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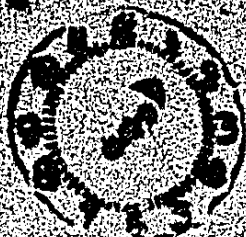
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CONSUMPTION AND REQUIREMENTS

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AIRCRAFT FUEL CONSUMPTION OF THE G.A.F.

JANUARY 1945.

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1. This report estimates the consumption of aircraft fuel by the German Air Force during the month of January and attempts to establish a systematic procedure for providing such estimates in the future.

2. The rounded figures for consumption by the various branches of the air force are listed in the table below.

G.A.F. Aircraft Fuel Consumption, January 1945.

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I. First-Line Aircraft.

A. Operational flights	8,900 tons
B. Transfer and training flights	1,800 tons
C. Rest and refitting flights	500 tons

Total, First-Line Aircraft 11,200 tons.

II. Aircraft Industry.

A. New production: test and ferrying flights ...	1,300 tons
B. Repair: test and ferrying flights	400 tons

Total, Aircraft Industry 1,700 tons.

III. Training Units.

A. Single-engined fighter training	6,900 tons
B. Twin-engined fighter training	2,500 tons
C. Bomber, Transport and misc. training	800 tons

Total, Training Units 10,200 tons.

IV. Transport Units 5,200 tons.

V. Communications and Auxiliary Units 1,100 tons.

VI. Experimental Units 300 tons.

VII. Second-Line Units 1,400 tons.

VIII. Miscellaneous 900 tons.

Total, German Air Force 32,000 tons.

3. In general terms, these calculations are based on estimates of:

(a) the number of sorties flown during the month in the various branches of the G.A.F.; and

(b) the average rate of fuel consumption per sortie.

A fuller discussion of the method of calculation used in each case, together with the detailed breakdown of the total consumption figure shown for each branch of the G.A.F., is given in the appended Schedules. In view of

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SECRET

- 2 -

X-99721

the possible margin of error attached to the figures, they must be taken only as approximations.

4. Jet- and rocket-propelled fighters have been excluded from this analysis, since the types of fuel consumed by these aircraft are not comparable to the standard types of aircraft fuel.

5. The January consumption figure of 32,000 tons is believed to be the lowest total the G.A.F. has yet reached. In comparison with previous months of low G.A.F. consumption, the further decline in January may be attributed to:

(a) the reduction in single-engined aircraft output, and consequently in the number of aircraft and engine tests and ferrying flights, through the loss of production and repair centers in the East;

(b) a further drop in the amount of practice and training flights conducted in operational units, owing to the fuel shortage; and

(c) the cessation, after mid-January, of flying bomb operations by units of the long-range bomber force. Since air-launching activity involves a costly expenditure of aircraft fuel, it may be presumed that this reprisal method has, at least temporarily, fallen victim to the fuel shortage.

Unfavorable weather conditions, coupled with unserviceable airfields, caused a fall in the scale of effort of almost all types in the West. In the case of single-engined fighters, this decline was offset by the transfer of fighter units to the Eastern Front and the increase of air activity in that area. Similarly, tactical reconnaissance and ground-attack operations in connection with the Russian offensive are believed to have resulted in a net increase in the scale of effort. Overall twin-engined fighter activity, on the other hand, was well below the level of December.

6. The extent to which the continuing and critical shortages of aircraft fuel have altered both the nature and the scale of G.A.F. operations may be appreciated by a comparison with the consumption figure for November 1943, which was estimated at 120,000 tons. In the intervening months, dwindling supplies of aircraft fuel have caused progressively the abandonment of all non-essential testing, transport and training flights, and then serious reductions in the number of operational sorties of all kinds.

