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WAR DEPARTMENT

OFFICE OF THE CHIEF OF THE ARMY AIR FORCES

WASHINGTON

AWPD/1

MUNITIONS REQUIREMENTS OF THE ARMY AIR FORCES

Prepared August 12, 1941

TO BE RETURNED
TO THE ARCHIVES
OF THE AAF
HISTORICAL OFFICE
Aug 1941
145.81-1

SECRET

MEMORANDUM FOR THE CHIEF OF STAFF:

Subject: Munitions Requirements of the Army Air Forces for the defeat of our potential enemies.

1. Discussion

1. Directive. Pursuant to the instructions of the President in his July 9, 1941 letter to the Secretary of War (Tab A) and in consonance with ABC-1 and Rainbow 5 (Tab B), the estimated requirements in the major items of munitions and the total personnel necessary to accomplish the mission of the Army Air Forces (Tab c) are summarized below.

2. Objectives to be attacked. An air intelligence summary (Tabs 1 through 1-m) indicates that the systems of objectives vulnerable to air attack and vital to the continuance of the war effort of Germany are: (to weaken Germany)-inland transportation, petroleum industry, electric power, and the bombing of Berlin; (to restrict Axis air operations) German air force installations and the German aviation industry and, (to support the final offensive) those listed above and battlefield objectives. In addition to the foregoing objectives in Germany, the security of this hemisphere and a successful strategic defensive in all other theaters requires a considerable air effort. (Tabs 5, 6, 7, 9, and 10)

3. Selection of Targets. Tabs 2, 2-a, 2-b, 3 and 5 through 15 present the basis and computations whereby the aircraft by numbers and by types indicated below are necessary to destroy the objectives indicated above. Within each system of objectives the critical point is selected as the target. The destruction of three ship elevators, nine locks and two inland harbors, for example, will stop the movement of 25% of the freight now being handled in Germany. See Tabs for Detail.

4. Aircraft and Personnel Requirements. The manufacture of the necessary airplanes and the training of the required personnel will require the all out effort of the United States. Even with such an effort it appears impracticable (Tab 17) to manufacture the total necessary number of airplanes until 1944. However, as an expedient, it is possible to employ double combat crews on the shorter range and more easily procured airplanes in order to initiate operations in force in 1943. The following summary indicates the total requirements in airplanes and in personnel.

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(Note: The eventual strength and composition of the Army Air Forces required to accomplish the mission includes 4000 mile radius of action bombardment airplanes and is set up as the ultimate requirement below. In order to initiate operations at the earliest possible date, double combat crews are to be employed as an undesired expedient in shorter range heavy and medium bombardment airplanes in the European theatre. The initial strength and composition of the Air Forces is indicated as the interim expedient in the tabulation below.)

Aircraft Types	Initial Groups	INTERIM EXPEDIENT Total A/P	INTERIM EXPEDIENT M. Rep. Rate	ULTIMATE REQUIREMENT Total A/P	ULTIMATE REQUIREMENT M. Rep. Rate
M/Bomb B 26	10	1062	286	1062 *	143 *
H/Bomb B 17	47	3995	547	3995	319
H/Bomb B29	24	2040	546	2040	273
H/Bomb 4000 mi	44			3740	501
Dive & Light	16	2201	98	2201	98
Total Bomb	161	9298	1477	13038	1334
Pursuit	54	8775	576	8775	576
Observ & Photo	2	2043	121	2043	121
Transport	32	2560	102	2560	102
Training		37051		37051	
GRAND TOTAL	239	59727	2276	63467	2133

* These airplanes to be replaced by longer range airplanes at the earliest possible date.

Personnel	Interim Expedient	Ultimate Requirement
Officers	179,398	195,679
Enlisted Men	1,881,721	1,969,237
	2,061,119	2,164,916

5. Conclusion. a. The program summarized above is designed to make possible initiation of the final phase of operations (Tab B) by July 1943, with the final all out campaign to be completed within the six months period, April to September, 1944, but employs the expediency of double combat crews for bombers required for German offensive. (Tab 4)

B. If American industry can produce the airplanes and related equipment by the dates noted above, the training of essential personnel can be accomplished. If industry cannot meet these dates, the ultimate effort will be postponed proportionately. (See Tab 17 for production estimates.)

c. The importance of the long range bomber is emphasized as a result of this study. Of vital importance to the United States is the bombardment airplane with a radius of action of 4000 miles or greater. (See Tab 4-b)

d. It is mandatory that escort fighters be developed for test

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without delay. An escort fighter with a range comparable to the bomber it supports must be developed to insure day bombing missions in spite of opposition by the pursuit developments expected in the near future.

