EXC. 50

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S E C R E T

31 May 1943

COPY NO. 21

EXHIBIT "A"

THE WESTERN AXIS OIL POSITION

The Enemy Oil Committee has considered the Western Axis oil position as of 31 May 1943 and reports as follows:

1. Requirements. We estimate the total 1943 operating requirements of the Western Axis for liquid fuels and lubricants at approximately 16,300,000 metric tons. This estimate, insofar as reflecting military uses, is based on the assumption that, in terms of oil requirements, military activities in 1943 will be at the same rate as in 1942.

2. Sources of Supply. Current sources of supply plus new synthetic plant capacity now approaching completion, are estimated at approximately 18,275,000 metric tons of products for 1943. This includes products derived from the refining of natural crude oils, from various forms of hydrocarbon synthesis, and from substitute fuels (other than gaseous and solid).

3. Stocks. We estimate the Western Axis stockpile as of 1 January 1943 at 5,000,000 metric tons, which is considered to be an "uncomfortably low" or "precarious level." However, the whole of this stockpile is not available for current use as it is made up of quantities in process or in transit and at distribution points awaiting use (military and industrial), plus a minimum for strategic reserves which would be expended only as a measure of extreme urgency.

Accumulated stocks being thus ear-marked, it is clear that

requirements during the early months of the year must be met from current production. Also, during the first six months, stocks must be built up in preparation for defensive warfare at many points which have heretofore been free from threat. Such new requirements are estimated at 500,000 tons. If there is taken into account the moderate excess of production over consumption during this period, it is clear that the German oil economy will still be operating on a very narrow margin.

During the second half-year, however, completion of new synthetic plants will, in the absence of interference, result in a progressive easing of the present stringency.

4. In view of the circumstances set forth in paragraph 3, it is highly desirable that immediate steps be taken to attack the Western Axis oil economy at its most vulnerable points (as follows):

a. Destroy or damage crude oil refineries and synthetic oil plants.

b. By bombing and otherwise, provide for the maximum interference with the transportation, distribution and storage facilities on which the Axis oil economy is dependent.

c. Force the maximum consumption and dispersal of available supplies through direct or threatened military action.

5. The primary "oil targets" are the Rumanian refineries concentrated at Ploesti, and the great synthetic plants at Leuna, Poelitz, Blechhammer and Bruex.

The Rumanian refineries are currently yielding approximately 27% of the total Axis oil supplies. The synthetic plants, including those above mentioned, are estimated to account for an additional 37%, a sharp increase over last year's 25%, and one which is expected to increase still more before 1944.

6. Because of the flexibility of the Axis processing facilities, it appears more important to interrupt the flow of products as a whole, than it does to strive to eliminate any single product, i.e., such as aviation gasoline, quality lubricants, or the like.

E N C L O S U R E

THE WESTERN AXIS OIL POSITION

REQUIREMENTS

7. The requirements for liquid fuels and lubricants by the Western Axis during 1943 (including civilian consumption in occupied areas) are estimated to be as follows: (See Appendix "A", Tables I, II, and III)

	Metric Tons
a. Aviation gasoline	
Air Force	1,115,000
b. Motor gasoline	
(1) Civilian[a]	1,610,000
(2) Military	
Ground force	3,790,000
Air force	450,000
Total -	5,850,000
c. Diesel oil, Gas oil and Kerosene	
(1) Civilian	2,185,000
(2) Military	
Ground force	1,260,000
Air force	150,000
Navy	462,000
Total -	4,057,000
d. Lubricants	
(1) Civilian	876,000
(2) Military	
Ground force	250,000
Air force	85,000
Navy	65,000
Total -	1,276,000
e. Heavy fuel	
(1) Civilian	1,722,000
(2) Military	
Navy	1,573,000
Total -	3,295,000
Subtotal -	15,593,000
f. Miscellaneous	
(1) Occupied Russia[b]	250,000
(2) Tar Oils[c]	450,000
Grand Total -	16,293,000
In round figures -	16,300,000

a. Estimate of civilian consumption (other than for occupied Russia) as per Appendix "A", Table "I" attached.

b. Occupied Russia, exclusive of Eastern Poland and Baltic States, products unspecified.

c. Estimate for civilian Tar oil consumption as heavy fuel oil, but not allocated to area of use. Tar oil used by Navy is included in naval fuel figures.

