

APPENDIX "A"

THE WESTERN AXIS OIL POSITION

Report by the Enemy Oil Committee

13. The requirements for liquid fuels and lubricants by Germany and her European satellites during 1943 are estimated at approximately 16,000,000 metric tons. Military and civilian allocations by products are shown in Table I.

TABLE I

ESTIMATED CIVILIAN AND MILITARY REQUIREMENTS OF LIQUID FUELS AND LUBRICANTS IN AXIS EUROPE, 1943

(In thousands of metric tons)

	<u>Industrial and Civilian</u>	<u>Ground Forces</u>	<u>Air Forces</u>	<u>Navies</u>	<u>TOTAL</u>
Aviation Gasoline	27	-	1781	11	1819
Light Motor Fuel*	1958	3428	384	38	5808
Kerosene	705	-	-	-	705
Lubricants	849	162	88	52	1151
Gas and Diesel Oil	1036	1350	115	762	3263
Fuel Oil	1855	-	-	1138	2993
SUB-TOTAL	6430	4940	2368	2001	15739
Exports to Neutrals (135,000 tons)					
Losses, Sinkings, etc. (125,000 tons)					250
			Total Requirements		15999

(in round figures 16,000,000 metric tons)

*Motor gasoline blended with diesel oil for use in diesel motors is here treated as light motor fuel.

The considerations that have been taken into account in arriving at these estimates for the various categories of use are, briefly, as follows:

14. Industrial and Civilian Consumption. We estimate that industrial and civilian consumption of liquid fuels and lubricants in Axis Europe in 1943 amounted to 6,430,000 metric tons, or about two-fifths of total Axis European production. This

excludes gaseous and solid substitute fuels, which were used in an amount equivalent to 1,300,000 metric tons of liquid fuel. Consumption was reduced by almost four-fifths from the 1938 level. The brunt of the curtailment of petroleum supply was borne by the conquered and occupied countries. The scale of reduction was about 60 percent among Axis combatants and more than 94 percent in conquered countries.

Of the 6,430,000 metric tons of oil allocated to industrial and civilian uses, industry consumed 37 percent, road transport 24 percent, agriculture 12 percent, shipping 11 percent, households 9 percent and railroads 7 percent.

There is ample confirmation of the fact that at present no margin is left between actual civilian allocations and the supplies urgently needed to maintain transportation, to operate inland shipping, to till the soil and to keep the wheels of essential industry turning. Beyond doubt the reduction of civilian oil allocations has already contributed to a slowing down of essential production and transportation. However, as a result of measures of reorganization and substitution taken in 1943, and now coming into effect, industrial and civilian consumption of liquid fuels and lubricants will probably be cut by 300,000 tons in the first six months of 1944 and by a total of 800,000 tons during the year.

15. Consumption by Ground Forces and Auxiliary Services. We estimate the total consumption of liquid fuels and lubricants by German and satellite ground forces and auxiliary services in 1943 at 4,940,000 metric tons. In addition, 362,000 tons of solid substitutes (in terms of liquid fuels) were used in military generator vehicles. German ground forces and auxiliary services are estimated to have consumed 4,599,000 tons of liquid fuels and lubricants and 352,000 tons of solid substitutes, while the corresponding figures for satellite ground forces are 341,000 and 10,000 tons.

Of the 4,940,000 tons consumed by Axis ground forces, the Eastern Front required 72 percent, the African, Sicilian and Italian theaters 6 percent, standing armies and occupation troops 12 percent, and auxiliary services (Todt and NSKK) 10 percent.

Ignoring the possibility of a second front, we tentatively estimate the consumption of liquid fuels and lubricants by German and satellite ground forces and auxiliary services during the first half of 1944 at 2,500,000 tons, or at about the average rate during 1943.

Additional requirements of liquid fuels and lubricants in the six months following an invasion may be very tentatively estimated as of the order of 450,000 tons.