6. ~~Continuing Study Essential.~~ The estimates prepared as a result of this study will require refinement. It is not anticipated that such refinement will result in any appreciable change in total requirements.

11. Recommended Action
The Secretary of War directs:

1. That this paper is approved and represents the major munitions requirements of the Army Air Forces.

2. That this paper will be used as the War Department basis for coordinating the aviation requirements of the Army, the Navy and other agencies, (Mr. Hopkins) in connection with the data called for by the President in his letter dated July 9, 1941.

3. That the Chief of the Army Air Forces be directed to take all preliminary action necessary to insure the effective initiation of all Air Force activities relating to the programs as set forth in this paper (with such modification as may result from coordinating all aviation requirements) at the earliest practicable date after a decision has been received from the President that the expanded munitions production program will be implemented.

1 Incl.
"AWPD/1 Munitions Requirements
of The Army Air Forces."

[redacted]

MUNITIONS REQUIREMENTS
OF
THE ARMY AIR FORCES

FOR THE DEFEAT OF OUR POTENTIAL ENEMIES

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THE WHITE HOUSE
WASHINGTON

July 9, 1941

My dear Mr. Secretary:

I wish that you or appropriate representatives designated by you would join with the Secretary of War and his representatives in exploring at once the over-all production requirements required to defeat our potential enemies.

I realize that this report involves the making of appropriate assumptions as to our probable friends and enemies and to the conceivable theatres of operation which will be required.

I wish you would explore the munitions and mechanical equipment of all types which in your opinion would be required to exceed by an appropriate amount that available to our potential enemies. From your report we should be able to establish a munitions objective indicating the industrial capacity which this nation will require.

I am not suggesting a detailed report but one that, while general in scope, would cover the most critical items in our defense and which could then be related by the OPM into practical realities of production facilities. It seems to me we need to know now our program in its entirety, even though at a later date it may be amended.

I believe that the confidential report which I am asking you to make would be of great assistance, not only in the efficient utilization of our productive facilities, but would afford an adequate opportunity for planning for the greatly increased speed of delivery which our defense program requires.

I am asking Mr. Hopkins to join with you in these conferences. I would appreciate it if you could take the initiative in these conferences.

Very sincerely yours,

/s/ FRANKLIN D. ROOSEVELT.

The Honorable,

17 The Secretary of War.

[redacted]

[redacted]

- FINAL SUMMARY -

~~Aircraft Types~~	Total Airplanes (including ~~25% Reserve~~)	Monthly Replacement ~~Rate~~	Anticipated on Hand July 1, 1943 ~~Present Schedule (See Tab-17)~~
Bombardment			
(4000 mi. radius)	(3740) *	(501) *	
(H & M)	7097	1379	(7550
(Dive & L)	2201	98	(
Pursuit	8775	576	7700
Observation & Photo	2043	121	350
Transport	~~2560~~	~~102~~	~~1140~~
TOTAL COMBAT	22676	2276	16740
	(26416)*	( )*	
Training	~~37051~~		~~15100~~
	59727		31840***
	(63467)*		

* The eventual strength and composition of the Army Air Force required to accomplish the mission includes 4000 mile radius of action bombardment airplanes. Pending the manufacture of these airplanes in tactical quantities, double combat crews are to be employed in operations against Germany in the shorter range airplanes (heavy and medium bombardment) as an undesired expedient. The strength and composition of this interim expedient Air Force are indicated by the figures not in parenthesis.

** When sufficient numbers of 4000 mile radius of action bombardment airplanes are on hand, the replacement rate of heavy and medium bombardment types will be reduced almost 50%, the expedient necessity for double combat crew operation having been eliminated.

*** This total has been reduced from the figure 43320 airplanes on page 2 of Tab 17 by the losses estimated during the period until July 1, 1933.