7. It is estimated that, at the present time, single-engined fighter flights of all kinds account for almost 40 per cent of total fuel consumption on the following basis:

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X-99721

First-Line Aircraft

Operational First-Line Aircraft	3,500 tons
Training and Reserve Aircraft	900 tons
Test and Development Aircraft	350 tons
Total, First-Line Aircraft	4,750 tons

Aircraft Industry

New Production	500 tons
Repair	50 tons
Total, Aircraft Industry	550 tons

Training Units

S.E.F. day	6,250 tons
S.E.F. night	600 tons
Formation Leaders	100 tons
Total, Training Units	6,950 tons
Total, Single-Engine Fighters	12,250 tons

The relatively high single-engine fighter consumption at the present time is due in part to the expanded training program for S.E.F. pilots and, until January, to the sustained high level of single-engine fighter production. But it is also a reflection of the curtailment or abandonment of long-range bomber, transport, coastal and long-range reconnaissance flights, both training and operational, necessitated by inadequate fuel allocations.

• It is impossible to provide a breakdown of the total consumption by types of aircraft fuel (B4, C3 and A3) since many aero-engines employ more than one type. Only a very small proportion of A3 is currently used in the G.A.F., (namely in elementary training), however, and the figures of aircraft fuel consumption represent almost entirely B4 and C3.

SECRET

3

SECRET

- 4 -

K-99721

G.A.F. Fuel Consumption for January, 1945.Schedule I - First Line Aircraft.A. OPERATIONAL FLIGHTS.

Category	Sorties per day	Duration of sortie (hrs).	Consumption per a/c per hr. (gals).	Total Consumption per day (gals).	Total Consumption per month (tons).
S.E.F.	365	14	76	34,675	3,468
T.E.F.	70	12	132	13,860	1,386
G.A.	175	12	72	15,750	1,575
TAC.R.	70	1	73	5,110	511
L.R.R.	20	4	140	11,200	1,120
L.R.B.	10	4	151	6,040	604
Coastal	15	5	32	2,400	240
Total					8,904

Notes: 1) The number of daily sorties is the A.I.3.(b) estimate, from which jet- and rocket-propelled fighter sorties have been deducted.

2) The average duration of a sortie is based on captured aircraft logbooks and records of G.A.F. operational units, and on intelligence observations of enemy air operations.

3) Consumption figures per hour for each category are the average of the consumption rates for the individual aircraft types in the category, weighted by the number of sorties by each type. The consumption rates for individual aircraft types, together with a description of the basis of calculation is listed in Schedule IX (pg. 13).

B. TRANSFER AND TRAINING FLIGHTS.

Category	Sorties per day	Duration of sortie (hrs).	Consumption per a/c per hr. (gals).	Total Consumption per day (gals).	Total Consumption per month (tons).
S.E.F.	365	14	76	9,247	925
T.E.F.	70	12	132	4,620	462
G.A.	90	12	72	2,160	216
TAC.R.	35	1	73	863	86
L.R.R.	10	4	140	467	47
L.R.B.	5	4	151	233	23
Coastal	10	5	32	133	13
Total					1,772

Notes: 1) Daily transfer and training flights in first line units are estimated to be the same number as operational flights for S.E.F. and T.E.F. aircraft, and one-half the number for the other categories. This estimate is based largely on captured unit records and individual aircraft logbooks, adjusted in the light of restrictions believed to have been imposed because of the fuel shortage.

2) The average duration of a sortie is based on similar evidence. T.E.F. units are believed to carry out more intensive training operations than other categories.

3) The figures for "transfer and training" flights include routine flights, test flights of aircraft repaired at the unit, and they are intended to cover all non-operational flying by the regular operational units.

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K-99721

- 5 -

C. REST AND REFITTING FLIGHTS.

Category	Sorties per day	Duration of sortie (hrs).	Consumption per a/c per hr. (gals).	Total Consumption per day (gals).	Total Consumption per month (tons).
S.E.F.	90	- Not applicable -	75	3,375	338
T.E.F.	10		117	585	58
G.A.	25		68	850	85
T.O.R.	10		7	355	36
L.R.R.	1		140	70	7
L.R.B.	2		167	167	17
Coastal	1		40	20	2
Total					543

- Notes: 1) "Resting and refitting" units are those first-line units temporarily withdrawn from operations for rest and re-equipment on to new aircraft types or sub-types.
- 2) The number of daily sorties has been calculated to bear the same proportion to the strength of those units as transfer and training flights bear to the strength of the operational units.
- 3) The weighted average consumption per aircraft per hour for each category differs from Schedules IA and B since the individual aircraft types are included in these units in different proportions.