SOURCES OF SUPPLY
(See Appendix "B")

8. The principal sources of supply of liquid fuels and lubricants available to the Western Axis powers are as follows:

a. Natural crude oils (including natural gasoline and shale oils). This raw material has been vigorously exploited by the Axis powers. The cost of products obtained from the refining of natural crudes in terms of labor, materials and including initial production costs - is only a small fraction of that required for synthetic products, and it may safely be assumed that no opportunity has been overlooked to expand yields from such sources. Pre-war production of Germany proper is believed to have been more than maintained while notable increases took place in Hungary and Austria. Rumania with a total estimated yield for 1943 of approximately 5,000,000 tons (including natural gasoline) is still by far the largest producer, accounting for about 50% of the total crude oil produced in Europe. For full details see Appendix "B", Annex "A".

b. Hydrogenation. (Appendix "B") The raw materials treated by this process include bituminous coals and lignites, and tars derived therefrom. The plants erected for such processing are estimated will have an output for 1943 of more than 5,000,000 metric tons - this comparing with a pre-war capacity of about 3,000,000 metric tons. The rate of new construction has been particularly vigorous since the fall of 1941, and plants coming into full operation during the current summer will, in the absence of interference, markedly reduce the strain under which the German oil economy is presently operating.

c. Fischer Tropsch Process (hydrocarbon synthesis). This process can operate on a wide variety of raw materials, but presently chiefly processes lignite, coke and coke oven gas.

Plant units are much smaller in size than in the case of the hydrogenation plants, and the product qualities are distinctly inferior. Estimated total output from this source for 1943 is about 1,600,000 metric tons (See Appendix "B", Annex "C").

d. Stocks. The estimated stock pile of the European Axis powers, all products included, is 5,000,000 metric tons as of 1 January 1943. Insofar as the accuracy of such a figure depends on calculation of all the elements of production and consumption for each year back to 1938, it accumulates all errors that must inevitably arise in such calculations. However, there has been abundant and convincing evidence that when the calculated stock pile reaches a certain level, intelligence indicates definite signs of distress - as it did, in fact as of 1 January 1943. The chief significance of the 5,000,000 ton figure quoted above, is then, as a datum point to which subsequent fluctuation may be referred, this especially in view of the fact that the whole of the estimated stock pile is regarded as so earmarked as not to be subject to current normal withdrawals.

POSITION BY PRODUCTS

9. The position of the European Axis powers in respect to the various oil products is as follows:

a. Aviation Gasoline

There is no doubt as to the ability of the Germans to meet all requirements for this product, both quantitatively and qualitatively. The so-called "green" or combat grade gasoline gives a performance equal to or superior to our best product. The primary source of this combat fuel is believed to be hydrogenation plants processing bituminous coals and bituminous coal tars. The "blue" or second grade aviation gasoline is used in bomber and transport planes and is derived from the refining of natural crudes and from the various

synthetic plants. Basis is lacking for calculation of stocks on hand of this and other products, apart from the over-all stock position.

b. Diesel Oil, Gas Oil, etc.

Recent German regulations requiring Diesel operators to use a fuel composed two-thirds of motor gasoline and one-third Diesel oil is good evidence either of a present scarcity of this product or unwieldy stocks of gasoline, presumably the former. This situation is not thought to invalidate the basic presumption that in the long run it is the over-all position that is significant, rather than the position in respect to individual products.

c. Lubricating Oils

Natural crude oil base stock is available in quantity and quality adequate for all Axis requirements, assuming that proper refining facilities have been constructed. Pre-war plants were inadequate in that respect, but the Germans were well acquainted with the technology required, and additional facilities are assumed to have been constructed. The quality of captured lubricants, as analyzed, gives support to such an assumption.

d. Other Products

The ratio of motor gasoline to the aviation product can readily be altered by changing processing procedure, - this depending on the requirements at any one time. Similar adjustments are possible in favor of each of the other products, though hardly with the same ease as in the case of gasoline.

VULNERABILITIES

10. The European Axis has been able to achieve a balanced oil economy only by the construction of numerous plants for the

production of synthetic oils, as well as by exercising a most vigorous policy toward the exploitation of the subsoil reserves of natural crude oil in the Axis and occupied territories. While oil fields as such are well-nigh invulnerable to air attack, other facilities are definitely susceptible to such attack.