16. Air Force Consumption. We estimate total consumption of liquid fuels and lubricants by German and satellite air forces at 2,368,000 tons. This total was rather evenly divided by areas, 35 percent having been consumed in Western and Central Europe, 39 percent on the Eastern Front, and 26 percent in the Mediterranean region. Three-fourths of the total was aviation gasoline, while one-fifth was motor fuel (for the ground services) and the rest lubricants. By far the largest consumer was the GAF (2,089,000 tons or 88 percent of the total), followed by the IAF (131,000 tons or 5.5 percent in the first eight months) and all other satellites (148,000 tons or 6.5 percent).

Of the 2,368,000 tons consumed by Axis Air Forces, operational and non-operational flying by combat planes required 37 percent, transport flying 20 percent, training and testing 21 percent, and supply and ground services 22 percent.

Ignoring the possibility of invasion, we estimate consumption of liquid fuels and lubricants by Axis air forces during the first six months of 1944 at 1,300,000 tons.

Additional requirements of liquid fuels and lubricants in the six months following an Allied invasion may be very tentatively estimated as of the order of 250,000 tons.

17. Naval Consumption. We estimate total consumption of liquid fuel and lubricants by German naval forces in 1943 and by the Italian navy during the first eight months of the year at 2,000,000 tons. Of this total we estimate German naval forces consumed 1,592,000 tons, of which 11,000 tons were aviation gasoline, 28,000 tons light motor fuel (for shore establishments), 45,000 tons lubricants, 732,000 tons diesel oil, and 776,000 tons fuel oil. Italian naval forces in the first eight months of the year we estimate consumed 408,000 tons, of which 6,000 tons were lubricants, 10,000 tons light motor fuel, 30,000 tons diesel oil, and 362,000 tons fuel oil.

Of the 2,000,000 tons consumed by the Axis naval forces, heavy units required 11 percent, destroyers 22 percent, submarines 29 percent and other craft and shore establishments 38 percent.

Ignoring the possibility of invasion, we estimate consumption by German naval forces in the first six months of 1944 will be 800,000 tons of liquid fuels and lubricants.

Additional naval requirements in the six months following an Allied invasion may be very tentatively estimated as of the order of 200,000 tons.

18. Exports to Neutrals. Fairly complete official and semi-official statistics, obtained from the countries concerned, indicate that the Western Axis exported at least 135,000 metric tons of petroleum products to neutrals during 1943. The bulk of such shipments was made from Rumania.

19. Stocks Destroyed. Our estimate of direct losses of oil products through tanker sinkings, bombing operations, etc., during 1943, is 125,000 tons. Weight is given to known sinkings, and to destruction of oil in storage such as took place at Ploesti. A semi-official report from Moscow states that Soviet forces did not capture or destroy important German fuel dumps during their advances in 1943. We believe that German losses of oil stocks on the Eastern Front are well covered by the allowance made in our ground force consumption estimates for wastage and losses.

20. Substitute Fuels. The year 1943 has witnessed a large expansion in the use of substitute fueled motors, especially in Germany. Up to the beginning of 1942, the development in the Reich lagged far behind that of France and of other countries of Western and Northern Europe. As long as Germany maintained reasonable hopes for the conquest of large oil fields in the Caucasus, the use of cumbersome generator motors was not pushed energetically. Occupied countries, where allocations of liquid fuels had long been reduced to a bare minimum, had advanced much further in their use. However, since the autumn of 1942 Germany has bent all efforts on converting road vehicles and motors used in agriculture, inland shipping, industry and railways to the use of solid and gaseous fuels.

By July 1943, there were in Axis Europe some 410,000 substitute fueled vehicles, more than five-sixths of which were trucks. About four-fifths of the total number of converted road vehicles used solid fuels and one-fifth gaseous fuels. Nearly one-third of the total number of substitute fueled units were stationed in Germany and another third in France. The remaining vehicles were divided between all the other countries of Axis Europe.

