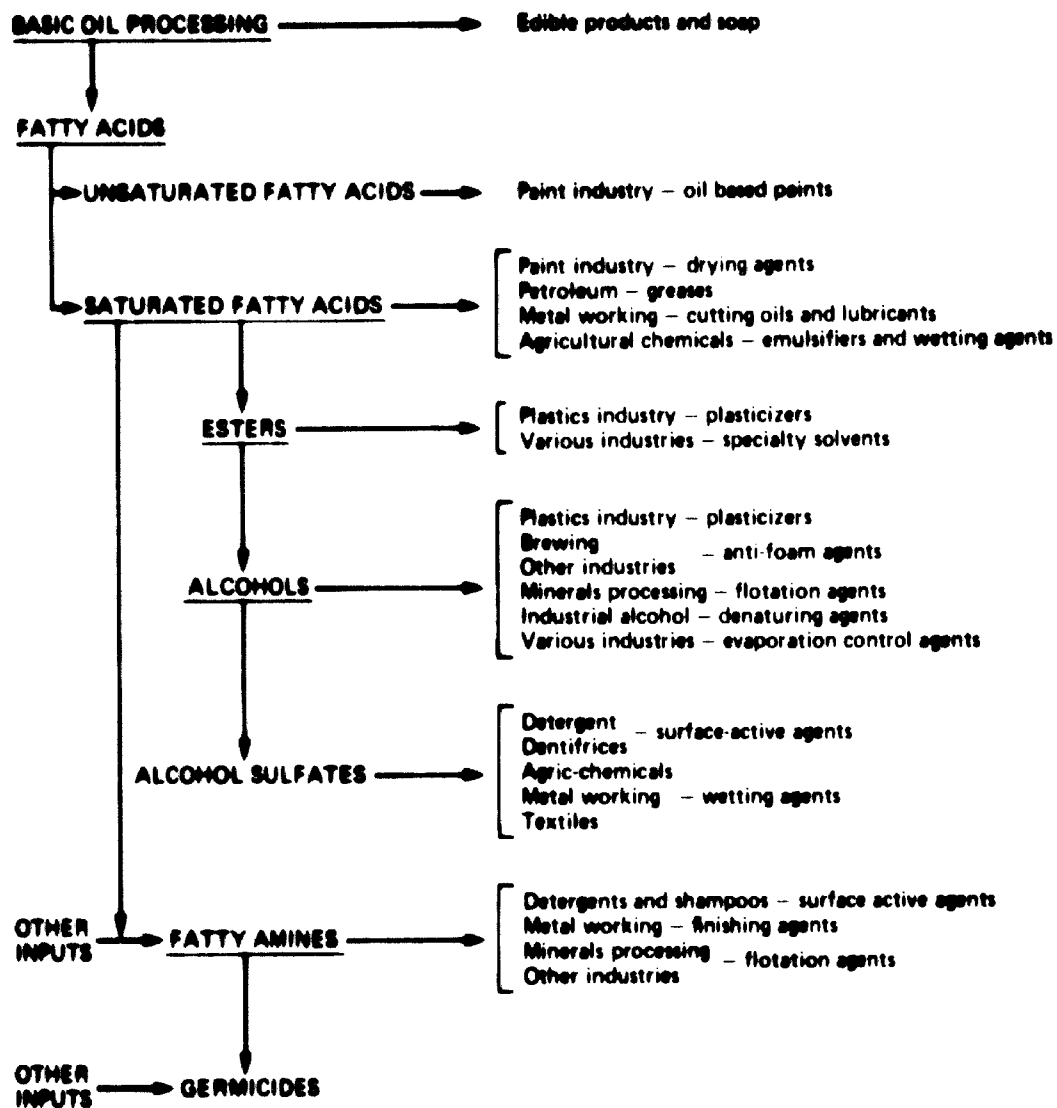


Figure 2-1. Selected Product and Industry Relationships

Estimates of future developments will be based as much as possible on Government plans and programs that can be identified. The third Four Year Development Plan for Algeria is presently being prepared, and it is assumed for purposes of this proposal that the Government will make available to the project team the relevant information assembled to date in the planning process. Such information would include any descriptions that have been prepared showing progress during the Four Year Plan for 1970-73 and the present industrial base of the country. It would also include such tentative plans for the next four years as have been drafted. The Ministry of Industry and Energy presently is sponsoring a study of the industrial development options, or strategies, that Algeria might elect to follow. Information arising from this study will be important to the project.

For the time period beyond the current planning horizon of the Government, the project team will be guided by available statements of Government policy and strategy for long-term industrial development. Such guidelines will be related to potential technical linkages between industries to project as fully as possible a reasonable pattern of development for the industries that could be users of vegetable oil products and derivatives.

The next step in the market study for industrial products will be to survey, to the extent possible in the time available for this study, current use of these products, by generic class. This will be done through personal interviews with senior technical persons in the industries concerned. Information will be sought concerning the specific compounds used and use factors in relation to industry output.

The most efficient development of the vegetable oil products and derivatives in Algeria would be obtained by following a strategy of orienting users to as few compounds as possible, so that those compounds could

be produced on the largest scale warranted by combined demands. In the market study for vegetable oils derivatives and the possibility of applying this strategy for the products concerned will be investigated.

Since there are economies of scale in producing any of the vegetable oil derivatives, it would facilitate establishment of a plant if as much demand as possible could be concentrated on a single product, rather than being spread over several variations of the product. For example, if the textile industry were to use detergents made from alcohol sulfates, and if the agricultural chemicals industry were to use alcohol sulfates as emulsifiers and wetting agents for pesticides, the possibility for producing alcohol sulfates on an economic scale would be enhanced. To test the possibilities for standardizing a limited range of products, the technical persons interviewed will be asked to discuss possibilities for adopting techniques and production practices that would involve some change in the compounds used.

Final estimates of the present and future markets for the principal vegetable oil derivative compounds will be made by evaluating the growth prospects of using industries, the use factors for the compounds concerned, and the possibilities of converting industries to use of a limited number of compounds.

RAW MATERIALS

Most of the raw materials for the Algerian vegetable oils industry are presently being imported, but efforts are being made to expand domestic production of oilseeds. The review of the world market situation mentioned earlier will include a discussion of trends in the availability of the major oilseeds that are potential raw materials for the Algerian industry, including sunflower seeds, cottonseed, rapeseed, sesame, safflower, soybeans and flaxseed. In addition, an analysis of available data concerning

the development of oilseed production in Algeria will be made to estimate the kinds of raw materials having potential for substantial production in the country.

A summary will be prepared showing the differences in types of equipment and processes that would be required to utilize the different potential raw materials and showing any differences in kinds and qualities of products that would be associated with the different raw materials.

ALTERNATIVES FOR ADDITIONAL CAPACITY

On the basis of general knowledge of the size of the Algerian economy and of its present state of development, it appears likely that the additional vegetable oil processing capacity required to meet the probable growth of demand will be found to be rather small in relation to the sizes of plants and processing equipment now in common use in the world. Although the SNCG has expressed interest in building three new plants, it is recommended that the decision concerning the way in which additional capacity will be provided be deferred until other alternatives that might be of interest have been considered. Therefore, it is proposed to proceed in the present project as outlined below.

Plans for enlarging the capacity of the vegetable oils industry should be related closely to the capacity and capabilities of the plants already installed in Algeria. The plants operated by the SNCG will be visited for the purpose of observing the installations and discussing their operations with the appropriate personnel. Particular attention will be paid to the extent to which these facilities are realizing their full production potential and to the possibilities for enlarging and/or diversifying the existing plants.

Based on the existing situation with respect to plant capacities and on the forecasts of demand for the various products covered in the market study, the project team will consider the possible ways which Algerian processing capacity could be made adequate to meet the expected demand. For this purpose, plant capacity will be treated in two categories: (a) oilseed crushing, oil extraction, and processing into edible products and soaps, and (b) processing into intermediate products for industrial use. The former will be referred to as basic capacity, and the latter will be termed industrial products capacity.

Basic Capacity

The number and identity of reasonable alternative ways in which the SNCG could satisfy future demand for basic capacity cannot be determined until the data on markets and existing plants are available. However, the alternatives might include expansion and/or diversification of existing plants, as well as construction of one or more new plants. The alternatives will be briefly described in the project report and will be ranked in order of approximate costs of construction and operation.

Prior to selecting the alternatives to be considered, the SNCG and any other relevant Algerian Government agencies will be consulted to determine the criteria that should be used to define alternatives that are meaningfully different from each other. In addition to the obvious criterion of cost, it may be necessary to consider such matters as numbers of jobs that would be created, the locations in which it is desirable to create jobs, and the environmental impacts of different types and locations of plants. The characteristics of each alternative in terms of the criteria found to be relevant will be described.

The descriptions of alternatives at this state of investigation including the cost ranking, will be made in general terms based on the experience of the project team and engineering judgment.

Industrial Products Capacity

Processing basic edible products into industrial intermediate products requires chemical transformations that are more complex than those involved in the basic oil processing. In addition, even large, highly industrialized economies some of the industrial products derived from vegetable oils are used in small quantities. Therefore, it is not possible to say in advance of the Algerian market study whether the production of industrial intermediates in Algeria would be advantageous.

