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SUMMARY

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AXIS EUROPEAN ARMED FORCES -- CONSUMPTION OF
LIQUID FUELS AND LUBRICANTS, 1943

The following table presents a summary statement of consumption of liquid fuels and lubricants by all Axis European armed forces in 1943. Total consumption of all products amounted to 9,369,000 metric tons, of which 1,792,000 tons was aviation gasoline, 3,850,000 tons gasoline, 2,227,000 tons Diesel oil, 302,000 tons lubricants, and 1,138,000 tons fuel oil. German armed forces consumed 89 percent of the total, Italian armed forces, active for only eight months, 7 percent, and other satellites only 4 percent.

The Eastern Front (including Finland and the areas behind the lines in Eastern Europe) required 4,585,000 tons, or 49 percent of the total, Western and Central Europe (with which is included all German naval consumption) 3,093,000 tons, or 33 percent, Africa, Sicily, and Italy 1,364,000 tons, or 15 percent, and the Balkans 267,000 tons, or 3 percent.

Total consumption of substitute fuels in 1943 by Axis European armed forces amounted to an additional estimate 411,000 tons (in terms of liquid fuel equivalents).

SUMMARY

TOTAL CONSUMPTION OF LIQUID FUELS AND LUBRICANTS BY AXIS EUROPEAN ARMED FORCES

(Thousand metric tons)

	<u>Aviation Gasoline</u>	<u>Gasoline</u>	<u>Diesel Oil</u>	<u>Lubricants</u>	<u>Fuel Oil</u>	<u>Total</u>
I. GERMANY						
A. Ground Forces	-	3180	1267	152	-	4599
B. Navy	11	28	732	46	776	1593
C. Air Force	1573	337	101	78	-	2089
TOTAL	1584	3545	2100	276	776	8281
II. ITALY						
A. Ground Forces	-	88	31	3	-	122
B. Navy	-	10	30	6	362	408
C. Air Force	99	21	6	5	-	131
TOTAL	99	119	67	14	362	661
III. MINOR SATELLITES						
A. Rumania						
1. Ground Forces	-	45	16	3	-	64
2. Air Force	58	14	4	3	-	79
B. Hungary						
1. Ground Forces	-	72	23	4	-	99
2. Air Force	30	7	2	1	-	40
C. Finland						
1. Ground Forces	-	9	3	-	-	12
2. Air Force	7	1	1	-	-	9
D. Bulgaria						
1. Ground Forces	-	10	3	-	-	13
2. Air Force	14	4	1	1	-	20
E. Slovakia and Croatia						
1. Ground Forces	-	24	7	-	-	31
TOTAL	109	186	60	12	-	367
IV. GRAND TOTAL ¹	1792	3850	2227	302	1138	9309
of which:						
A. Eastern Front	642	2839	958	146	-	4585
B. Western & Central Europe ²	680	476	1054	107	776	3093
C. Africa, Sicily, Italy	470	340	143	39	362	1364
D. Balkans	(	195	72	10	-	267

¹ Total savings of liquid products in 1943 resulting from conversion amounted to an estimated 471,000 tons (Ground Forces -- 185,000 tons; Navy -- 5,000 tons; Air Forces -- 16,000 tons; and Total and USKK -- 175,000 tons).

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ENEMY OIL COMMITTEE

Western Axis Sub-Committee

AXIS AIR FORCES' CONSUMPTION OF LIQUID FUELS AND LUBRICANTS, 1943

January, 1944

AXIS AIR FORCES -- CONSUMPTION OF LIQUID FUELS
AND LUBRICANTS, 1943

I. CONSUMPTION IN 1943

Total consumption of liquid fuels and lubricants by German and satellite air forces is estimated at 2,368,000 tons. This total was divided rather evenly 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) and all other satellites (148,000 tons or 6.5 percent). (See Table for additional details.)

The average monthly rate of consumption by the GAF was 174,000 tons. The average monthly rate of consumption by the combined German and satellite air forces was 197,000 tons.

II. COMPARISON OF THE BRITISH AND AMERICAN ESTIMATES

British estimates of Axis air force consumption are available for the first nine months of the year and total 1,437,000 tons, or an average monthly rate of 124,000 tons. The difference between the British and the American estimates is, therefore, very important, since the American exceeds the British by 73,000 tons per month, or by nearly 60 percent. Unfortunately the source or sources of the discrepancy cannot be analyzed, since the methodology employed by the British is not known here.

III. CONSUMPTION IN 1944

Ignoring the possibility of invasion, consumption of liquid fuels and lubricants by Axis air forces during the first six months of 1944 is tentatively estimated at 1,300,000 tons. This figure is reached on the basis of the following assumptions and considerations:

1. an overall increase in flying activity of about 20 percent, which is more or less in line with the overall increase in first line strength;
2. continued conversion of vehicles in the GAF ground services to solid substitute fuels.

Additional requirements of liquid fuel and lubricants in the six months following an Allied invasion may be tentatively estimated, on the basis of various assumptions, as in the order of 150,000 to 250,000 tons.