Summary, Schedule I.

A. Operational flights	8,900 tons
B. Transfer and training flights	1,800 tons
C. Rest and refitting flights	500 tons
Total first line aircraft	11,200 tons

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SECRET

5

SECRET

- 6 -

K-99721

G.A.F. Fuel Consumption for January, 1945.

Schedule II - Aircraft Industry.

A. FIRST LINE AIRCRAFT.

Category		No. of a/o monthly	No. of hrs flight per a/o.	Consumption per a/o per hr. (gals).	Total Consumption per month (gals)	Total Consumption per month (tons)
S.E.F.	New	760	} 2½	75	142,500	475
	Rep	100		75	18,750	63
T.E.F.	New	265	} 5	138	182,850	610
	Rep	15		137	10,275	34
Q.A.	New	150	} 2½	76	28,500	95
	Rep	40		66	6,600	22
TAC.R.	New	115	} 2½	77	22,138	74
	Rep	40		75	7,500	25
L.R.R.	New	10	} 5	138	6,900	23
	Rep	10		140	7,000	23
L.R.B.	New	-	} 5	-	-	-
	Rep	10		139	6,950	23
Coastal	New	5	} 5	61	1,525	5
	Rep	-		-	-	-
TOTAL					New	1,282
					Rep	190

B. TRAINING AIRCRAFT

S.E.F.	New Rep	40 100	} 2½	75 75	7,500 18,750	25 63
T.E.F.	New Rep	- 20		} 5	- 137	- 13,700
Training Types	New Rep	- 100	} 2½		- 17.5	- 4,375
TOTAL					New Rep	25 124

C. TRANSPORT AIRCRAFT

Ju. 52	Rep	25	5	102	12,750	42
	Rep	15	5	139	10,425	35
TOTAL						77

D. SECOND LINE AIRCRAFT

Ju. 87	Rep	25	2½	56	3,500	12
	Rep	25	2½	76	4,750	16
TOTAL						28

SECRET

6

SECRET

- 7 -

K-99721

Summary, Schedule II:

	<u>New</u>	<u>Rep'd</u>	<u>Total</u>
A. First Line Aircraft	1,282 tons	190 tons	1,472 tons
B. Training Aircraft	25	124	149
C. Transport Aircraft	-	77	77
D. Second Line Aircraft	-	28	28
	Total, Aircraft Industry		1,726

- Notes: 1) The numbers of new and repaired aircraft turned out monthly are, for the most part, A.I.3.(b) estimates of the monthly production of the G.A.F.
- 2) The number of hours flown includes: a) engine tests at the engine assembly or repair factory; b) test flights of the aircraft at the final assembly or repair factory; and c) ferry flights of new or repaired aircraft to their units. In the case of twin-engined aircraft it also includes flight-testing of the U/T apparatus. These calculations are based on figures found in captured log-books of individual aircraft and aero-engines, adjusted to make allowance for subsequent changes due to the strained fuel position.

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- 3) The total number of pilots in the two training programmes (5,760 S.E.F. and 1,020 T.E.F.) is based on general estimates of monthly input and output of fighter pilots and the rate of pilot wastage in training. The totals have been apportioned among the several schools on the basis of the duration of the course in each school.
- 4) S.E.F. fighter school (a) trains on elementary aircraft types; S.E. fighter school (b) trains on standard S.E.F. types.
- 5) It is recognised that the method of calculation employed here is not flexible. The margin of error surrounding the training consumption figure for any month is therefore greater than for other types of consumption, and it is again stressed that these figures are approximations only.