The most vulnerable points in the German oil economy are as follows:

a. Refineries (See Appendix "C")

While Europe as a whole has substantial excess refining capacity, the destruction of key plants such as the concentration of refineries at Ploesti, would necessitate a complete re-orientation of the present system of processing and transportation of Rumanian crude and products. Deficiencies in Rumanian plant capacity so created, could possibly be met by shipment of crude to distant points for refining, or reconstruction of the plants destroyed. The latter would require not less than nine months time, and substantial appropriations for labor and materials.

b. Synthetic Plants

The synthetic plants presently contributing to the European Axis output are listed in Appendices and this together with their estimated output for 1943. The estimated output may be taken as a fair measure of the importance of the plants in terms of target priorities.

c. Transportation

The more vital points concerned in the transportation of raw materials and the various products are as follows:

(1) The rail and pipeline system conveying oil from Ploesti to Giurgiu in Rumania, and from Giurgiu via barge on the Danube and its tributaries to distributional or transshipment points in the Balkans, Central and Northwest Europe.

(2) The railway center at Budapest and certain railroad bridges in Hungary.

(3) The Mitteland Canal system of Germany, which links, from east to west, the Rhine, Elbe, Oder and Vistula waterways.

(4) The Rumanian railroad routes radiating from Ploesti.

(5) The tank steamer routes from Hamburg via the Kiel Canal to the Baltic Sea, and from Lubeck, Rostock and Stettin on the Baltic Sea to ports in the Baltic States, Finland and Norway.

The pertinent aspects of the above listed transportation routes are considered in Appendix "D" of this report.

ANNEX "A"

TABLE I

CONTINENTAL EUROPE, EXCLUDING RUSSIA, SPAIN, PORTUGAL AND TURKEY
ESTIMATED CIVILIAN AND WAR INDUSTRY DEMAND

YEAR 1943

Metric Tons

	Motor Fuel	% of 1938	Kerosine	% of 1938	Lubricants	% of 1938	Gas Oil & Dis.Fuel	% of 1938	Residual Fuel Oil	% of 1938
Albania	500	10%	1,200	46%	-	-	2,700	62%	5,300	63
Belgium	35,300	9%	8,400	39%	17,800	2%	74,000	16%	7,700	22
Bulgaria	5,000	29%	17,000	98%	6,000	79%	14,000	63%	3,000	38
Czechoslovakia	52,000	21%	30,000	38%	28,600	12%	23,000	14%	-	-
Denmark	23,500	7%	25,800	27%	7,100	2%	20,000	10%	15,400	100
Estonia	4,100	22%	6,500	31%	1,400	4%	2,100	40%	2,300	60
Finland	15,000	11%	19,400	28%	7,100	11%	6,000	24%	-	-
France	235,300	8%	25,800	19%	85,700	5%	107,000	12%	150,000	9
Germany & Austria	990,000	29%	85,900	49%	537,000	8%	769,000	16%	150,000	9
Greece	11,800	17%	9,000	45%	2,800	29%	12,800	37%	15,400	8
Hungary	47,100	64%	64,500	93%	21,400	8%	41,100	15%	46,200	105
Italy	70,000	14%	64,500	40%	54,300	5%	221,600	7%	472,000	25
Latvia	2,900	11%	6,500	21%	700	2%	1,400	1%	1,500	30
Lithuania	600	12%	6,400	27%	700	1%	-	-	3,100	16
Netherlands	23,500	6%	51,600	20%	10,700	2%	51,400	17%	7,700	15
Norway	23,500	13%	12,900	35%	7,100	3%	20,600	14%	7,700	185
Poland	23,600	18%	64,500	47%	35,700	7%	13,700	2%	7,700	59
Rumania	50,000	32%	180,000	81%	17,000	5%	68,500	61%	1,050,000	78
Switzerland	30,300	14%	9,700	48%	10,000	5%	55,000	29%	11,500	-
Yugoslavia	5,900	14%	25,800	84%	5,000	2%	13,700	87%	3,800	9
Total	1,609,900	17%	713,400	44%	876,100	6%	1,471,500	34%*	1,722,300	41

APPENDIX "A"

TABLE I

EUROPE, EXCLUDING RUSSIA, SPAIN, PORTUGAL [illegible]
ESTIMATED CIVILIAN AND WAR INDUSTRY DEMAND

YEAR 19[illegible]