[redacted]

OFFENSIVE VS GERMANY

HEM. DEFENSE

STRAT. DEF. IN ASIA

G.T. M&H BOMB TOTAL BOMBARDMENT BY TYPES

BOMB FOR AIR SUPPORT COMMANDS

BOMBARDMENT

Aircraft Type	Total Gps.	Total Sqdns	Combat Sqdns	Opn. Tn. Sqdns.	Hq. Sq.	Op. A/P	25% R in A/P	N.R. in A/P	Pertinent Tabs
M/B B-25,26 types	10	60	40	10	10	850	212	286	
H/B B-17, 24 types	20	120	80	20	20	1360	340	456	2
H/B B-29,32 types	24	144	96	24	24	1632	408	546	4
H/B 4000 Mi* radius of act.	(44)	(264)	(176)	(44)	(44)	(2992)	(748)	(501)	4
TOTALS	54	324	216	54	54	3842	960	1288	
H/B B-17,24 types	23	138	92	23	23	1564	391	46	6
H/B B-17,24 types	4	24	16	4	4	272	68	45	7
M/B	10	60	40	10	10	850	212	286	
H/B B-17,24 types	47	282	188	47	47	3196	799	547	
H/B B-29,32 types	24	144	96	24	24	1632	408	546	
H/B 4000 mi* radius of action	(44)	(264)	(176)	(44)	(44)	(2992)	(748)	(501)	
ALL TYPES	81	486	324	81	81	5678	1419	1379	
DIVE AND LIGHT BOMBERS									
L/B A-20	13	65	39	13	13	757	189	42	12
Dive Bombers	13	65	39	13	13	1004	251	56	12
TOTALS	26	130	78	26	26	1761	440	98	

* H/B 4000 mile radius of action not included in totals.

PURSUIT

	Aircraft Type	Total Gps	Total Sqdns	Combat Sqdns	Opn Tn Sqdns	Hq Sq	Op. A/P	25% R in A/P	M.R. A/P	in Pertinent Tabs
OFFENSIVE VS GERMANY	Inter. Day	21*	84	63	21	21	2205	551	334	8
	Inter. Night		21	21		-	525	131	80	
	TOTAL	21	105	84	21	21	2730	682	414	
HEMISPHERE DEFENSE	Inter. Day	31	124	93	31	31	3255	814	98	
	Inter. Night		31	31		-	775	194	23	9
	Fighter Long range	-	-	-	-	-	-	-	-	
	TOTAL	31	155	124	31	31	4030	1008	121	
RESERVE FOR GROUND FORCES	Inter. Day	-	-							11
	Inter. Night	-	-							
	Fighter Long Range	-	-							
	TOTAL	0	0	0			0			
STRATEGIC DEFENSE IN ASIA	Inter. Day	2	8	6	2	2	210	53	33	
	Inter. Night		2	2			50	12	8	10
	Fighter, Long Range	-	-				-	-	-	
	TOTAL	2	10	8	2	2	260	65	41	
TOTAL PURSUIT BY TYPES	Inter. Day	54	216	162	54	54	5670	1418	465	
	Inter. Night		54	54			1350	337	111	
	Fighter, Long Range	-	-				-	-	-	
	TOTAL	54	270	216	54	54	7020	1755	576	
G.T. PUR.	ALL TYPES	54	270	216	54	54	8775		576	

*Only 16 of these groups can be accommodated initially in England and Suez, 5 groups will be initially located in the Western Hemisphere.

TRAINING

Bombardment	2594 Op. A/P	
Transport	74	
Observation	445	
Primary Training	11115	15
Basic Training	11486	
Advanced Training 1 Engine	3853	
Advanced Training 2 Engine	7484	
TOTAL	37051	

PHOTO & OBSERVATION

Observation for Air Support Command

Aircraft Type	Total Gps	Total Sqdns	Combat Sqdns	Opn Tn Sqdns	Hq Sq	Op. A/P	25% R in A/P	M.R. in A/P	Pertinent Tabs
Observation		108	108			1521	380	98	
Photo	2	10	8		2	114	28	23	12
TOTAL	2	118	116		2	1635	408	121	12

TRANSPORT

Maintenance Command	13	65	52	0	13	832	208	25	13
Ground Troop Training	19	95	76	0	19	1216	304	77	12
TOTAL	32	160	128		32	2048	512	102	

TOWED GLIDERS

15 Man Gliders						2400	600	153	12

A-WPD/1 TAB D

CRITICAL ITEMS AND DATES REQUIRED

1. Inclosed herewith and marked Tab D-1 and Tab D-2 are "Air Corps Organizational Equipment" and "Planning Project - Ship Tonnage" respectively. These tabulate the requirement for:

All Air Corps Organizational equipment
Airplanes
Government furnished equipment
Bombsights
Cameras
Etc.