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The quantities of liquid fuels saved by the use of gaseous and solid substitute fuels has been estimated at 1,300,000 tons, or about one-fifth of the total quantity of all liquid fuels and lubricants allocated to industrial and civilian uses in 1943. Savings in road transportation accounted for 80 per cent of this total, another 12 percent went for agriculture, while the remaining 8 percent was divided between industry, shipping and railways.

Savings in the various countries were mainly dependent on the number of substitute fueled motors but also to a considerable extent on the quantities of substitute fuels which could be made available. Nearly half of the total savings were achieved in Germany and only about one-sixth in France. Further progress in substitution can be expected in 1944, especially in Germany and Eastern Europe.

21. Sources of Supply. The requirements for liquid fuels and lubricants of the Western Axis powers are met from the sources of supply ^{a)} as summarized in Table II:

TABLE II

ESTIMATED PRODUCTION OF LIQUID FUELS AND LUBRICANTS IN AXIS
EUROPE
(1943)
(in thousands of metric tons)

	Aviation Gasoline	Light Motor Fuel	Diesel, Gas Oil & Kerosene	Heavy Lubes Fuel	Total
I Crude Oil and 160* Natural Gasoline (including shale oil)	2597	2122	2148	720	7747
II "Oil from Coal"					
(a) Hydrogenation 1480**	1550	1115		210	4355
(b) Fischer-Tropsch 50***	575	515		60	1200
(c) "Unknown" Plants (Fischer-Tropsch)	80	75		10	170
(d) Tar Oils					
1. L.T.C.	50	110	220		380
2. H.T.C.	30	90	780		900
3. Benzol 100	500				600
III Alcohol	175				175
IV Bottled Gases (Liquefied)	313				313
V Lubes from Vegetable Oils				5	5
VI Regenerated Lubes				200	200
Total Production 1790	5875	4027	3148	1205	16045

*Includes 35,000 tons of alkylate

**Includes 150,000 tons of alkylate

***Alkylate

The special considerations affecting the various estimates are as follows:

22. Natural Crude Oils (including natural gasoline and shale oil). The position with respect to crude oil supplies is substantially changed since our report of 2 June (J.I.C. 106), chiefly as a result of the following factors:

Our estimate for the output of crude oil in Hungary during 1943 has had to be reduced from 1,413,000 metric tons to 800,000 metric tons, in consequence of firm intelligence

supporting the lower figure. There is general agreement that the subsoil reserves of Hungary would have easily permitted the building up of a present annual output of the magnitude originally estimated, had not the Hungarian government firmly opposed depleting the country's reserves for German account.

Other changes have included a reduction of over 100,000 tons in the estimated production of the Reitbrook oil field in Germany, in consequence of a more complete study of the data available from aerial reconnaissance, and a downward revision of similar magnitude in the allowance for Albanian oil production, in consequence of facts recently available from Italy.

Our preliminary estimate of crude oil production from Axis Europe during the first six months of 1944 is 4,400,000 metric tons, thus at about the same level as during 1943. The continuing downward trend in the output from Rumanian and German oil fields is expected to be counterbalanced by highly probable increases in production from Austria and Hungary.

23. Hydrogenation. Our estimate of the output of the hydrogenation plants has been materially reduced since our report of 2 June 1943 (J.I.C. 106), and is now placed at a total of 4,340,000 metric tons for the year 1943. Photographs taken during periodical aerial reconnaissance have made it clear that construction of the great new installations at Bruex, Blechhammer North and Blechhammer South has gone forward much more slowly than anticipated, thus requiring a proportional reduction in our estimates for their 1943 output. Also, as a result of discussions with the British Hartley Committee in London, it is considered improbable that there is any important production from "unknown" hydrogenation plants.