...ne	% of 1938	Lubricants	% of 1938	Gas Oil & Dist. Fuel	% of 1938	Residual Fuel Oil	% of 1938	Total Liquid Fuels and Lubricants	% of 1938
00	46%	-	-	[illegible],700	[illegible]	[illegible],300	[illegible]	9,700	47%
00	[illegible]	17,800	27%	[illegible]	[illegible]	7,700	[illegible]	100,700	14%
00	59%	6,000	79%	[illegible]	[illegible]	2,000	[illegible]	45,000	53%
00	33%	28,000	72%	[illegible]	[illegible]	-	-	125,600	32%
00	27%	7,100	30%	20,[illegible]	10%	15,400	100%	52,400	14%
00	31%	1,400	49%	[illegible]	40%	2,300	60%	16,400	32%
00	28%	7,100	41%	[illegible],000	[illegible]	-	-	48,300	19%
00	[illegible]	[illegible],700	31%	[illegible],000	[illegible]	[illegible]	9%	553,800	10%
00	[illegible]	[illegible],000	84%	[illegible]	[illegible]	[illegible]	[illegible]	2,518,900	[illegible]
00	[illegible]	2,300	29%	[illegible]	[illegible]	[illegible]	8%	54,800	16%
500	93%	[illegible]	89%	[illegible],100	[illegible]	[illegible]	100%	220,300	92%
500	40%	[illegible],500	55%	[illegible],500	[illegible]	[illegible],000	25%	685,400	31%
500	23%	700	23%	1,400	19%	1,500	30%	13,000	18%
100	27%	700	18%	-	-	3,100	16%	10,800	21%
500	20%	10,700	21%	52,400	17%	7,700	19%	144,900	13%
00	35%	7,100	35%	20,600	14%	7,700	185%	71,800	18%
500	47%	35,700	79%	13,700	22%	7,700	59%	145,200	37%
000	61%	17,000	58%	68,500	61%	1,050,000	78%	1,365,500	73%
700	48%	10,000	50%	55,000	29%	11,500	-	116,500	26%
800	84%	5,000	24%	13,700	87%	3,800	9%	54,200	36%
400	44%	876,100	61%	1,471,500	34%*	1,722,300	41%*	6,393,200	31%*

S E C R E T

APPENDIX "A"

TABLE II

12. AXIS AIRFORCE REQUIREMENTS OF PETROLEUM IN 1942

(thousands of metric tons)

	German Air Force	Italian Air Force	Axis Satellites	Total
Operational Flying	550	64	95	709
Air Transportation	180	22	10	212
Ferrying	10	--	--	10
Training	150	19	19	188
Total Flying (Aviation Gasoline)	890	105	124	1,119
Supply and Ground Requirements*	480	60	60	600
Total Lubricants**	69	8	9	86
Grand Total	1,439	173	193	1,805

* Light motor fuel and Diesel oil.

** Five percent of aviation gasoline and motor fuel consumption.

S E C R E T

APPENDIX "A"

TABLE III

1. AXIS GROUND FORCE REQUIREMENTS OF PETROLEUM IN 1942

(Quantities in thousand metric tons)

	German		Axis Satellites	
	Divisional	Non-Divisional	Total	Total
Eastern Front				
Consumption at Front	1,760	1,174	284	3,218
Supply: Railhead to Front		260	24	284
Wastage and Loss (10%)		319	31	350
Total Eastern Front		3,513	339	3,852

Other Areas	Total
North Africa	240
Germany, Poland & Baltic	180
Italy	70
Other Axis Satellites*	100
Occupied Western and Northern Europe**	175
Balkan, Crete, Dodecanese Islands	183
Todt Organization	500
GRAND TOTAL GROUND FORCE CONSUMPTION	5,300

* Hungary, Rumania, Bulgaria, Slovakia.

** France, Holland, Belgium, Denmark, Norway.

APPENDIX "B"

14. WESTERN AXIS PETROLEUM AND SUBSTITUTE SOURCES IN 1943
(In 1,000's of metric tons)

	Gasoline		Kero-sene & Diesel	Heavy Fuel	Lubri-cants	Total[a]
	Avia-tion	Motor				
1. Crude oil & nat'l gasoline (Including shale oil)	175[b]	1,679	2,940	2,800	1,148	8,742[a]
2. Synthetics						
Hydrogen-ation, German	1,140[c]	2,200	1,300		200	4,840
Fischer-Tropsch, German	200[c]	770	375		25	1,370
Unknown Plants, German		401	68			469[d]
Outside Germany- hydro.		20				20
- Fischer		36	18			54
Synthetic lubs. from veg. oil etc.					19	19[e]
3. Tar oils (in excess of requirements for other uses)				1,000		1,000
4. Miscellaneous						
Benzol		600				600
Alcohols		500				500
Bottled gases (liquified)		460				460[f]
Regenerated lubes					200	200
TOTAL PRODUCTION	1,515	6,666	4,701	3,800	1,592	18,274
		In round figures 18,275				

a. Total products produced from 9,630,000 tons of crude after deduction of 880,000 tons as refinery losses, refinery fuel and gaseous products. These figures are actual production after allowing for normal shut-downs.