Tonnage
Initial shipment and sustaining shipments in gasoline, oil and other supplies for one year for all air units based outside the United States.

a. Tabs D-1 and D-2 have been provided the G-4 and War Plans Divisions of the General Staff and have been incorporated in their computations. See the notes on the Tabs for the basis of the computations.

2. The dates that this equipment and tonnage will be required depend directly upon the dates that the combat airplanes can be manufactured at the required monthly rates. The study is based on the initiation of operations in July 1943 with final all-out effort to be completed within the six month period, April to September, 1944. If industry cannot meet those dates, the ultimate effort will be postponed proportionately. (Paragraph 5, Conclusion, Basic Study).

3. The basic purpose of this study, A-WPD/1, is to comply with the July 9 directive from the President to the Secretary of War in order that the President would be "able to establish a munitions objective" which can then "be related by the O. P. M. into practical realities of production facilities". This study indicates that the War Department can meet all training and other requirements earlier than the O. P. M. could have the necessary tactical combat airplanes manufactured. As a basic statement, therefor, the combat airplanes should be manufactured at the earliest possible date and all other actions can be coordinated therewith.

4. As a general guide in computing the dates on which all supplies and tonnage will be required, the following data are extracted from the study:

a. ~~Combat Airplanes.~~

(1) The controlling basic date on which supplies, equipment, and tonnage will be required is the date on which the American aviation industry can begin to produce combat airplanes at the monthly replacements rates required. The critical items in this category are: (Par. 4, Basic Study)

~~Aircraft Types~~	Monthly Replacement Rate (MFG. capacity required)	~~Desired~~ Date
Medium Bombardment (B-25 or 26 type)	286	Nov. 1, 1943
Heavy Bombardment (B-17 or 24 type)	547	
Heavy Bombardment (B-29 type)	546	
TOTAL	1379	

(2) If this monthly production rate of combat airplanes cannot be met by November 1, 1943, the dates on which the training planes are required, indicated below, may be postponed accordingly.

(3) All equipment and all tonnage indicated in Tabs D-1 and D-2 will be required on the date on which this monthly production rate is accomplished.

(4) Prior to the date that this production rate is achieved, supplies and tonnage will be required in the general ratio that the current monthly output of combat type airplanes bears to the ~~required~~ monthly output of combat type airplanes.

b. Training Airplanes.

The numbers of training airplanes by type which must be procured (Page 1 of Tab D-1) and the dates on which these airplanes

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should be made available (See paragraph 4 a (1) and (2) above) are as follows:

Primary Training Airplanes	- 5127	- February 15, 1942
Basic Training Airplanes	- 5511	- May 1, 1942
Advanced Training (1 Engine)	- 99	- June 1, 1942
Advance Training (2 Engine)	- 4366	- July 15, 1942

[redacted]

TAB NO. 1

NATIONAL MISSION - AIR MISSION - SITUATION
~~POSSIBLE LINES OF ACTION.~~

1. National Mission: To defeat our potential enemies. (Letter from The President to the Secretary of War, July 9, 1941).

The broad strategic objective (object) is, in conjunction with Great Britain and her allies, to defeat Germany and her allies (ABC-1).

This plan is based upon the conception that Germany should be decisively defeated first, and that her allies, including Japan should be decisively dealt with after that aim has been reached.

2. Air Mission:

a. To wage a sustained air offensive against German military power, supplemented by air offensives against other regions under enemy control which contribute toward that power (ABC-1).

b. To support a final offensive, if it becomes necessary to invade the continent.

c. In addition, to conduct effective air operations in connection with Hemisphere Defense and a strategic defensive in the Far East.

3. Situation. The center of the Axis system is in Germany. Hence, that is where pressure must be applied ultimately. Italy has been relegated to a position of secondary importance.

The German offensive against Russia and the other German war operations have placed a considerable strain upon the economic structure of the Reich, and the Russian Campaign engaged a major portion of the German army and most of the German Air Force in Eastern Europe.

The declaration of war by Germany against Russia improved the conditions for enforcing the sea blockade and the means of applying pressure through economic warfare. Even in the event of Russian collapse, the German economic structure will continue to operate under heavy strain, and there will be a period of at least a year before Russian economy could be resusicated and incorporated into the German system.