When the results of the market study are known and the number of products needed has been determined, the project team will describe the products and product groups best suited to production in Algeria. Ways in which production could be accomplished by adding facilities to basic oil processing plants will be indicated.

Selection of Preferred Alternatives

A report describing alternatives with respect to additional basic processing capacity and the possibilities for producing industrial intermediate chemicals will be submitted to UNIDO as indicated in the Request for Proposal for the project final report. The relative advantages and disadvantages of the various alternatives can then be considered by UNIDO and the SNCG, and the most desirable ways to provide additional processing capacity can be selected for further study. There may be no single criterion that will govern this selection. This procedure will insure that the appropriate officials have the opportunity to reach an informed judgement based on all relevant factors. The decision reached at this point will define the number and general characteristics of processing plants for which designs and specifications will be needed.

Section 3
Schedule and Costs

Section 3

SCHEDULE AND COSTS

SCHEDULE

The work will be carried out in accordance with the schedule of activities and milestones outlined in Figure 3-1. Work will begin within two weeks after receipt of the study contract. The economist/market analyst (study leader) and the process engineer will spend one week in San Francisco to prepare detailed work plans and will then proceed to Algeria (via Washington, D. C. for consultations in the U. S. Department of Agriculture, Paris to obtain Algerian visas, and Rome for consultations at the FAO). Since UNIDO will have a Project Director in Algiers, it is assumed that no visits to UNIDO in Vienna will be required during the project.

The foregoing team members will spend approximately six weeks in Algeria working in close liaison with the UNIDO Project Director and the SNCG. It is assumed that the Project Director and SNCG will assist actively in arranging interviews needed in Algeria and in obtaining the release of data required for the project. On completion of the field work and an oral discussion of preliminary findings with the Project Director and the SNCG, the team members will return to San Francisco for preparation of the written report. Other members of Bechtel's engineering and technical staff and the president of Frank E. Sullivan Company will be available to assist as necessary in analysis of data and preparation of the report.

The report will be submitted in draft form, in French, approximately four months from the start of work in the project, following the procedure indicated in the Request for Proposal for the final project report. The report will be finalized within 30 days after receipt of UNIDO comments and submitted as indicated in the Request for Proposal.

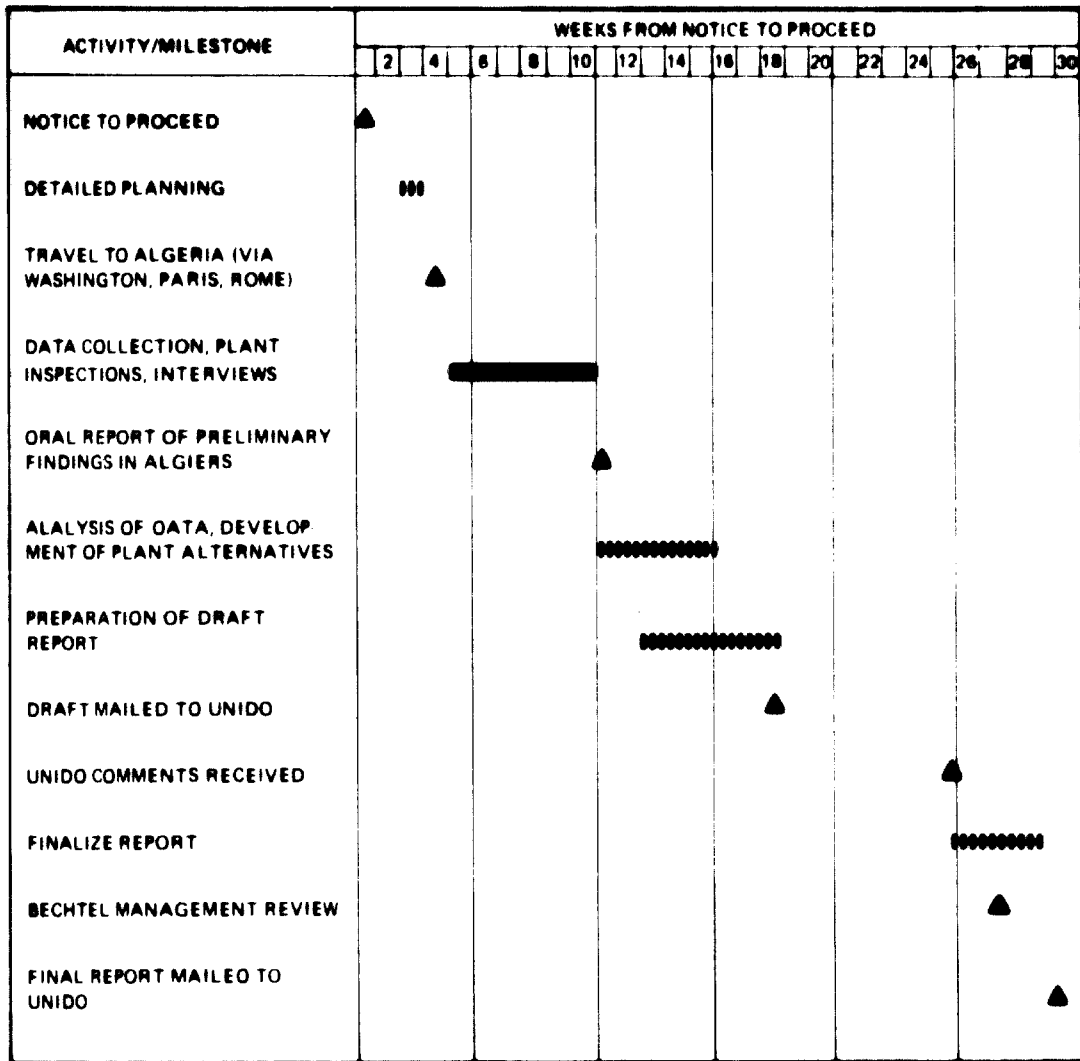


Figure 3-1. Project Schedule and Milestones

ANALYSIS OF COST PROPOSAL

1. Professional Services

Project Area

<u>Position Title</u>	<u>Man- Month</u>	<u>Rate (\$/ Man-Month)</u>	<u>Total Costs(\$)</u>
Study Leader/Development Economist-Marketing Analyst	1.4	7845	10,985
Process Engineer/Marketing Analyst	<u>1.4</u>	7300	<u>10,220</u>
Total Project Area	2.8		21,205

Home Office

<u>Position Title</u>	<u>Man- Month</u>	<u>Rate (\$/ Man-Month)</u>	<u>Total Costs(\$)</u>
Department Manager	.1	9455	945
Group Manager	.1	9455	945
Study Leader/Development Economist-Marketing Analyst	2.1	7845	16,475
Process Engineer/Marketing Analyst	1.2	7300	8,760
Process Engineer	<u>.2</u>	7400	<u>1,480</u>
Total Home Office	3.7		28,605

2. Subsistence

Project Area

74 man/days @ 38 per day	2,810
10 " " @ 25 " "	250

Intransit

14 man/days @ 30 per day	420
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Briefing and Debriefing

man/days @ per day	<u>N/C</u>
Total Subsistence	3,480

3. Travel and Transportation

	<u>Trips</u>	<u>Days En Route</u>	<u>Total Cost(\$)</u>
San Francisco/Washington D. C. / Paris/Rome/Algiers/San Francisco air round trip			
Study Leader	1	7	1065
Process Engineer	1	7	1065
Other local trips allowance All transportation within Algeria to be provided.			50
Cost of Staff in Transit (Study Leader 0.3 man-month; Process Engineer 0.3 man-month)			<u>1445</u>
Total Travel and Transportation			3625

4. Reports (Draft Final and Final Reports)

Preparation	2645
Publishing	<u>1500</u>
Total Reports	4145

5. Other Direct Costs

Telephone, Telegraph, Postage, Cables, etc.	1120
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6. Equipment, Materials and Supplies	<u>100</u>
Total Other Direct Costs	1220

7. Subcontracts

Consultants .7 man/months @ \$6430	<u>4500</u>
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8. Grand Total - Items 1-7 - Contract Price U. S. Dollars	\$66,780
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9. Currency Requirements - a) b) and c)

Bechtel is flexible in this regard - to be negotiated.

Man-Month Cost Analysis

- Man-Month at Home Office (U. S. A.) refers to a 173.3 man-hour work-month with five work days, Monday through Friday, 40 hours per week.
- Man-Month in Project Area refers to a 173.3 man-hour work-month with five work days, Monday through Friday, 40 hours per week.
- All Bechtel personnel are of "professional staff" classification, both in Home Office and in Project Area.
- Man-Month cost is determined as follows:

Bare Labor	1.000
Additives (Insurance, vacation, sick leave, holiday, social security, and re- tirement benefits)	.290
Overhead	1.676
Fee	<u>.445</u>
	3.411

- Overhead covers the indirect cost to Bechtel of maintaining and operating established offices. These indirect costs are not charged to the work as direct costs and shall not duplicate such direct costs.

Qualifications to Cost Proposal

This cost proposal has been prepared using the following assumptions as described below. It is assumed that all local travel within the Project Area will be provided by UNIDO. Initiation of action to have such travel provided will be taken by UNIDO.