b. Includes 50,000 tons of alkylates or iso-octanes produced from gases.

c. This 200,000 tons of alkylate or iso-octane is made from synthetic plant gases, both Fischer-Tropsch and hydrogenation, and is additional product over that estimated in the plant capacities and product output shown in Annex "B", Sections I and II, and Annex "C", Sections I and II.

d. From hydro 266,000 T. gasoline and Fischer-Tropsch 135,000 gasoline / 68,000 diesel oil.

e. These synthetic lubes (19,000T) are made from vegetable oils, alcohol, etc.

f. This product estimated to be derived in the amount of 420,000 tons from synthetic plant gases and 40,000 tons from petroleum gases - and is additional to other products from such sources.

APPENDIX "B"

ANNEX "A"

15. Crude Oil Production. Petroleum companies of the United States and Great Britain played a prominent part in exploring and developing crude oil production in continental Europe prior to the war. As a result there has been available a good background of geological and statistical data covering all the important oil producing areas of Axis Europe. Subsequent direct and indirect Intelligence has been fitted into the framework of known facts, and permits a fair appraisal of the present yield of the oil fields controlled by the Western Axis.

It is estimated that during 1943 the production of crude oil and natural gasoline will total 9,630,000 metric tons, from the sources shown below:

Country	Metric Tons
Albania	264,000
Czechoslovakia	32,000
Estonia	75,000
France	95,000
Germany	1,083,000
Natural gasoline	2,000
Austria	1,004,000
Hungary	1,402,000
Natural gasoline	11,000
Jugoslavia	49,000
Italy	11,000
Poland	500,000
Natural gasoline	35,000
Roumania	4,867,000
Natural gasoline	200,000
Total Western Axis	9,630,000

A brief statement of the salient features of crude oil production in the countries listed above is as follows:

a. Albania. Oil production in Albania is considered to come entirely from the Devoli field in the south-central part of the country. In 1938 the Devoli field contained locations for about 2500 new wells, and equipment was available which would permit completing these at a rate of about 100 per year. The field will therefore not reach peak production for many years to come, and as the average yield per well is only about

one and a half metric tons per day, it is unlikely ever to be of major importance. Albanian crude oil is heavy and has a high sulfur content, making it unadaptable to normal refining; it is therefore used as hydrogenation stock for the plants at Bari and Livorno.

b. Czechoslovakia. The oil fields of former Czechoslovakia are at Hodonin, in Moravia, and at Gbely, in Slovakia. Neither field is of significance, either in regard to present production or with respect to future extension possibilities. Peak production is probably represented by the figure currently estimated for 1943.

c. Estonia. The oil production of Estonia comes entirely from the distillation of oil shale. The reserves of oil-bearing shale are tremendous, and the production is limited only by the capacity of the refineries in which it is treated. In 1940 the refineries of Estonia produced 200,000 metric tons of shale oil, but in 1941 they were damaged and the technical personnel dispersed. Subsequent progress in restoring the industry has been slow, and it is believed that during 1943 production will still be less than 50 percent of normal capacity.

d. France. Crude oil production in France is derived from the Pechelbronn district, in Alsace. Oil is produced here by a combination of wells and mining in shafts and cross-cuts. The methods employed limit the rate at which oil can be recovered, and the best German efforts can do little more than maintain the pre-war average. A very small amount of oil shale is mined and refined at Autun, in central France.

e. Germany. There are two large oil fields and some 14 lesser ones within the boundaries of Germany proper. The important fields are at Nienhagen, near Hanover, and at Reitbrook, near Hamburg.

A considerable allowance is made for the discovery of new production in Germany. This is owing to the fact that all oil production in Germany is associated with salt dome structures, and in 1939 the country contained scores of known salt domes whose oil production possibilities had not been adequately tested.

f. Austria. There are three known oil fields in Austria, at Zistersdorf, Gaiselberg and St. Ulrich, all in an area some 50 kilometers north-northeast of Vienna. The production of significant quantities of oil in Austria only began in 1936, and as known in 1939, none of Austrian fields had been fully delimited, either aerially or in depth. In addition, within the oil producing region there were numerous structures yet untested, or on which active drilling was just beginning.

g. Hungary. The principal production of crude oil in Hungary comes from the fields at Budafapuszta (Lispe) and Lovaszi, near the Jugoslavian border in the southwestern part of the country.