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In the face of the tight oil position indicated by our calculation of supply and demand in Axis Europe, and the strong probability that requirements will be increased by a greater scale of military activity in the near future, we are somewhat at a loss to explain the slow progress which has been permitted on the construction of new hydrogenation capacity. Among the factors which may have inevitably contributed to this delay are any or all of the following: (1) Destruction of manufacturing facilities in the Ruhr may have prevented delivery of essential plant equipment; (2) the program of simultaneously constructing three huge hydrogenation plants, in addition to several similar plants for rubber production, may have been miscalculated in the sense of being absolutely beyond the capacity of German manufacturing facilities to provide equipment with reasonable promptness; (3) the use of forced labor, with attendant sabotage, may have unduly slowed construction; (4) other industries, which compete with synthetic oil plants for equipment, may have a higher priority than oil.

In calculating the current production from hydrogenation and Fischer-Tropsch plants, we have made no allowance for decreased production which may result from the lost time and inefficiency of wartime conditions - blackouts, air alerts, etc., apart from direct bomb damage. Although there unquestionably has been a loss of output from such causes, we are unable at present to appraise it and doubt that it is greater than the limit of error of our calculations as a whole.

We estimate that during the first six months of 1944, production from the hydrogenation plants will total 2,900,000 metric tons, if plant outputs are not interfered with by United Nations attacks.

24. Fischer-Tropsch Process (Hydrocarbon Synthesis). Our estimate of Fischer-Tropsch production has been revised on the basis of additional aerial photographic coverage during the latter part of 1943, and is now placed at 1,370,000 metric tons for the year. As a result of the recent completion of extensions to certain plants, we estimate that Fischer-Tropsch production during the first half of 1944 will amount to about 800,000 metric tons.

25. Tar Oils. The products of the coal carbonization industry afford substantial contribution to the liquid fuel pool, apart from the role these products play as supplies of raw material for hydrogenation. We estimate that during 1943 a total of 380,000 metric tons of liquid fuel was obtained from the low temperature carbonization of lignite and bituminous coal. A much greater output of liquid fuel is estimated as secured from high temperature tars, our present figures being a total of 1,500,000 metric tons from this source during 1943, of which 600,000 tons is in the form of benzol. We foresee production at about this same rate during the first six months of 1944.

26. Miscellaneous Products. The supply of liquid fuels and lubricants is further augmented by the use of alcohol, bottled gas (liquefied), vegetable oil lubricants and by the regeneration of used lubricating oils. Total supplies from these sources during 1943 we estimate to amount to 793,000 metric tons, and we anticipate that quantities of the same order of magnitude will be available during 1944.

27. Position by Products. Although the product composition of the output of Western Axis synthetic plants and refineries can, within broad limits, be adjusted to needs, such adjustments require time. In other words, to assure complete

flexibility, i.e., stocks must be available to cover needs during the readjustment period. Flexibility is also reduced by the fact that an important part of the crude oil refining capacity is not under direct German control.

With production and requirements as closely in balance as in 1943, we may conclude that any serious errors in planning, any important interference with production, and any sudden shifts in product requirements will cause serious local and temporary product shortages. However, if during 1944 the Western Axis should succeed in establishing a substantial operating margin of supplies over requirements, the recognized basic flexibility of its oil production facilities would permit a smooth adjustment of production output to meet changes in demand.

28. Vulnerabilities. The position in respect to vulnerabilities continues to support in full the recommendations of our previous reports; however, stress may be laid on the following additional circumstances:

a. The certainty with which specific plants can be identified as important primary sources of aviation gasoline warrants the upgrading of these plants in terms of target priorities;

b. The elimination in part temporarily, and in part permanently, of surplus refining capacity at Ploesti and the further reduction of this excess refinery capacity by the capture, destruction and immobilization of Italian refineries has served to justify a higher target priority for all oil targets, insofar as the margin of plant capacity over raw materials for processing has been materially reduced. Effectiveness of bombing operations such as took place at Ploesti would be much increased if provision were made for follow up attacks;

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c. The greater accessibility of oil targets to bombing operations, by reason of the construction of the Axis frontiers, gives greater emphasis to the attractiveness of these, as well as other, bombing objectives.