To assist in making effective use of the study time available, UNIDO will issue all field personnel of the contractor a letter requesting that customs and immigration procedures be expedited.

**Section 4
Management
and Organization**

Section 4

MANAGEMENT AND ORGANIZATION

Bechtel proposes to assign a small, highly qualified staff to this project. This team will work closely together drawing on their experience and consulting as necessary with other professionals in the Bechtel organization. The Frank E. Sullivan Company of Tiburon, California is highly specialized in the design and operations of vegetable oil processing plants and would serve as subcontractor to Bechtel. Relevant experience of our two groups is summarized in Section 5. Detailed personal history statements (TARS 2 and 3) for each of the proposed members of the project team are in Section 6.

Manager

Department Manager - Gene H. Dyer. Mr. Dyer is Manager of the Process and Environmental Department in Bechtel's Scientific Development operation, which will have direct responsibility for the proposed study. In this capacity, Mr. Dyer oversees the work of engineers, scientists, planners, economists, and environmentalists in the preparation of special research projects and studies.

Project Manager

George T. Hayes. Mr. Hayes is head of the Resources Planning and Economics Group in Bechtel's Scientific Development Department. He will have overall project responsibility and management. He is a licensed mechanical engineer (California). During a two-year

assignment as Manager of Bechtel Espana he headed a study of the feasibility of developing an agro-industrial-tourism complex in southern Spain. He has managed and participated in a variety of product development and corporate planning activities.

The following members of the team will conduct the project work in Algeria.

Study Leader

Neil T. Houston. Dr. Houston will have direct responsibility for coordinating the effort of the study team, both in the United States and in Algeria. He has a broad background in economic development studies, industrial plant location, and feasibility analysis. He has served as project leader for many studies in the United States and abroad, including the work of a joint U. S. -French-British team on a one-year project for the World Bank concerning regional transport in Africa. He was a member of the Bechtel team for the Setif regional development study in Algeria in 1970-71 and has worked in Morocco, Spain, Portugal and other countries.

A. T. Stewart, Jr. Dr. Stewart is Chief Scientist in Bechtel's Scientific Development Department and a specialist in the chemical process industries. He is especially well suited to identify the opportunities for using vegetable oil derivatives in the various industries developing in Algeria and to determine the optimum ways by which such derivatives can be produced.

Home Office Support will be provided by the following and such other members of Bechtel's engineering and technical staff as may be required.

Frank E. Sullivan. Mr. Sullivan is a chemical engineer with many years of experience in the food, chemical, and fatty oil processing industries. He has worked with leading companies in the United States and other countries both to improve operations in existing plants and to design new facilities. He is especially well qualified with respect to the edible products and soap, both in terms of raw materials and product characteristics and in plant design capability.

Robert T. Milligan. Dr. Milligan has many years experience in the design and development of chemical processes for industry. He is currently engaged in process engineering for water pollution control and is particularly well qualified to consider the environmental impact aspects of potential plants and product uses in Algeria.

**Section 5
Experience**



Section 5

CORPORATE CAPABILITIES AND EXPERIENCE

BECHTEL

From a modest beginning in 1898, the Bechtel organization has developed into one of the world's most experienced firms in the fields of planning, architecture, engineering, and management of large projects. The firm's operations extend to fifty nations and all continents. Industrial and public works experience includes design and construction of fossil-fueled and nuclear power plants, refineries, chemical plants, pipelines, LNG and other cryogenic plants, marine facilities, airports, ground transportation systems, dams and other hydro structures, food processing plants, mining and metallurgical facilities, pipe mills and other metal working plants, cement plants, hospitals, telecommunications systems, and environmental control systems.

Also important in providing a full-spectrum capability base, Bechtel has performed a number of market and economic studies pertinent to the successful execution of the Algerian vegetable oils feasibility study. Included in this experience is the analysis of:

- Industrial development opportunities
- Transportation system development
- Geographic and product market opportunities
- Resource utilization
- Socio-economic-labor impact of new facilities.

Such work is generally carried on within Bechtel's Scientific Development Department, which has a multi-disciplinary staff of 130 engineers, economists, planners and system analysts. UNIDO is familiar with the work of this department on the Masan Free Export Zone (Korea) study in 1971. Other specific project examples:

Market and Economic Studies

- Development Program for Setif Region, Algeria. An integrated development program was prepared covering water resources, agriculture, industry and infrastructure. Regional resources and relations to national markets and transportation systems were analyzed. The industrial profile utilized linkage concepts, driving industries, and complementary industrial relationships. The study was sponsored by SONATRACH on behalf of the Ministry of Industry and Energy. Bechtel is presently negotiating with SONATRACH for the next phase of analysis for this region, consisting of a feasibility study for water resource development and irrigated agriculture.
- Engineering and Construction Opportunities in the Fertilizer Industry. As a part of its own planning for corporate development and diversification, Bechtel analyzed future markets and expansion plans for the fertilizer industry for the period 1970-1980. Although the study concentrated on North America, it also appraised the size and near-term outlook for such major fertilizer markets as India, South East Asia and Europe. Attention was focused on the opportunities for additional ammonia capacity in large and small-size plants, and on the outlook for nitric acid, ammonium nitrate and nitric phosphate.
- Batam Island Industrial Free Trade Zone. As the principal part of a master planning study for a small Indonesian Island in the Singaport Strait, a study was conducted to develop a plan for phased industrialization and to determine the role of a free trade zone in this development. The work was for a consortium consisting of Pacific Bechtel, Pertamina, and Nissho-Iwai. Government institutional arrangements were recommended, and evaluation criteria were devised, from

which a list of potential candidate industries was set forth. Additionally, several focal point or driving industries were specified. Social, labor and economic impacts were determined for the local region and were related to the national scene.

- Chemical Markets in the State of Kentucky. This study was prepared under the auspices of the Kentucky Department of Commerce to help to attract new industry to the state. Existing and potential product markets for plastics, synthetics, rubber and associated petrochemicals were determined and were related to industrial development. The study evaluated several alternate sites as to their merits for serving midwest U.S. markets. Work included analysis of population trends, sources of industrial supply, and identification of industrial prospects.
- Point Tupper Industrial Complex. For the British American Oil Company Limited, Bechtel examined the markets available to support a petroleum-based industrial complex in Nova Scotia over a 20- to 30-year period of growth. The study took into account markets within the complex as well as outside markets. Factors determining successful entry into these markets, such as raw materials, land and capital, labor, and transportation costs were also considered.
- Market Potential to 1980 for Ferroalloys in Selected Countries. This study was aimed at determining market feasibility for a ferroalloy production facility to be located in Southern Iran and was part of a regional development study conducted for the Plan Organization of that country. Ferromanganese, ferrochrome and ferrosilicon markets were estimated and projected for the nation and regional areas and for selected countries that were considered to represent potential export markets. The study projected growth in raw steel production in these countries and the corollary growth in ferroalloy consumption.
- Market to 1980 for Submarine Pipeline Anchors. Bechtel was asked by Magnavox Company to determine the size of the total submarine pipeline anchoring market to 1980, and the potential number of self-embedment anchors that could serve this market. Future off-shore production of crude oil, world-wide, was estimated.

Although definitive data on existing submarine pipeline mileages does not exist, Bechtel market analysis personnel devised two techniques to estimate the size of the future market. Each technique served to check the other and allowed us to furnish the client with an expected geographic distribution of his product. Thus, we were able to suggest where his market development efforts should be concentrated.

- U. S. Primary Aluminum Industry in 1980. For Bechtel's own corporate planning purposes, a 12-year future forecast was made of components of the primary aluminum industry to project new additions to capacity, market shares and organizational changes expected to have impacts on the industry. Trends in bauxite and alumina products abroad were projected, and sociopolitical changes in foreign producing countries were noted and assessed for their effect on the United States.

Food Related Plant and Process Experience

Over the years the Bechtel group of companies has undertaken or assisted on numerous projects for food-related industries. Many of these required evaluation of alternate processes, and process selection and development. Because Bechtel does not have proprietary or patent interests in processes, this work can be completely objective and is designed to serve the best interests of the client.

Following are selected examples of Bechtel's experience in food related industries:

- General Foods Corporation. Bechtel provided engineering, design, procurement, and construction services for a major grass roots food processing plant for the Jello Division in Delaware. Production for some 16 grocery items was designed, including manufacturing, packaging, storage and laboratory operations. Additionally, ancillary facilities were designed for distribution of the final products.

- United Vintners. For the Petri winery, a number of assignments were performed in the 1960's. These included conducting a pilot plant program to extract juice from grapes. The work involved selection and development of processes. Additionally, engineering services were performed for an addition to the plant's warehousing and bottling facilities.