A number of potentially favorable structures for oil production are known to exist in western Hungary, and Intelligence of good reliability has been received to the effect that a German company has made an important discovery of oil in south-central Hungary, at Totkomlos. A conservative allowance has been made to evaluate new production from any or all of these possibilities.

h. Jugoslavia. Until 1941, the known oil production from Jugoslavia amounted to only about 1,000 tons per year, from two small fields at Selenica and Peklenica, in northeastern Slovenia. There were also two small gas fields, at Goilo and Bujavica, in Croatia. It is reported that in 1942 an oil discovery of some importance was made in connection with the gas field at Goilo. Because of this direct Intelligence, and because the oil-producing strata of Hungary are of widespread occurrence in Jugoslavia, an allowance is made for production from this country during 1943.

i. Italy. Oil has been produced for many years from a few small fields in the Emilia district of northern Italy. In the past, both the Italian Government and private industry have made substantial efforts to expand Italian crude oil production without success.

j. Poland. The production of crude oil in Poland is obtained from one large field and scores of smaller ones in the Galician district of south Poland. The large field, at Boryslaw, reached its peak production in the early 1900's, and is now far advanced in its decline, and this is also the general status of the east Polish oil fields. The fields of western Galicia are still capable of some expansion, and there are possibilities for the discovery of new production in this area. During 1943, and for several years thereafter, the increase in west Polish production may be expected to balance the decline of the east Polish fields, and maintain the country's total at close to its pre-war average.

k. Roumania. There are more than twenty larger and smaller oil fields in Roumania, and all of the important ones are within a radius of 50 kilometers of the city of Ploesti. Despite government efforts to encourage exploration, Roumania's oil production has passed its peak, and the yield for the current and succeeding years will be less than that of 1942.

APPENDIX "B"

ANNEX "B"

16. ESTIMATED PRODUCTION FOR HYDROGENATION PLANTS FOR 1943 IN THOUSANDS OF METRIC TONS PER YEAR.

Section I.

This Section shows estimated production of these plants at annual rates in terms of motor gasoline. These rates are estimated from knowledge of plant equipment and which can most accurately be done in terms of making a single product -- motor gasoline. The rates are calculated on a 90% service factor for the plants and do not include the very large production of gaseous hydrocarbons, part of which are used to make alkylates or isooctanes. (See Appendix "B", note "C").

		Jan.	Mar.	May	July	Sept.	Nov.	1943
Bituminous Coal or Tar								
1. Blechhammer N	Tar	-	-	100	300	500	500	233
2. Blechhammer S	Coal	-	-	-	100	300	500	150
3. Poelitz	Tar & Coal	700	700	700	700	700	700	700
4. Gelsenberg	Coal	400	400	400	400	400	400	400
5. Scholven	Coal	350	350	350	350	350	350	350
6. Welheim	Pitch	150	150	150	150	150	150	150
Subtotal A		1,600	1,600	1,700	2,000	2,400	2,600	1,983
French Plants								
7. Lievin	Coal	10	10	10	10	10	10	10
8. Bethune	Coal	10	10	10	10	10	10	10
Subtotal B		20	20	20	20	20	20	20
Brown Coal or Tar								
9. Bruex	LTC tar	750	750	750	750	750	750	750
10. Leuna	Tar & coal	600	600	600	600	600	600	600
11. Boehlen	Tar	400	400	400	400	400	400	400
12. Magdeburg	Tar	300	300	300	300	300	300	300
13. Zeits	Tar	500	500	500	500	500	500	500
14. Lutzkendorf	Tar	125	125	125	125	125	125	125
15. A.G. Fur Kraft	Tar	100	100	100	100	100	100	100
16. Wessling	Coal	200	200	200	200	200	200	200
Subtotal C		2,975	2,975	2,975	2,975	2,975	2,975	2,975
Total (A+B+C)		4,595	4,595	4,695	4,995	5,395	5,595	4,978
"Unknown Plants"		-	100	200	300	500	500	266
Grand Total		4,595	4,695	4,895	5,295	5,895	6,095	5,244

Section II

This Section shows the most probable distribution of products as believed to be produced. The total is somewhat less when making aviation gasoline than when making motor gasoline as estimated above, and somewhat more when making diesel oil or lubricants.