C. SINGLE-ENGINE NIGHT FIGHTER TRAINING

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Type of school	No. of flying hrs. per pilot	No. of months training	No. of hrs. per pilot per month	Consumption rate per hr. (gals)	Consumption per pilot per month (gals)	No. of pilots at school in month	Total cons. per month (gals)	Total cons. per month (tons)
S.E. Night Fighter R.T.U.	20	1	20	75	1,500	120	180,000	600

The single-engine night fighter R.T.U. is known to have an establishment strength which is one-fourth that of the day fighter R.T.U. An average of 120 pilots monthly has therefore been chosen.

D. FORMATION LEADERS SCHOOL

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Formation Leaders	20	1	20	75	1,500	20	30,000	100

The Formation Leaders School is a special training course, believed to last one month, for the additional training of existing S.E.F. operational pilots to become leaders of flying formations.

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X-99721

E. BOMBING, TRANSPORT AND MISCELLANEOUS.

Total..... 775 tons.

A block allocation of 775 tons has been allotted to cover bomber, transport, ground attack, path-finding and similar miscellaneous training on a small scale carried out during the month.

SUMMARY SCHEDULE III.

A.	S.E.F. Training (Day)	6,250 tons.
B.	I.F.F. Training	2,475 tons.
C.	S.E.F. Training (Night)	600 tons.
D.	Formation Leaders	100 tons.
E.	Miscellaneous.	775 tons.

Total, Training Units: 10,200 tons.

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G.I.F. Fuel Consumption for January 1945.

Schedule IV - Transport Units.

A. OPERATIONAL FLIGHTS.

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Aircraft type	No. of a/o operating monthly	Hours flown per a/o	Consumption per a/o per hr. (gals).	Total monthly consumption (gals).	Total monthly consumption (tons).
Ju.52	2400	5	102	1,224,000	4,080
He.111	475	4	139	264,100	880
Misc.	150	5	102	76,500	255
Total					5,215

B. TRANSFER AND TRAINING FLIGHTS.

Ju.52	25	2	102	5,100	17
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Notes: 1) The number of monthly transport sorties is based upon intelligence evidence of transport operations or, when this is lacking, on the establishment strength and serviceability of the transport units operating in the area. The average duration of a sortie is derived from captured aircraft log books.

2) The miscellaneous category of transport aircraft includes such types as the Ju.290, Ju.90, Ju.252, Ju.352, etc. Their performance has been taken as similar to that of a Ju.52.

SUMMARY, Schedule IV.

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A. Operational flights 5,200 tons

B. Transfer and Training flights - tons

Total Transport units 5,200 tons

Schedule V - Communications and Auxiliary Units.

Aircraft type	No. of a/o operating monthly	Hours flown per a/o	Consumption per a/o per hr. (gals).	Total monthly consumption (gals).	Total monthly consumption (tons).
He.111	450	5	139	312,750	1,043
F1.156	750	2	16	24,000	80
Total					1,123

Notes: 1) Included as "auxiliary" units are such services as liaison, courier, ambulance, glider-towing, etc.

2) The consumption rate of a He.111 has been taken for the twin-engined types in these services (Ju.88, Do.217 and Me.110). The F1.156 rate has been used to cover the single-engined types (FW.58, W.34, etc.).

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(11)

SECRET

- 12 -

X-99721

Schedule VI - Experimental Units.

Experimental Units

300 tons.

A total of 300 tons has been assigned, as a rough approximation, for G.I.P. experimental units and stations (excluding those engaged on jet or rocket aircraft activity).

Schedule VIII - Second Line Units.

Type of operation	No. of daily sorties	Duration of sortie (hrs)	Consumption per a/c per hr. (gals).	Total daily consumption (gals).
A. Operational flights	130	1 1/4	74	11,990
B. Training and transfer	65	1/2	73	1,581
C. Rest and refitting	13	1/2	76	497

SUMMARY, Schedule VIII.