FRANK E. SULLIVAN COMPANY

Bechtel is fortunate in having available as a consultant for this project the president of the Frank E. Sullivan Company (FESCO) of Tiburon, California. Located only a few miles from Bechtel headquarters in San Francisco, FESCO provides consulting services and engineering design to leading U. S. Companies processing vegetable oils. The company was formed in 1967 under the leadership of Frank E. Sullivan, who brought to the new organization 25 years experience in fats and oils processing and related industries. This experience is indicated in Mr. Sullivan's personal history form in Section 6. By concentrating on the vegetable oils industry, a staff of 12 is able to offer analysis in depth of client problems. Projects recently completed or now underway include:

- Palmco, Inc., Portland, Oregon. New grass roots edible palm oil processing plant for Portland, Oregon. Complete detailed engineering, purchase of all process equipment, tank farm, boiler room, construction supervision and plant start-up. Sullivan process is employed for physical refining of crude palm and coconut oil to produce edible product.
- Archer-Daniels-Midland, Decatur, Illinois. Consulting, engineering modification and equipment specification for improving efficiency at the large Decatur West edible oil refinery.
- Fore Terminal, Alameda, California. Engineering design and purchase specifications for batch type tallow refining.
- Central Soya Company, Fort Wayne, Indiana. Process consultants for new edible oil refinery at Decatur, Illinois including tank farm, refining, bleaching, hydrogenation, deodorizing and hydrogen gas plant.

- Keith Engineering Corporation, Santa Fe Springs, California. Design and detailed engineering for a continuous caustic oil refinery for North West Vegetable Oil, Australia. Design and detailed engineering for bleaching and deodorization at same plant.
- Pacific Molasses Company, San Francisco, California. Design, engineering and equipment specifications for a tallow storage and processing plant at Westwego, Louisiana, including refining, bleaching, storage and building.
- Hunt-Wesson Foods, Fullerton, California. Complete design and detailed engineering including piping, structural and contractor bid package, for major plant expansion. Complete engineering and purchasing for a new semi-continuous hydrogenation system, a Sullivan process. This also used liquid hydrogen for vaporizing into hydrogen gas.

**Section 6
Personnel**

UNITED NATIONS

PERSONAL HISTORY STATEMENT (PROJECT PERSONNEL)

(TARS 2)

THIS INFORMATION MAY BE SUBMITTED TO MEMBER GOVERNMENTS

DATE: March 22, 1972 SIGNATURE: Gene H. Dyer

1. NAME: Gene Harlan Dyer	2. NATIONALITY: U. S. A.
3. PRESENT ADDRESS: Bechtel Corporation 50 Beale Street San Francisco, Calif. 94119	4. DATE OF BIRTH: May 13, 1930
	5. MARITAL STATUS: Married

6. KNOWLEDGE OF LANGUAGES: Mother Tongue: English

OTHER LANGUAGES	READ		WRITE		SPEAK		UNDERSTAND	
	EASILY	NOT EASILY	EASILY	NOT EASILY	FLUENTLY	NOT FLUENTLY	EASILY	NOT EASILY

7. EDUCATION (see Instruction 5)

DATES ATTENDED		NAME and LOCATION of INSTITUTION of LEARNING	ACADEMIC DEGREES and CERTIFICATES or DIPLOMAS OBTAINED	MAIN FIELD of STUDY
From	To			
1947	1951	University of Nebraska	B.S.	Chemistry, math. physics Nuclear Engineering Construction Methods
1951	1955	University of Idaho, Richland Extension	none	
	1967	Bechtel Corporation		

8. LIST ANY PUBLICATIONS OR PAPERS: (see instruction 6)

"Factors in Nuclear Power Economics", NUCLEX 1966, October, 1966

"NUFUEL Computer Code Gives Accurate Nuclear Fuel Costs", Electrical World, November 28, 1966

Uranium Enrichment Problem as Seen by the Engineer-Constructor, Nuclear Symposium on Uranium Enrichment, Turin, Italy, October, 1968

Uranium Enrichment Procurement, Atomic Industrial Forum Topical Conference on Nuclear Fuel Procurement and Financing, Miami, Florida, February, 1969

9. LIST SPECIAL QUALIFICATIONS AND SKILLS CONFIRMED BY LICENSES HELD AND MEMBERSHIP IN PROFESSIONAL, CIVIC, PUBLIC OR INTERNATIONAL SOCIETIES OR INSTITUTIONS RELEVANT TO YOUR APPLICATION; INDICATE THE CLASS OF MEMBERSHIP WHEN APPROPRIATE:

Member, USA Standards Institute Sub-Committee N-101.3 on Uranium Enrichment, Chairman, Working Group on Standard Enrichment Levels

Member, USA Standards Institute Sub-Committee N-101.5 on Uranium Reprocessing

Chairman, Northern California Section, American Nuclear Society, 1969-70, Board of Directors, 1970-71.

Member, Atomic Industrial Forum, Uranium Isotopic Enrichment Committee

PROFESSIONAL EXPERIENCE (see instruction 7)

A.	<p>From: 1963 To most recent date of employment: Present</p> <p>EMPLOYER (Name and Address) AND TYPE OF BUSINESS: Bechtel Corporation, 50 Beale Street, San Francisco, California 94119</p> <p>TITLE OF POST AND NATURE OF DUTIES: Mr. Dyer is currently the Manager of the Process and Environmental Department, encompassing regional planning, development engineering work on nuclear fuel facilities, developmental chemical processing facilities, pollution abatement work in air treatment, municipal sewage treatment and reclamation, desalting, and solid wastes treatment. Earlier, Mr. Dyer was Process Group Leader for several development studies on uranium recovery and processing, with emphasis in the mining and milling, conversion to UF₆, isotopic enrichment, fuel fabrication, and reuse processes. He was also Project Manager for the conceptual and preliminary design of a large spent-fuel reprocessing plant.</p> <p>NUMBER AND KIND OF EMPLOYEES SUPERVISED:</p>
B.	<p>From: 1959 To: 1963</p> <p>EMPLOYER (Name and Address) AND TYPE OF BUSINESS: U. S. Atomic Energy Commission, Germantown, Maryland</p> <p>TITLE OF POST AND NATURE OF DUTIES: As a Reactor Engineer, Mr. Dyer directed programs for the development of advanced nuclear power plants to serve as possible successors to the type being used in the N. S. Savannah. He was group leader for the completion of a second reactor core developed by the General Electric Company. Upon completion of the N. S. Savannah, Mr. Dyer assumed responsibility for the technical direction of the Oak Ridge National Laboratory thorium-fuel-cycle development program for the AEC, including the design and construction of the thorium-uranium recycle facility, the development of Sol-Gel processing techniques, and fuel cycle cost evaluations for various reactor types.</p> <p>NUMBER AND KIND OF EMPLOYEES SUPERVISED:</p>
C.	<p>From: 1955 To: 1959</p> <p>EMPLOYER (Name and Address) AND TYPE OF BUSINESS: U. S. Navy, Research & Development Bureau of Ordnance, Washington, D. C.</p> <p>TITLE OF POST AND NATURE OF DUTIES: Mr. Dyer served as Project Engineer on guided missile liquid and solid propellant development.</p> <p>NUMBER AND KIND OF EMPLOYEES SUPERVISED:</p>

PROFESSIONAL EXPERIENCE (Continued)

D.	<p>From: 1951 To: 1955</p> <p>EMPLOYER (Name and Address) AND TYPE OF BUSINESS: General Electric Company, Richland, Washington</p> <p>TITLE OF POST AND NATURE OF DUTIES: As a Reactor Operations Engineer, Mr. Dyer conducted special design and development programs which involved underwater remote processing equipment for handling radioactive process equipment, flow instrumentation equipment, and specialized mechanical and hydraulic equipment to allow on-the-line reactor refueling operations.</p> <p>NUMBER AND KIND OF EMPLOYEES SUPERVISED:</p>
E.	<p>From: To:</p> <p>EMPLOYER (Name and Address) AND TYPE OF BUSINESS:</p> <p>TITLE OF POST AND NATURE OF DUTIES:</p> <p>NUMBER AND KIND OF EMPLOYEES SUPERVISED:</p>
F.	<p>From: To:</p> <p>EMPLOYER (Name and Address) AND TYPE OF BUSINESS:</p> <p>TITLE OF POST AND NATURE OF DUTIES:</p> <p>NUMBER AND KIND OF EMPLOYEES SUPERVISED:</p>
G.	<p>From: To:</p> <p>EMPLOYER (Name and Address) AND TYPE OF BUSINESS:</p> <p>TITLE OF POST AND NATURE OF DUTIES:</p> <p>NUMBER AND KIND OF EMPLOYEES SUPERVISED:</p>

Use additional sheet if you have held more posts.

UNITED NATIONS

PERSONAL HISTORY STATEMENT (PROJECT PERSONNEL)

(TARS 3)

THIS INFORMATION MAY BE SUBMITTED TO MEMBER GOVERNMENTS

(see instruction 8)

ANALYSIS OF RELEVANT EXPERIENCE: Use this space to analyse your experience in relation to your statement concerning your specialisation. Additionally, if you are applying for a specific post, please indicate the number of the Job Description of this post and analyse your experience in relation to the duties and requirements set out in the Job Description.

Mr. Dyer is Manager of the Process and Environmental Department in Bechtel's Scientific Development operation. As such, he is responsible for SD's activities in regional planning, development engineering work on nuclear fuel facilities, developmental chemical processing facilities, pollution abatement work in air treatment, municipal sewage treatment and reclamation, and desalting.