	Capacity as Motor Gasoline	Product Breakdown Assumed				
		Aviation	Motor	Diesel	Lubes	Total
A.	1,983	990	775			1,765
B.	20		20			20
C.	2,975	150	1,425	1,300	200	3,075
D.	266		266			266
	5,244	1,140	2,486	1,300	200	5,126
					Gaseous losses	118
						5,244

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APPENDIX "B"

ANNEX "C"

17. ESTIMATED PRODUCTION OF FISCHER-TROPSCH PLANTS FOR 1943 EXPRESSED IN THOUSANDS OF METRIC TONS PER YEAR-

Section I.

This Section shows the estimated capacity of the plants in terms of the annual rate of production of primary product (synthetic crude oil). The rates are predicated on a 90% service factor for the plants.

(000's Omitted)

	Jan.	Mar.	May	July	Sept.	Nov.	1943
Germany							
Holten	125	125	125	125	125	125	125
Castrop-Rauxel	150	150	150	150	150	150	150
Hoesch	90	90	90	90	90	90	90
Homberg	190	190	190	190	190	190	190
Krupp	100	100	100	100	100	100	100
Essener Verein	100	100	100	100	100	100	100
Lutzkendorf	150	150	150	150	150	150	150
Schwarzheide	300	300	300	300	300	300	300
Deschowitz	70	70	70	80	90	110	80
SUBTOTAL	1,275	1,275	1,275	1,285	1,295	1,315	1,285
France & Italy							
Kuhlmann (Harnes)	30	30	30	30	30	30	30
Valdarno	30	30	30	30	30	30	30
SUBTOTAL	60	60	60	60	60	60	60
"Unknown"	100	150	200	300	300	300	225
TOTAL	1,435	1,485	1,535	1,645	1,655	1,675	1,570

Section II.

This Section shows the estimated workup into final products, wherein there is an estimated loss (refinery, fuel, gas, etc.) of approximately 9%. Part of the gaseous products are used in combination with the gaseous products from the hydrogenation plants to produce synthetic alkylates and iso-octanes (see Appendix "B", note C).

Source	Primary Product	Motor Gasoline	Diesel Oil	Lubes	Total
German Plants	1,285	770	375	25	1,170
French & Italian	60	36	18	-	54
"Unknown Plants"	225	135	68	-	203
	1,570	941	461	25	1,427
				Losses	143
					1,570

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18.

APPENDIX "C"

ESTIMATED EUROPEAN REFINERY OUTPUT FOR 1943

(Figures in thousands of metric tons yearly)

Crude Production		Refinery	Capacity	Crude Handled*	Gasolines	Kerosene Gas Oil Diesel Oil	Lubes	Fuel Oil Etc.	Ref. Fuel & Loss
Germany	1085	Germany	2505	1085	105	325	340	228	87
Czechoslovakia	32	Czechoslovakia	700	700	35	224	217	161	63
Austria	1004	Austria	800	800	134	356	114	123	73
Hungary	1413	Hungary	400	400	96	208	16	44	36
Italy	11	Italy	2100	873	201	427	42	126	77
Albania	264								
Yugoslavia	49	Yugoslavia	180	54	11	16	3	18	6
Rumania	5067	Rumania & Bulg.	9280	5013	1135**	1592	331	1454	501
Poland	535	Poland	800	535	107	214	64	114	36
Estonia	75	Estonia	100	75	8	30	-	33	4
France	95	France	7915	95	22	25	21	22	5
Belgium	0	Belgium)							
Netherlands	0	Netherlands)							
Norway	0	Norway)	1335	0	0	0	0	0	0
Denmark	0	Denmark)							
TOTAL	9630		26,215	9630	1854**	3417	1148	2323	888

* Exclusive of distillates from other refineries.

** Including 125,000 metric tons of aviation base stock and 50,000 tons of alkylate.

APPENDIX "D"

19. VULNERABLE POINTS IN THE WESTERN AXIS PETROLEUM TRANSPORT SYSTEM

a. Summary. The most important medium for the transport of oil is the railway network of Europe. It is difficult to specify railroad objectives in Western Europe which would have peculiar significance for oil transportation, but any damage to the railroad facilities in general may be expected to have a proportionally adverse effect on oil movements. It is possible to be more specific with regard to railroad objectives in Southeastern Europe, and those of outstanding importance in oil movements will be noted below.