A. Operational flights	1200 tons
B. Training and transfer flights	150 tons
C. Rest and refitting flights	50 tons
Total, Second line units	<u>1400 tons</u>

- Notes: 1) The "second line" units comprise the special night ground attack units now operating on all fronts.
- 2) The consumption rate per aircraft is the weighted average of the individual aircraft types (Pv.190, Ju.87, Hs.129, Hs.123, Ju.88, Ju.188 etc.)

Schedule VIII - Miscellaneous.

Miscellaneous

900 tons.

The "miscellaneous" consumption figure is intended to cover those items of consumption which do not properly fit into any of the foregoing schedules. The total includes fuel consumption by aircraft in Luftlotte reserves, loss of fuel through evaporation, additional losses of fuel through total destruction of aircraft in crashes or by being shot up on the ground, and similar items.

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(12)

99721

U.S. Fuel Consumption for January 1943

Schedule II - Aircraft Consumption Rates

Fuel consumption rates for the various aircraft types have been calculated by the following procedure: (1) Basic rates of fuel consumption per hour at economical cruising speeds were obtained either from captured documents or R.A.F. Performance Cards; (2) to these figures has been added a percentage correction to adjust them to average consumption rates maintained under operational conditions. This adjustment makes allowance for higher rates of consumption during take off, climb, combat and the remainder of the operational flight. The correction to be applied in each case has been based on the operational experience of comparable R.A.F. and U.S.A.A.F. aircraft types. It will be noted that the highest correction (35%) has been made in the case of single-engine aircraft used in fighter, fighter-bomber or reconnaissance roles and the lowest correction (10% or 5%) in long-distance transport, coastal and reconnaissance flights which are generally flown at economical cruising speeds. A 25% allowance has also been made for training types, since the flights are of shorter duration and a relatively large proportion of the flying time is spent in the take off and in climbing.

The table below lists the aircraft types believed to be employed currently in the G.A.F., together with the adjusted consumption rate per hour and engine type.

Aircraft type	Cons. per hr. (gals.) econ. cruise	% correction added	Cons. per hr. (gals.) adjusted	Engine type
<u>S.E.P., G.A., Tac. R.</u>				
Mo.109	57	35	77	DB605
FW.190 (A, P, G)	56	35	76	BMW801
(D)	51	35	69	Jumo 213
Ju.87	42	35	56	Jumo 211
FW.189	43	35	58	AS 430
Ha.129	59	35	80	GRAND/05
<u>T.E.P.</u>				
Ju.88 (G-1)	107	25	133	BMW801
(G-6)	112	25	140	Jumo 213
Mo.110	103	25	129	DB605
He.219	72	25	90	DB603
Mo.130	72	25	90	DB603
<u>L.R.P., L.R.B.</u>				
Ju.88 (L)	128	10	141	Jumo 211
(R)	113	10	124	BMW801
Ju.188	126	10	138	Jumo 213
He.111	127	10	139	Jumo 211
He.177	226	10	249	DB 610
<u>Coastal.</u>				
BV.138	58	5	61	Jumo 205
Ar.196	17	5	18	BMW132
<u>Transport.</u>				
Ju.52	93	10	102	BMW132
Ju.252	91	10	100	Bromo 323
Ju.352	96	10	106	Bromo 323
Ju.90	148	10	163	BMW132
Ju.290	156	10	172	BMW801
FW.200	184	10	202	Bromo 323
<u>Auxiliary.</u>				
Fi.156	15	10	16	AS 10
Ju(F) 34	35	10	39	BMW132
FW.58	23	10	25	AS 10
Ha.126	46	10	51	Bromo 323
<u>Training.</u>				
Mo.108	26	35	35	AS 10
Hu.181	5	35	7	Hirth HM504
KL.35	5	35	7	Hirth HM504
Ar.95	19	35	26	AS 430
Ar.66	13	35	18	AS 10

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