UNITED NATIONS

PERSONAL HISTORY STATEMENT (PROJECT PERSONNEL)

(TARS 2)

THIS INFORMATION MAY BE SUBMITTED TO MEMBER GOVERNMENTS

DATE: March 22, 1972

SIGNATURE: 

1. NAME: **George T. Hayes**
 2. NATIONALITY: **U. S. A.**
 3. PRESENT ADDRESS: **Bechtel Corporation**
50 Beale Street
San Francisco, Calif. 94119
 4. DATE OF BIRTH: **June 18, 1917**
 5. MARITAL STATUS: **Married**

6. KNOWLEDGE OF LANGUAGES: Mother Tongue: English

OTHER LANGUAGES	READ		WRITE		SPEAK		UNDERSTAND	
	EASILY	NOT EASILY	EASILY	NOT EASILY	FLUENTLY	NOT FLUENTLY	EASILY	NOT EASILY
Spanish	X		X		X		X	

7. EDUCATION (see instruction 5)

DATES ATTENDED		NAME and LOCATION of INSTITUTION of LEARNING	ACADEMIC DEGREES and CERTIFICATES or DIPLOMAS OBTAINED	MAIN FIELD of STUDY
From	To			
1934	1937	Riverside Junior College	A. A.	Pre-Engineering
1937	1938	Boeing School of Aeronautics	Certificate of Completion	Aeronautic Engineering
1938	1940	University of California - Berkeley	B. S. M. E. (Aero)	Aeronautic Engineering
1940	1941	Harvard Business School		Industrial Management

8. LIST ANY PUBLICATIONS OR PAPERS: (see instruction 6)

- Development Potential of Southeast Spain
- Potential for Management Research in India
- The Industry-Government Aerospace Relationships

9. LIST SPECIAL QUALIFICATIONS AND SKILLS CONFIRMED BY LICENSES HELD AND MEMBERSHIP IN PROFESSIONAL, CIVIC, PUBLIC OR INTERNATIONAL SOCIETIES OR INSTITUTIONS RELEVANT TO YOUR APPLICATION; INDICATE THE CLASS OF MEMBERSHIP WHEN APPROPRIATE:

Licensed Mechanical Engineer, California

10.

PROFESSIONAL EXPERIENCE (see Instruction 7)

A.	<p>From: 1970 To most recent date of employment: Present</p> <p>EMPLOYER (Name and Address) AND TYPE OF BUSINESS: Bechtel Corporation, 50 Beale Street, San Francisco, California 94119</p> <p>TITLE OF POST AND NATURE OF DUTIES: Mr. Hayes is Manager of Regional Planning and Economics in Scientific Development. In this capacity, he directs regional development, market analysis, and systems engineering. Prior to this, he was Senior Business Development Representative, providing support for diversification of Bechtel's services into developing areas of technology.</p> <p>NUMBER AND KIND OF EMPLOYEES SUPERVISED:</p>
B.	<p>From: 1965 To: 1969</p> <p>EMPLOYER (Name and Address) AND TYPE OF BUSINESS: Bechtel Corporation, 50 Beale Street, San Francisco, California 94119</p> <p>TITLE OF POST AND NATURE OF DUTIES: For two years, Mr. Hayes was Manager of Bechtel Espana in Madrid, an organization sponsored by the International Power, Industrial and Metals Division. During this period, he managed a broad study of the feasibility of developing and agro-industrial-tourism complex in southeastern Spain. As Assistant Manager of SDD, Mr. Hayes managed and participated in corporate economic surveys involving water resources, minerals and metals, and energy supplies. One study was on the economic implications of newly discovered sources of natural gas in Western Europe.</p> <p>NUMBER AND KIND OF EMPLOYEES SUPERVISED:</p>
C.	<p>From: 1962 To: 1965</p> <p>EMPLOYER (Name and Address) AND TYPE OF BUSINESS: Stanford Research Institute, 333 Ravenswood Avenue, Menlo Park, California</p> <p>TITLE OF POST AND NATURE OF DUTIES: As Director, Planning, of Stanford Research Institute. Mr. Hayes worked with representative members of the professional staff in selecting goals and objectives and evolving organizational solutions to complex internal problems. In addition, he was manager of studies of the industry-government relationship in important segments of American industry: i. e., international telecommunications and aerospace. He also served as senior economist in a study for the Government of India of the potential for applied research services in that country.</p> <p>NUMBER AND KIND OF EMPLOYEES SUPERVISED:</p>

PROFESSIONAL EXPERIENCE (Continued)

D.	From: 1951 To: 1962
EMPLOYER (Name and Address) AND TYPE OF BUSINESS: Stanford Research Institute, 333 Ravenswood Avenue, Menlo Park, California TITLE OF POST AND NATURE OF DUTIES: Before becoming Director, Planning, Mr. Hayes was the Assistant Director of SRI's Physical Sciences Research activities. During his earlier years with SRI, he planned, developed, and executed research programs for a variety of companies and government agencies. Among these were economic development, transportation, water supply, public facility, and regional economic studies, some of which involved the developing countries. NUMBER AND KIND OF EMPLOYEES SUPERVISED:	
E.	From: 1946 To: 1951
EMPLOYER (Name and Address) AND TYPE OF BUSINESS: American Airlines TITLE OF POST AND NATURE OF DUTIES: Mr. Hayes was Engineering Manager of Constellation Convair Aircraft with American Airlines. NUMBER AND KIND OF EMPLOYEES SUPERVISED:	
F.	From: 1941 To: 1946
EMPLOYER (Name and Address) AND TYPE OF BUSINESS: U.S. Navy TITLE OF POST AND NATURE OF DUTIES: With the U.S. Navy, Mr. Hayes rose to the rank of Lt. Commander in the Naval Air Transport Service. NUMBER AND KIND OF EMPLOYEES SUPERVISED:	
G.	From: To:
EMPLOYER (Name and Address) AND TYPE OF BUSINESS: TITLE OF POST AND NATURE OF DUTIES: NUMBER AND KIND OF EMPLOYEES SUPERVISED:	

Use additional sheet if you have held more posts.

UNITED NATIONS

PERSONAL HISTORY STATEMENT (PROJECT PERSONNEL)

(TARS 3)

THIS INFORMATION MAY BE SUBMITTED TO MEMBER GOVERNMENTS

(see instruction 8)

ANALYSIS OF RELEVANT EXPERIENCE: Use this space to analyze your experience in relation to your statement concerning your specialization. Additionally, if you are applying for a specific post, please indicate the number of the Job Description of this post and analyze your experience in relation to the duties and requirements set out in the Job Description.

Mr. Hayes is head of Regional Planning and Economics in SD's Process and Environmental Department. As such, he directs regional development, market analysis, and systems engineering. His experience in planning is extensive and includes management of a broad feasibility study for the development of an agro-industrial-tourism complex in southeastern Spain. Mr. Hayes spent many years with Stanford Research Institute, ultimately as Director of Planning, and was responsible for planning, developing, and executing numerous research programs for a variety of companies and government agencies. Among these projects were economic development, regional economic studies, and infrastructural requirement analyses.

UNITED NATIONS

PERSONAL HISTORY STATEMENT (PROJECT PERSONNEL)

(TARS 2)

THIS INFORMATION MAY BE SUBMITTED TO MEMBER GOVERNMENTS

DATE: April 24, 1973

SIGNATURE: Neil T. Houston

1. NAME: Neil T. Houston

2. NATIONALITY: U. S. A.

3. PRESENT ADDRESS: Bechtel Corporation
50 Beale Street
San Francisco, California 94119

4. DATE OF BIRTH: July 19, 1917

5. MARITAL STATUS: Married

6. KNOWLEDGE OF LANGUAGES Mother Tongue: English

OTHER LANGUAGES	READ		WRITE		SPEAK		UNDERSTAND	
	EASILY	NOT EASILY	EASILY	NOT EASILY	FLUENTLY	NOT FLUENTLY	EASILY	NOT EASILY
French	X			X	X		X	
Spanish	X			X	X		X	

7. EDUCATION: (see instruction 5)

DATES ATTENDED		NAME and LOCATION of INSTITUTION of LEARNING	ACADEMIC DEGREES and CERTIFICATE or DIPLOMAS OBTAINED	MAIN FIELD of STUDY
From	To			
1935	1939	Washington and Lee University	B. A.	
1940	1941	Fletcher School of Law and Diplomacy	M. A.	International Economic Relations
1946	1948	Harvard University	M. A., M. P. A., Ph. D.	Economics

8. LIST ANY PUBLICATIONS OR PAPERS: (see instruction 6)

- Management Education in Europe, Stanford Research Institute, 1968
- An Action Program for Agricultural Development in Portugal, SACOR, Lisbon, 1967
- Economic Analysis of St. Lawrence Seaway Cargo Movements, U. S. Dept. of Commerce, 1966.
- The California Economy, 1947-1980, Stanford Research Institute 1960 (author of sections of transportation, agriculture, and construction industries)
- 'Behind the Monetary Crisis!' Contemporary Review, January 1972

9. LIST SPECIAL QUALIFICATIONS AND SKILLS CONFIRMED BY LICENSES HELD AND MEMBERSHIP IN PROFESSIONAL, CIVIC, PUBLIC OR INTERNATIONAL SOCIETIES OR INSTITUTIONS RELEVANT TO YOUR APPLICATION; INDICATE THE CLASS OF MEMBERSHIP WHEN APPROPRIATE:

PROFESSIONAL EXPERIENCE (see Instruction 7)

A.	<p>From: December 1972 To most recent date of employment: Present</p> <p>EMPLOYER (Name and Address) AND TYPE OF BUSINESS: Bechtel Corporation, 50 Beale Street, San Francisco, California 94119</p> <p>TITLE OF POST AND NATURE OF DUTIES: Senior Economist in Regional Planning and Economics group. Plan and conduct research in economic development and feasibility studies.</p> <p>NUMBER AND KIND OF EMPLOYEES SUPERVISED:</p>
B.	<p>From: March 1970 To: November 1972</p> <p>EMPLOYER (Name and Address) AND TYPE OF BUSINESS: 102 Albion Gate, London W2 2LE, England</p> <p>TITLE OF POST AND NATURE OF DUTIES: Worked as individual Consulting Economist and as Vice President of International Research Associates, Palo Alto, California, representing that company in Europe. Specialized in economic development, transportation, and investment feasibility analysis. In 1970 and in 1971 was Consultant to International Bank for Reconstruction and Development on missions to Argentina. Consultant to Bechtel for economic feasibility analysis in Setif (Algeria) regional planning study.</p> <p>NUMBER AND KIND OF EMPLOYEES SUPERVISED:</p>
C.	<p>From: 1969 To: 1970</p> <p>EMPLOYER (Name and Address) AND TYPE OF BUSINESS: Bechtel Corporation, 50 Beale Street San Francisco, California 94119</p> <p>TITLE OF POST AND NATURE OF DUTIES: Dr. Houston was a Senior Economist in Bechtel's group that specializes in regional economic development planning and manager of the research programs in applied economics and transportation.</p> <p>NUMBER AND KIND OF EMPLOYEES SUPERVISED: 4 economists</p>

PROFESSIONAL EXPERIENCE (Continued)

D.	<p>From: 1953 To: 1969</p> <p>EMPLOYER (Name and Address) AND TYPE OF BUSINESS: Stanford Research Institute</p> <p>TITLE OF POST AND NATURE OF DUTIES: Dr. Houston was a Senior Economist, working largely on economic development subject. Major topics included water resources, agricultural development, industrial plant location, population growth, community facilities, transportation, and the flow of trade between regions. He has conducted several studies abroad while working with foreign subcontractors and counterpart teams. These include agricultural development studies in Spain, Portugal, and Morocco, and a recent major review of regional transportation planning affecting</p> <p>NUMBER AND KIND OF EMPLOYEES SUPERVISED: 25 economists (40 countries in Africa.)</p>
E.	<p>From: 1950 To: 1953</p> <p>EMPLOYER (Name and Address) AND TYPE OF BUSINESS: Island Trading Company of Micronesia, Honolulu, Hawaii</p> <p>TITLE OF POST AND NATURE OF DUTIES: As Director of Import-Export Programs, Dr. Houston led an economic planning group for the Trust Territory of the Pacific Islands.</p> <p>NUMBER AND KIND OF EMPLOYEES SUPERVISED:</p>
F.	<p>From: 1948 To: 1950</p> <p>EMPLOYER (Name and Address) AND TYPE OF BUSINESS: University of California, Berkeley, California</p> <p>TITLE OF POST AND NATURE OF DUTIES: During this period, Dr. Houston was an Assistant Professor of Business Administration.</p> <p>NUMBER AND KIND OF EMPLOYEES SUPERVISED:</p>
G.	<p>From: To:</p> <p>EMPLOYER (Name and Address) AND TYPE OF BUSINESS:</p> <p>TITLE OF POST AND NATURE OF DUTIES:</p> <p>NUMBER AND KIND OF EMPLOYEES SUPERVISED:</p>

Use additional sheet if you have held more posts.

U N I T E D N A T I O N S

PERSONAL HISTORY STATEMENT (PROJECT PERSONNEL)

(TARS 3)

THIS INFORMATION MAY BE SUBMITTED TO MEMBER GOVERNMENTS

(see instruction 8)

ANALYSIS OF RELEVANT EXPERIENCE: Use this space to analyze your experience in relation to your statement concerning your specialization. Additionally, if you are applying for a specific post, please indicate the number of the Job Description of this post and analyze your experience in relation to the duties and requirements set out in the Job Description.

Work relevant to the Algerian vegetable oils industry project includes studies of plant locations for Poultry Producers of Central California and Heublein Corporation (Anderson Foods Division), both involving size and location of markets and transport of raw materials. Was project leader for study of agricultural development in Spain for the Minister of Agriculture and projected growth of domestic demand and export potential for major crops. Also led a similar study in Portugal. As Consultant to Bechtel in 1970-71 projected demand for agricultural products in connection with the Setif (Algeria) regional development study and performed the economic feasibility analysis for the potential irrigation projects in that region.

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UNITED NATIONS

PERSONAL HISTORY STATEMENT (PROJECT PERSONNEL)

(TARS 2)

THIS INFORMATION MAY BE SUBMITTED TO MEMBER GOVERNMENTS

DATE: 19 April, 1973

SIGNATURE: *A. Theodore Stewart, Jr.*

1. NAME: A. Theodore Stewart, Jr.
 3. PRESENT ADDRESS: 1385 Canada Road
 Woodside, California 92660

2. NATIONALITY: U.S. A.
 4. DATE OF BIRTH: 4th July 1929
 5. MARITAL STATUS: Married

6. KNOWLEDGE OF LANGUAGES: Mother Tongue: English

OTHER LANGUAGES	READ		WRITE		SPEAK		UNDERSTAND	
	EASILY	NOT EASILY	EASILY	NOT EASILY	FLUENTLY	NOT FLUENTLY	EASILY	NOT EASILY
French		X		X		X		X
German		X		X		X		X

7. EDUCATION (see Instruction 5)

DATES ATTENDED		NAME and LOCATION of INSTITUTION of LEARNING	ACADEMIC DEGREES and CERTIFICATES or DIPLOMAS OBTAINED	MAIN FIELD of STUDY
From	To			
1945	1947	Pfeiffer College		Chemistry Physics
1947	1954	Duke University	B. S., M. A., Ph.D.	Chemistry Physics

8. LIST ANY PUBLICATIONS OR PAPERS: (see instruction 6)

15 Publications in Chemistry, Plastics and Composites Processes
 3 Patents - one pending.

9. LIST SPECIAL QUALIFICATIONS AND SKILLS CONFIRMED BY LICENSES HELD AND MEMBERSHIP IN PROFESSIONAL, CIVIC, PUBLIC OR INTERNATIONAL SOCIETIES OR INSTITUTIONS RELEVANT TO YOUR APPLICATION; INDICATE THE CLASS OF MEMBERSHIP WHEN APPROPRIATE:

American Men of Science; Dictionary International Biography; American Chemical Scientist; A. A. A. S.; American Institute of Management, Sigma Xi; Phi Lambda Upsilon; Phi Beta Kappa.

10.

PROFESSIONAL EXPERIENCE (see Instruction 7)

<p>A.</p>	<p>From: 1969 To most recent date of employment: Present</p> <p>EMPLOYER (Name and Address) AND TYPE OF BUSINESS: Bechtel Corporation, Engineering and Construction</p> <p>TITLE OF POST AND NATURE OF DUTIES: Chief Scientist. Scientific Development. Identify and evaluate new technology in the Process Industries as: Chemical, Pharmaceutical, Oil, Metals, Food, etc.</p> <p>NUMBER AND KIND OF EMPLOYEES SUPERVISED:</p>
<p>B.</p>	<p>From: 1966 To: 1969</p> <p>EMPLOYER (Name and Address) AND TYPE OF BUSINESS: Northrop Corporation, Hawthorne, California.</p> <p>TITLE OF POST AND NATURE OF DUTIES: Principal Scientist. Initiated and processed programs in high temperature composites for SST application and shields for the space studies.</p> <p>NUMBER AND KIND OF EMPLOYEES SUPERVISED:</p>
<p>C.</p>	<p>From: 1963 To: 1965</p> <p>EMPLOYER (Name and Address) AND TYPE OF BUSINESS: Avco Corporation, Lowell, Massachusetts</p> <p>TITLE OF POST AND NATURE OF DUTIES: Assistant Section Chief, Plastics Research. Directed 33 man group in Composites, Foams, High Temperature Plastics, Radar Absorbing Materials. Group was responsible for Apollo Heat Shield.</p> <p>NUMBER AND KIND OF EMPLOYEES SUPERVISED:</p>

PROFESSIONAL EXPERIENCE (Continued)

D.	<p>From: 1959 To: 1962</p> <p>EMPLOYER (Name and Address) AND TYPE OF BUSINESS: Shell Development Corporation, Emeryville, California</p> <p>TITLE OF POST AND NATURE OF DUTIES: Research Chemist. Fundamental research in Polymer Chemistry resulting in Patented, Nationally Distributed Product. Developed New Paint Latexes and revised theory of Emulsion Polymerization</p> <p>NUMBER AND KIND OF EMPLOYEES SUPERVISED:</p>
E.	<p>From: 1955 To: 1958</p> <p>EMPLOYER (Name and Address) AND TYPE OF BUSINESS: U. S. Navy</p> <p>TITLE OF POST AND NATURE OF DUTIES: Officer, Nuclear Supervisor</p> <p>NUMBER AND KIND OF EMPLOYEES SUPERVISED:</p>
F.	<p>From: 1954 To: 1955</p> <p>EMPLOYER (Name and Address) AND TYPE OF BUSINESS: Union Carbide Corporation, Pittsburg, Pennsylvania</p> <p>TITLE OF POST AND NATURE OF DUTIES: Fellow, Mellon Institute. Process Familiarization UCC Processes. Research into High Pressure Syntheses leading to Novor Amine Synthesis.</p> <p>NUMBER AND KIND OF EMPLOYEES SUPERVISED:</p>
G.	<p>From: To:</p> <p>EMPLOYER (Name and Address) AND TYPE OF BUSINESS:</p> <p>TITLE OF POST AND NATURE OF DUTIES:</p> <p>NUMBER AND KIND OF EMPLOYEES SUPERVISED:</p>

Use additional sheet if you have held more posts.