The extent of the economic strain on Germany is indicated by the following: at present there are 6½ million men under arms in the German army, 100,000 in the German Navy, and 1½ million in the German Air Force. Behind this armed front, there are 8½ million men engaged in armaments works alone, about half of whom are working in steel industries. Nearly 17 million

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[redacted]

Destruction

men are directly engaged in this war, to the exclusion of all normal civil pursuits and production. Hence, there is a very heavy drain on the social and economic structure of the state. Description of that structure will virtually break down the capacity of the German nation to wage war. The basic conception on which this plan is based lies in the application of air power for the breakdown of the industrial and economic structure of Germany. This conception involves the selection of a system of objectives vital to continued German war effort, and to the means of livelihood of the German people, and tenaciously ~~concentrating all bombing~~ toward destruction of those objectives. The most effective manner of conducting such a decisive offensive is by destruction of precise objectives, at least initially. As German morale begins to crack, area bombing of civil concentrations may be effective.

It is improbable that a land invasion can be carried out against Germany proper within the next three years. If the air offensive is successful, a land offensive may not be necessary.

Our air bases in England and elsewhere must be made secure, primarily by ground forces, and the lines of communication by sea must also be made secure.

4. a. Possible Lines Of Action. Based on an analysis of military and economic factors, the following lines of action for an air offensive can be set up for consideration.

(1) ~~Lines of action whose accomplishment will accomplish the~~ air mission in Europe.

(a) Disruption of a major portion of the Electric Power System of Germany.

(b) Disruption of the German transportation system.

(c) Destruction of the German oil and Petroleum system.

(d) Undermining of German morale by air attack of civil concentrations.

(2) ~~Lines of action representing intermediate objectives, whose accomplishment may be essential to the accomplishment of the principal objectives listed above.~~

(a) Neutralization of the German Air Force
(1) By attack of its bases.
(2) By attack of aircraft factories (engine and airframe).
(3) By attack of aluminum and magnesium factories.

[redacted]

(3) ~~Lines of action representing diversion objectives, which may be forced upon us by the necessity for assisting in maintaining the security of bases.~~

(1) Attack of submarine bases.
(2) Attack of surface sea craft.
(3) Attack of "invasion" bases.

5. ~~Discussion of Possible Lines Of Action.~~

A. ~~Electric Power.~~ Nearly all industry, civil as well as military, finds its roots in electric power. The German electric power system, the second largest in the world, was greatly expanded for this war. Even so, it is operating at 50% greater rate than the British electric power system today. It is vital to the German war effort, and is highly important to civil life.

Following are some of the industries dependent upon electric power:

Aircraft manufacture
Aluminum production (which absorbs 10% of all public power)
Synthetic rubber production (a critical item. 2 plants provide nearly 1/2 production).
The textile industries (an important item in view of the shortage of wool and warm clothing in Germany).
All the armament industries, involving the production of guns, great quantities of shells, and tanks.
Shipbuilding industry
The automotive industry
Cold storage of food
Urban transportation.

The electric power industry is closely integrated into a "power grid". However, the careful selection of major power stations and switching stations and their destruction would make it possible to isolate the principal manufacturing and population centers from their sources of electric energy.

The targets involved are small, but readily distinguishable in daylight. They are susceptible to destruction by bombs, ~~but many hits are required.~~

They vary in distance from 400 to 1,000 miles from England.

They are precision targets. A typical plant covers an area about 500 ft. x 300 ft. The British estimate that about 17 hits in that area will guarantee destruction of the plant.

[redacted]

[redacted]

It is estimated that the destruction of about 50 power plants will reduce the total capacity to about 60% of the present total. However, by destroying selected switching stations this number might be reduced to about twenty, and the industrial power to key manufacturing centers be almost completely shut off. Eighty percent of electric power consumed in Germany is utilized by industry.

50 targets are set up for this task. See Chart 1, Targets.

b. Transportation. In anticipation of this war, Germany has deliberately dispersed critical industries as much as possible. However, this has made transportation even more vital than would normally be the case. The German Transportation system is carrying an extremely heavy load, divided about as follows:

Railroad	72%
Waterways	25%
Long haul truckage	3%

Railways

The German railways are working at capacity. They are dependent upon a highly complex system of marshalling yards. The great majority of railroad traffic enters or leaves the Ruhr, which is virtually the manufacturing center of the heavy industries. 70% of the steel industry is concentrated there.