IV. METHODOLOGY

A. Sorties. The basic element in the estimates is the number of sorties per month by theaters and types of plane. The number of sorties in the Western and Mediterranean theaters is based on the observed sortie figures prepared by the BAM. To these have been added allowances for non-operational flying by operational planes based on USAAF experience in the European and Mediterranean theaters (it may be noted that use of RIF non-operational experience leads to an almost identical total consumption, but to a slightly different allocation of the total by theaters). The number of sorties on the Eastern Front has been calculated by applying maximum USAAF experience in the European and Mediterranean theaters to the first line strength in Russia. The number of sorties by non-operational planes in Central Germany has been assumed to be equivalent to the non-operational sorties of USAAF planes. The number of sorties per month by planes in the satellite air forces has been more or less arbitrarily put at 8 to 12, depending on the area and the tasks. The number of sorties per transport plane per month has been assumed, partly on the basis of intelligence, to be 15.

B. Consumption per Sortie. Consumption per sortie has been estimated as a certain percentage of tankage capacity. In the case of models equipped to carry extra tanks, it has been assumed that 75 percent of the normal tankage (85 percent in the case of fighters) was used on three-fourths of the sorties and 75 percent of the maximum tankage (85 percent in the case of fighters) on the remaining sorties. In the case of models not so equipped 75 percent of tankage (85 percent in the case of fighters) has been assumed for all sorties. An average consumption per sortie per type was then calculated by weighting the various models according to their share in first line strength.

C. Calculation of Consumption. Given the number of sorties by types per month and the average fuel consumption per sortie by types, the calculation of consumption was simply a matter of multiplication. To the totals thus obtained were added an allowance of $7\frac{1}{2}$ percent for wastage and losses. Lubricants were calculated as 4 percent by weight of aviation gasoline consumption.

D. Training. The estimates for consumption of aviation gasoline by training planes have been based on intelligence as to the number and type of planes available, the number of pilots being trained, and the number of hours of training. This has been converted into full-length sorties per plane per month and the appropriate consumption rates per sortie have been applied to secure an estimate of total consumption.

E. Testing. The estimates for consumption of aviation gasoline in the testing of engines and aircraft have been based on intelligence as to the number and horsepower of engines produced in 1943, the average number of hours of testing per engine, and the average consumption per horsepower per hour.

F. Ground Services. The consumption of motor fuel by the ground services is based on an OSS study of the vehicular strength of the GAF and on the assumption that an allowance of one-half ton of motor fuel per vehicle is adequate. Savings resulting from conversion to solid substitute fuels are estimated at 5 percent of motor fuel consumption in the Russian and Mediterranean theaters and at 20 percent in the West and in Central Germany. In the case of satellite ground services consumption has been estimated on the basis of the relationship between the consumption of aviation gasoline and motor fuel by the GAF.

AXIS AIR FORCE CONSUMPTION OF AVIATION GASOLINE, MOTOR FUEL, AND LUBRICANTS, 1943

(Thousand metric tons)

	Aviation Gasoline			Total Aviation Gasoline	Supply & Ground Services ³		Lubricants ⁴	Total Liquid Products
	Combat Planes ¹	Transport Planes	Training & Testing ²		Gasoline	Diesel Oil		
1. GERMAN AIR FORCE								
a. Western & Central Europe	201	76	392	669	91	28	33	821
b. Eastern Europe	379	218	-	597	189	56	31	873
c. Mediterranean Area	<u>160</u>	<u>147</u>	<u>-</u>	<u>307</u>	<u>57</u>	<u>17</u>	<u>14</u>	<u>395</u>
TOTAL	740	441	392	1573	337	101	78	2089
2. ITALIAN AIR FORCE								
a. Mediterranean Area	51	25	23	99	21	6	5	131
3. SATELLITE AIR FORCES								
a. Eastern Europe	42	-	3	45	11	3	2	61
b. Mediterranean Area	<u>-</u>	<u>-</u>	<u>64</u>	<u>64</u>	<u>15</u>	<u>5</u>	<u>3</u>	<u>87</u>
TOTAL	42	-	67	109	26	8	5	148
4. GRAND TOTAL	833	466	482	1781	384	115	88	2368
of which:								
a. Western & Central Europe	201	76	392	669	91	28	33	821
b. Eastern Europe	421	218	3	642	200	59	33	934
c. Mediterranean Area	211	172	87	470	93	28	22	613

FOOTNOTES TO TABLE

1. Includes operational and non-operational consumption.
2. G.F. figure includes 346,000 tons for training and 46,000 tons for testing.
3. Conversion of 5 percent of G.F. vehicles in Russia and Mediterranean area and of 20 percent of G.F. vehicles in the West and in Germany is assumed, resulting in a total saving of 46,000 tons of motor fuel in 1943.

Satellite ground and supply services are assumed to have made no conversion to substitute fuels, except in Finland where the savings are negligible. Consumption of motor fuel is estimated as 30.8 percent of their aviation gasoline consumption, which is the relationship between G.F. motor fuel requirements (assuming no conversion by the G.F.) and G.F. aviation gasoline consumption.

Italian ground and supply services' consumption of motor fuel is estimated as 27.8 percent of Italian aviation gasoline consumption, which is the relationship between G.F. motor fuel consumption (allowing for conversion) and G.F. aviation gasoline consumption.

Total consumption of motor fuel is estimated to be divided as follows: gasoline 77 percent and Diesel oil 23 percent.

4. Lubricants are calculated as follows:

- a. 4 percent of aviation gasoline;
- b. 3 percent of motor fuel for unconverted vehicles;
- c. 5 percent of the substitute fuel (in terms of liquid fuel) for converted vehicles.

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ENERGY OIL COMMITTEE

Western Axis Sub-Committee

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AXIS MILITARY CONSUMPTION OF LIQUID FUELS AND LUBRICANTS, 1943

January 1944