UNITED NATIONS

PERSONAL HISTORY STATEMENT (PROJECT PERSONNEL)

(TARS 3)

THIS INFORMATION MAY BE SUBMITTED TO MEMBER GOVERNMENTS

(see instruction 8)

ANALYSIS OF RELEVANT EXPERIENCE: Use this space to analyse your experience in relation to your statement concerning your specialization. Additionally, if you are applying for a specific post, please indicate the number of the Job Description of this post and analyze your experience in relation to the duties and requirements set out in the Job Description.

Comprehensive knowledge of Industrial Organic Chemical Processes derived from Instruction, Research and Research Management association with Chemical, Plastics and Petrochemical Industries.

UNITED NATIONS

PERSONAL HISTORY STATEMENT (PROJECT PERSONNEL)

(TARS 2)

THIS INFORMATION MAY BE SUBMITTED TO MEMBER GOVERNMENTS

DATE: April 24, 1973

SIGNATURE:

Robert T. Milligan

1. NAME: Robert Thomas Milligan
 2. NATIONALITY: U.S. A.
 3. PRESENT ADDRESS: 2 Vista Del Mar
 Orinda, California 94563
 4. DATE OF BIRTH: December 22, 1919
 5. MARITAL STATUS: Married - 4 children

6. KNOWLEDGE OF LANGUAGES: Mother Tongue: English

OTHER LANGUAGES	READ		WRITE		SPEAK		UNDERSTAND	
	EASILY	NOT EASILY	EASILY	NOT EASILY	FLUENTLY	NOT FLUENTLY	EASILY	NOT EASILY
French		X						
German		X						

7. EDUCATION (see Instruction 5)

DATES ATTENDED		NAME and LOCATION of INSTITUTION of LEARNING	ACADEMIC DEGREES and CERTIFICATES or DIPLOMAS OBTAINED	MAIN FIELD OF STUDY
From	To			
1937	1941	University of Illinois Champaign-Urbana, Ill.	Bachelor of Science	Chemical Engineering
1941	1944	Ohio State University Columbus, Ohio	Doctor of Philosophy	Chemical Engineering

8. LIST ANY PUBLICATIONS OR PAPERS: (see instruction 6)

- "Extraction of Fatty Acid Glycerides from Soybean Oil" B. S. thesis, Univ. of Ill, 1941
- "Effect of Physical Constants on the Plates per Transfer Unit of a Glass Walled Plate Column Still" Ph. D. Dissertation Ohio State Univ. 1946
- "Zero Discharge of Wastewater from Petroleum Refineries" by J. W. Porter, J. H. Blake and R. T. Milligan for AIChE/EPA Symposium in Washington, D. C. April 20-26, 1973.

9. LIST SPECIAL QUALIFICATIONS AND SKILLS CONFIRMED BY LICENSES HELD AND MEMBERSHIP IN PROFESSIONAL, CIVIC, PUBLIC OR INTERNATIONAL SOCIETIES OR INSTITUTIONS RELEVANT TO YOUR APPLICATION; INDICATE THE CLASS OF MEMBERSHIP WHEN APPROPRIATE:

- Listed in "American Men and Women of Science"
- Full member: American Inst. of Chemical Engineers - Environmental Div AIChE and Environmental Div. ACS
- American Chemical Society; Water Pollution Control Federation; Registered Chemical Engineer, State of Calif. Member Honor Soc: Tau Beta Pi; Sigma Xi; Phi Lambda Upsilon.

PROFESSIONAL EXPERIENCE (Continued)

D.	<p>From: 1963 To: 1967</p> <p>EMPLOYER (Name and Address) AND TYPE OF BUSINESS: Shell Development Company, Emeryville, California - Research and Development</p> <p>TITLE OF POST AND NATURE OF DUTIES: Supervisor of Licencing Design - Responsible for preparing process designs for processes licenced by Shell to others. Responsible for negotiating technical details with clients in licencing contracts. Coordinating projects with construction contractors and for process start-up and attainment of guarantees.</p> <p>NUMBER AND KIND OF EMPLOYEES SUPERVISED:</p>
E.	<p>From: 1959 To: 1963</p> <p>EMPLOYER (Name and Address) AND TYPE OF BUSINESS: Shell Development Company, Emeryville, California - Research and Development</p> <p>TITLE OF POST AND NATURE OF DUTIES: Supervisor of Engineering Services - In charge of four groups, providing design services to other functions. One group handling design optimization utilizing computer programming. A second group specializing in design of fractionating columns. A third group specializing in mechanical design of process equipment. A fourth group doing engineering drafting of final drawings.</p> <p>NUMBER AND KIND OF EMPLOYEES SUPERVISED:</p>
F.	<p>From: 1951 To: 1959</p> <p>EMPLOYER (Name and Address) AND TYPE OF BUSINESS: Shell Development Company, Emeryville California - Research and Development</p> <p>TITLE OF POST AND NATURE OF DUTIES: Supervisor in Chemical Process Engineering Department - Responsible for preparing process designs and evaluations on new chemical processes being developed at the Emeryville Research Center and for guiding the process development program required to obtain the design data.</p> <p>NUMBER AND KIND OF EMPLOYEES SUPERVISED:</p>
G.	<p>From: 1950 To: 1951</p> <p>EMPLDYER (Name and Address) AND TYPE OF BUSINESS: Shell Chemical Company, Ammonia Division, Pittsburg California Manufacturer of Agricultural Fertilizer</p> <p>TITLE OF POST AND NATURE OF DUTIES: Technologist responsible for recommending way for improving plant operation and for running plant test programs. Experience obtained in plant operation and in solving plant problems.</p> <p>NUMBER AND KIND OF EMPLOYEES SUPERVISED:</p>

UNITED NATIONS

PERSONAL HISTORY STATEMENT (PROJECT PERSONNEL)

(TARS 3)

THIS INFORMATION MAY BE SUBMITTED TO MEMBER GOVERNMENTS

(see instruction 8)

ANALYSIS OF RELEVANT EXPERIENCE: Use this space to analyze your experience in relation to your statement concerning your specialization. Additionally, if you are applying for a specific post, please indicate the number of the Job Description of this post and analyze your experience in relation to the duties and requirements set out in the Job Description.

The following is a summary of my professional experience record in terms of job specialty and years of service in that specialty or in management of that specialty

Process Design	11 years
Process Development	6 years
Venture Analysis	4 years
Process Improvement	2 years
Computer Application	2 years
Process Analysis	1 year
Process Operation	1 year
Effluent Disposal	1 year

UNITED NATIONS

PERSONAL HISTORY STATEMENT (PROJECT PERSONNEL)

(TARS 2)

THIS INFORMATION MAY BE SUBMITTED TO MEMBER GOVERNMENTS

DATE: April 30, 1973

SIGNATURE:

Frank E. Sullivan
by 9770

1. NAME: Frank E. Sullivan

2. NATIONALITY: U. S. A.

3. PRESENT ADDRESS: 2 Burrell Court
Tiburon, California 94920

4. DATE OF BIRTH: 10/25/1919

5. MARITAL STATUS: Married

6. KNOWLEDGE OF LANGUAGES:

Mother Tongue: English

OTHER LANGUAGES	READ		WRITE		SPEAK		UNDERSTAND	
	EASILY	NOT EASILY	EASILY	NOT EASILY	FLUENTLY	NOT FLUENTLY	EASILY	NOT EASILY
Swedish						X		X
German						X		X
French						X		X

7. EDUCATION: (see instruction 5)

DATES ATTENDED		NAME and LOCATION of INSTITUTION of LEARNING	ACADEMIC DEGREES and CERTIFICATES or DIPLOMAS OBTAINED	MAIN FIELD of STUDY
From	To			
1937	1940	Pratt Institute, Brooklyn New York	3-year certificate	Chemical Engineering
1944	1945	New York University, N. Y.	Bachelors - Chemical Eng.	Chemical Engineering
1948	1949	Stevens Institute, Hoboken New Jersey	Masters - Chemical Eng.	Chemical Engineering

8. LIST ANY PUBLICATIONS OR PAPERS: (see instruction 6)

Please refer to attachment

9. LIST SPECIAL QUALIFICATIONS AND SKILLS CONFIRMED BY LICENSES HELD AND MEMBERSHIP IN PROFESSIONAL, CIVIC, PUBLIC OR INTERNATIONAL SOCIETIES OR INSTITUTIONS RELEVANT TO YOUR APPLICATION; INDICATE THE CLASS OF MEMBERSHIP WHEN APPROPRIATE:

- Member of American Oil Chemists Society
- Member of American Chemical Society
- Member of American Institute of Chemical Engineers
- Registered Professional Engineer - California

10.