It is estimated that about eight marshalling yards handle almost all of this traffic to the Ruhr. These marshalling yards are only about three hundred and fifty miles from England. They are area targets. The yards themselves are not particularly vulnerable to air attack. Traffic may be seriously delayed, but the damage to tracks is fairly easily repaired. Hence, they must be subjected to repeated attacks.

It is estimated that disruption of the marshalling yards of the Ruhr for 24 hours sets back the production of the Ruhr about two weeks. Considering the rail net as a whole, it is believed that repeated attacks upon fifteen marshalling yards would cause such traffic confusion as to break down the operating system. In addition, there are important railroad bridges across such major waterways as the Rhine, the Elbe, and the Oder. These bridges are difficult to replace, even with temporary structures. They represent rather small precision targets. Repeated attacks are necessary to prevent replacement with temporary structures.

A total of 30 targets are set up for the railroad transportation system.

[redacted]

Inland Waterways.

The German transportation system is vulnerable through the inland waterways because of 2 factors:-

a. The waterways carry 25% of the total freight transported in Germany.

b. The railroads are already taxed to capacity, and could not stand up under a 25% increase.

The vulnerability of the inland waterway system to air attack arises from the fact that the destruction of an estimated 14 targets would neutralize the effectiveness of the main east-west canal system of Germany. These 14 targets consist of 3 ship elevators, locks at 9 points, and the inland harbors at Mannheim and Duisburg. (See Sub-Tab 1a for map designating the 14 targets.)

The purposes of the German Inland Waterways are twofold:-

a. To relieve the railroads in time of national emergency of the slow, bulky freight such as coal, ore, agricultural products, etc., etc. (See sub-Tab 1b.)

b. To bring the Ruhr coal and Sigerland iron products to central and southeastern Germany (areas of the strategically relocated German industry - Hermann Goering Works, Volkswagan Plant, gasworks at Magdeburg-Rothensee) by a cheap water route.

The main continuous stretch known as the Central German Canal, starting with Duisburg on the Rhine and ending at Plauer near Berlin, is about 330 miles long. The canal has 54 locks and double locks, 3 ship elevators, (Sub-Tab 1b.1), 23 pumpworks, 29 water overflow facilities, 21 high water entries, 27 safety locks, 11 canal bridges, 454 tunnels underneath canals, 110 railway bridges, 6 highway bridges, 636 street bridges, 9 railway and street tunnels, and 8 pipe bridges.

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The locks and elevators of the Central German Canal and its branch canals are listed in Sub-Tab 1c, which gives their locations and utilizable lenghth and width.

In 1943 the Rhine-Main-Danube canal system will be completed. Broadly speaking; the purpose of this system is to connect the North and Black Seas by a continuous inland waterway. The completion of this system will increase the number of targets beyond those which have been selected on the existing system. Three targets have been set up for this increase.

The seasonal factor should be given careful consideration in any final plan of operations against the German inland waterway system, inasmuch as the canals are frozen over for a considerable period in the winter and traffic fluctuates widely at other seasons of the year; reaching a peak in late fall. The greatest effect would be secured by an attack on the canal system at the time of greatest traffic, i.e. in the late summer and fall seasons.

In addition to the effect upon war industry, crippling of the German transportation system would bring severe suffering to the German people by denying them the necessary coal for heating. The winters in Germany are cold and clothing is becoming scarce. Breakdown of the transportation system would interfere with the orderly distribution of foodstuffs and common utilities.

These locks and ship elevators are precision targets. They are easy to locate and vulnerable to destruction by bombing. Their destruction would have an immediate effect, and a relatively permanent one.

The importance of transportation is emphasized by the fact that 70% of steel production is in the Ruhr, and 2/3 of the iron ore for steel production must be transported into Germany from outside sources.

Summary of Transportation targets:

Railway			
Marshalling yards	15		
Bridges over the Rhine, Oder and other sensitive points	15		
	30		
Inland waterways			
Ship elevators	3		
Locks and harbor works	11	(existing)	
Targets	3	(new canal)	
Total	17		47

c. Petroleum and Synthetic Oil. German transportation, the German Air Force, the German Navy, and German industry all are dependent upon oil. The amount of oil in storage in Germany before the war is not known. The present German production and importation of oil and the production of synthetic oil and gasoline is believed to be capable of meeting current expenditures.

About 60% of aviation gasoline comes from synthetic production in Germany proper. Eighty per cent of this production comes from 27 plants. These plants vary from 400 to 1,000 miles from England. They are easily distinguishable in daylight, and they are susceptible to destruction by bombing. They are precision targets.