The waterways of Europe nearly equal the rail routes in their importance for petroleum transportation. Although the flow of oil for direct military use probably is effected by rail, large quantities of oil are also transported by water, and the blocking of any main water routes would shift their traffic to the already overloaded railroads, increasing the difficulty of transportation as a whole, and consequently of that component formed by oil.

b. Railroads. Of the transportation objectives which can be singled out for their especial relationship to oil movements, the most important is the rail and pipeline center at Ploesti, Roumania. Virtually the entire Roumanian production of petroleum, amounting to approximately 5 million tons/year, becomes available to the refinery center of Ploesti, from which point it is farther distributed by rail and pipeline.

Damage to the railroad marshalling yards at and around Ploesti would proportionally retard the movement of some three million tons of petroleum products destined for Axis Europe, the Eastern front and Italy.

Second to Ploesti in importance is the railroad center at Budapest, Hungary, which is an important point of passage for the greater part of such Roumanian oil as is carried by rail to the Axis countries of Western Europe and Scandinavia. Some fifteen railway lines, six of which are double-tracked routes, terminate in the three railway stations of Budapest. Two of these stations are on the east side, and one on the west side of the Danube River, with intercommunication afforded by two large iron railroad bridges.

If the rail center at Budapest were seriously damaged, it would be possible to detour a portion of the traffic over the Slovakian and Jugoslavian railroads. It appears important, therefore, to note that with the exception of a single line on the north, all the railroads comprised between the Danube River and the Carpathian mountains are obliged to cross the broad, navigable Tisza River in Hungary. Destruction of the bridges across this river, and particularly those at Szeged and Szolnok, would thus effectively supplement a successful attack on Budapest.

Oil from Ploesti destined for Bulgaria, Greece, Crete and the Dodecanese is sent by rail or pipeline to Giurgiu, on the Danube River in Roumania, at which point it crosses the river by a train ferry to the Bulgarian railhead at Ruschuk. The capacity of the train ferry is only about 1,000 tons per day, even if it is employed exclusively to move oil. The destruction of the ferry would add materially to the difficulty of shipping oil to Greece and the islands of the eastern Mediterranean, especially if supplemented by damage to bridges on the rail route Ruschuk-Gornija-Orehovitza-Trnovo.

c. Pipelines. A maximum of about 1 million tons/year of oil may be transported through pipelines from Ploesti to Giurgiu on the Danube and to the port of Constanta on the Black Sea. Currently, only the oil movement to Giurgiu is of significance. The principal pumping station for the Giurgiu pipelines is located within the Astra Romana refinery group at Ploesti, and damage to this pumping station would seriously limit the use of the Ploesti-Giurgiu pipelines. The main pumping station for the Ploesti-Constanta pipeline is at Teleajan, east of Ploesti. A more generally vulnerable point in the transport of oil from Ploesti to Constanta is the bridge across the Danube at Cerna Voda, which carries both the pipeline and the railroad. The transport route from Ploesti via Constanta and Bulgarian ports might become of immense importance in the event of an active military campaign in the Balkans.

d. Inland Waterways. At the river port of Giurgiu, more than a million tons annually of petroleum products are transshipped to barge and continue on the Danube to Central and Northern Europe or to Jugoslavia and railheads into Italy. The only conspicuously vulnerable point in the Danube route is the Iron Gate (Turnu Severin) where the Danube cuts through the Carpathian mountains in a narrow gorge. The entire volume of the river's flow is here constricted in a rapids through which a canal has been blasted to permit the passage of barges. Owing to the force of the current, it is necessary to tow barges upstream by means of a paralleling electric railroad. Destruction of this railroad, or the blockading of the canal through the sinking of barges would correspondingly cut one of the largest channels of oil flow in Europe.

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In northwestern Europe, the Mitteland Canal which crosses Germany in the approximate latitude of Hanover and Berlin from connections with the Rhine River, and links the Weser, Ems, Elbe, Oder and Vistula River systems, is an important objective. It is via the Mitteland Canal that the production from the synthetic oil plants of the Ruhr area, Central Germany, Silesia and Stettin, as well as the refined products from the oil fields of Hamburg and Hanover, are distributed back and forth within Germany and moved eastward for military use. Perhaps the most vulnerable point in the Mitteland Canal system is the viaduct by which the canal crosses the Weser River near Minden in Northwestern Germany.

e. Baltic Sea Routes. The tanker routes on the Baltic Sea are the principal means for distributing oil to the North-Central and Northern Russian fronts, and the apparent vulnerable points in this distribution system are the main points of loading and discharge, namely, the port facilities of Hamburg, Lubeck, Rostock, Stettin, Riga and Talinn.