PROFESSIONAL EXPERIENCE (see Instruction 7)

A.	<p>From: November 1967 To most recent date of employment: Present</p> <p>EMPLOYER (Name and Address) AND TYPE OF BUSINESS: Frank E. Sullivan Company (A California Corporation), 1640 Tiburon Blvd., Tiburon, California 94920</p> <p>TITLE OF POST AND NATURE OF DUTIES: <u>President:</u> Our firm specializes in process, engineering and complete plant design for vegetable oil industries. Some recent projects are described briefly in Section 5 of the accompanying proposal.</p> <p>NUMBER AND KIND OF EMPLOYEES SUPERVISED: 12 employees - engineers and designers</p>
B.	<p>From: April 1963 To: November 1967</p> <p>EMPLOYER (Name and Address) AND TYPE OF BUSINESS: Arthur G. McKee & Company, 650 Fifth Street, San Francisco, California</p> <p>TITLE OF POST AND NATURE OF DUTIES: I joined Wenco Division as Manager of Process Engineering to develop and engineer new processes in food and chemical industries. My principal responsibilities were the design and use of the Siebtechnik Screen Centrifuge in numerous processes. After 22 months I was transferred to the Food Division of McKee as Process Engineering Consultant. My duties involved technical discussion with clients on the design of complete processing plants for vegetable oil.</p> <p>NUMBER AND KIND OF EMPLOYEES SUPERVISED: 5 engineers</p>
C.	<p>From: November 1950 To: April 1963</p> <p>EMPLOYER (Name and Address) AND TYPE OF BUSINESS: De Laval Separator Company, Poughkeepsie, New York</p> <p>TITLE OF POST AND NATURE OF DUTIES: <u>Manager of Engineering:</u> I was responsible for the development of new products and processes and the entire engineering organization. This included control lab, metallurgical lab, plant engineering and pilot plant. Also the coordination of engineering with the European Alfa-Laval Group including the parent company in Sweden.</p> <p>NUMBER AND KIND OF EMPLOYEES SUPERVISED: 80 technical and non-technical personnel</p>

UNITED NATIONS

PERSONAL HISTORY STATEMENT (PROJECT PERSONNEL)

(TARS 3)

THIS INFORMATION MAY BE SUBMITTED TO MEMBER GOVERNMENTS

(see instruction 8)

ANALYSIS OF RELEVANT EXPERIENCE: Use this space to analyze your experience in relation to your statement concerning your specialization. Additionally, if you are applying for a specific post, please indicate the number of the Job Description of this post and analyze your experience in relation to the duties and requirements set out in the Job Description.

Specialist in vegetable oils processing for past 10 years. Have designed complete plants and have developed and designed improvements to existing plants and processes. Currently participate in process and engineering design and cost estimating and supervise others working in these fields. Specific examples of work are included in Frank E. Sullivan Company experience data in Section 5 of the accompanying proposal.

FRANK E. SULLIVAN

PATENTS

	<u>Patent No.</u>	
	<u>U. S.</u>	<u>Canada</u>
Refining of Fatty Oils and Fats	2,702,813	534,023
Flushing of Centrifugal Separators of the Hermetic Type	2,906,449	607,739 607,740
Centrifugal Separator	2,837,273	598,217
Method for Continuous Processing of Tall Oil	2,838,481	580,495
Recovery of Edible Protein from Fatty Animal Stock	3,063,840	

RECENT TECHNICAL PAPERS

<u>Title</u>	<u>Presented</u>	<u>Published</u>
Refining of Fatty Oils for Edible Use	Latin American AOCS Short Course, Monterrey, Mexico 1/23-25/67	
New Advances in Edible Oil Processing	AOCS, N. Calif. Section Meeting, San Francisco 9/22/67	
Fatty Oil Processing Conventional versus Miscella	AOCS, 41st Fall Meeting Chicago, Ill. 10/16/67	
New Trends in Edible Oil Processing	AOCS, S. Calif. Section Meeting, Los Angeles 1/18/68	

RECENT TECHNICAL PAPERS (continued)

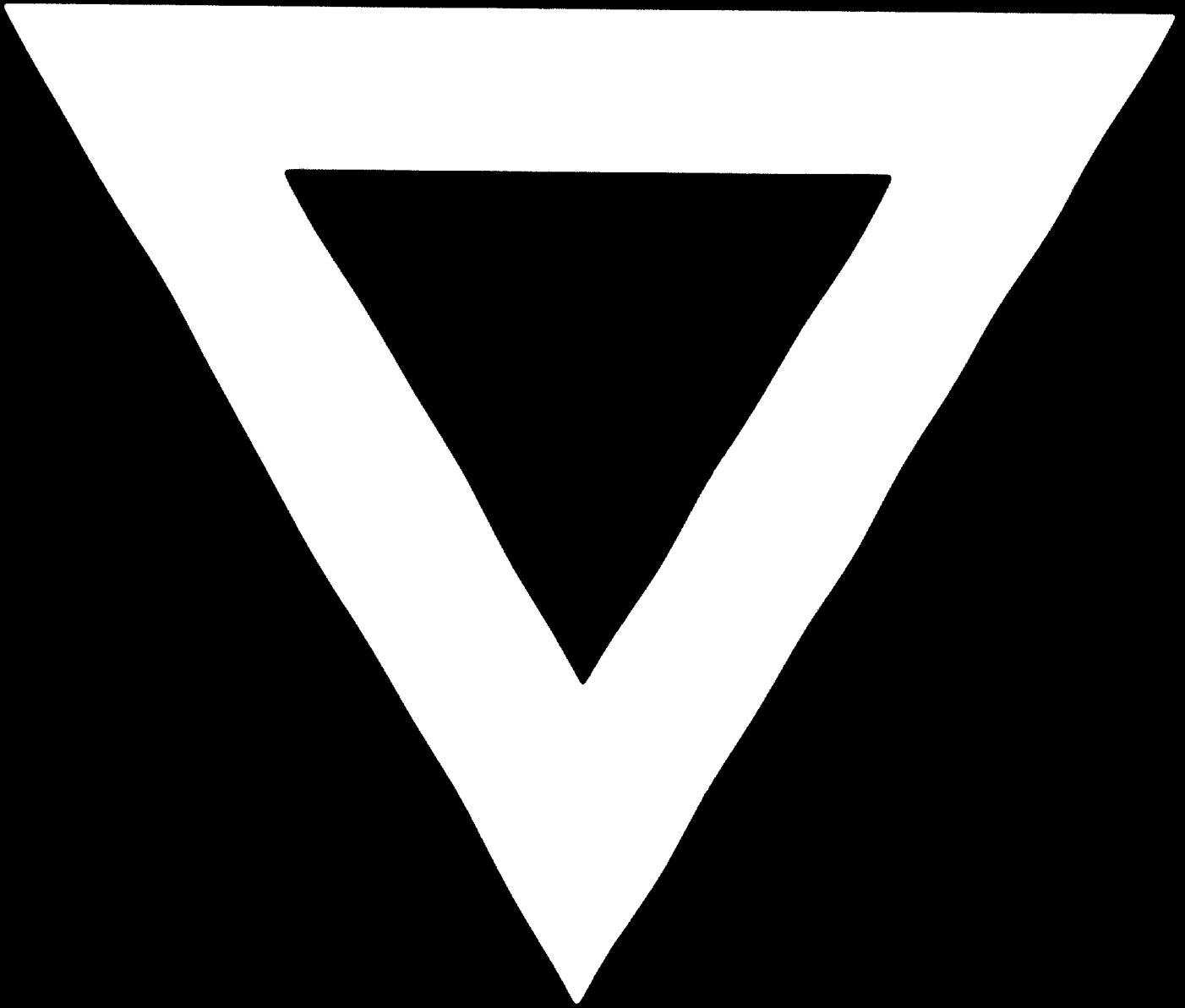
<u>Title</u>	<u>Presented</u>	<u>Published</u>
From Seed to Margarine at the Oil	IOMSA, West Coast Division, Anaheim, California 3/29/68	Oil Mill Gazetteer, December 1968
The Refining Process in the Purification of Fatty Oils	AOCS Short Course, Michigan State Univ. 9/4/70	
Processing of Oils - Relation to Source Materials	USDA - Western Div. , 11/5/70	
Technological Advances in Commercial Hydrogenation	AOCS Short Course Guadalajara, Mexico 4/20/71	IMQAG
New Concepts in Commercial Hydrogenation	AOCS, Atlantic City, New Jersey, October 1971	

AOCS - American Oil Chemical Society

IOMSA - International Oil Mill Superintendents Association

USDA - United States Department of Agriculture

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