About 22% of the oil for aviation gasoline comes from Rumania. It is refined in Rumania and is moved primarily by water transportation up the Danube to Germany. Success in the oil venture might necessitate operating against the Danube to stop this flow. Hence, the importance of retaining bases in Asia Minor or Syria.

Russian oil, if procurable by Germany, must also move across the Black Sea by water transportation, which might be disrupted by air attack in this theater.

Synthetic oil plants resemble ordinary petroleum refineries, and both are vulnerable to destruction by bombing. They are large targets, easily distinguishable, and they are hard to replace. However, they should not be considered area targets. The most vital element of each plant should be determined and bombing should be concentrated against that point. Near missives and normal bombing distribution will contribute to destructive effect required.

Number of targets set up for this task: 27.

d. Morale. Timeliness of attack is most important in the conduct of air operations directly against civil morale. If the morale of the people is already low because of sustained suffering and deprivation and because the people are losing faith in the ability of the armed forces to win a favorable decision, then heavy and sustained bombing of cities may crash that morale entirely. However, if these conditions do not exist, then area bombing of cities may actually stiffen the resistance of the population, especially if the attacks are weak and sporadic.

Hence, no specific number of targets is set up for this task. Rather it is believed that the entire bombing effort might be applied toward this purpose when it becomes apparent that the proper psychological conditions exist.

INTERMEDIATE OBJECTIVES.

e. German Air Bases. One way to insure the feasibility of precision bombing attacks upon the Principal Objectives would be through the destruction of the German Fighter Forces. However, the Germans have been at great pains to provide adequate air bases for their forces. It is estimated that there are approximately 500 bases in Western Germany and the occupied territories. They are provided with exceptionally strong light " flak" defenses. Aircraft are dispersed, generally about a mile from the landing areas for the bombers, less for the fighters. Each airplane is provided with individual protection in the form of a revetment and concrete taxiways are provided. Quarters for personnel are scattered through neighboring villages. The whole system is carefully camouflages. Incidentally, the German air bases are far superior to the bases of the R.A.F., from the standpoint of security.

It seems improbable that the German Fighter Command can be neutralized by air attack of its bases. However, further analysis will be made.

f. Present and Projected Strength in Aircraft.

	7/31/41	Projected to 7/1/43
1. Estimated Plane Strength		
a. Operational Combat	5,847	9,250
b. Total in Air Fleets	11,835	18,900
c. Sum total of all types	36,320	57,705
2. Estimated Pilot Strength	48,500	69,500
3. Estimated total monthly losses	1,800	2,945

The above figures for 7/1/43 were arrived at by a continuation of curves representing past growth of productive capacity and losses. It is not believed that the figures estimated by this method are possible of attainment by Germany, due to various difficulties of production, notably a lack of skilled labor, various essential materials, transportation difficulties and other factors. Hence; the gain in German air force strength in planes between today and 7/1/43 as estimated

by extension of curves has been arbitrarily reduced by 50 percent, giving the estimate shown below:

Estimated Strength German Air Force, 7/1/43.

	Total Operational Combat Planes	Total in Air Fleet Planes
Bombers	3,567 (including 500 long range type)	7,245 (including 800 long range type)
Dive Bombers	1,007	2,075
Pursuit (1 E)	2,001	4,092
Fighters (2 E)	959	1,972
	7,534	15,384

It is estimated that of the bombers shown above, 500 of the Total Operational Combat and 800 of the Total in Air Fleet, will consist of long range types. (Over 1000 miles radius of action.)

It is estimated that the total number of airp;anes in the German Air Force, including transport, training types, army cooperation, and a depot reserved equal to 100% of Air Fleet airplanes will on 7/1/43 amount to approximately 45,000 planes. The achievement by Germany of this estimate is, of course, contingent upon the availability of all essential materials, skilled labor, and other elements of production necessary to complete the job.

g. German Aircraft Factories. The Germans have concealed most of their new factories, and have dispersed them. Also the manufacture of parts and assemblies has been widely decentralized. However, the older plants are still being used as assembly plants, and their location is well known. They are from 500 to 700 miles from England. They really represent area targets, or areas of precision targets. They are not so susceptible to bombing as had been anticipated, as factory bombingis apt to result in less damage than had been estimated. However, adequate forces of bombers should be capable of seriously reducing production, if used in quantity and for considerable periods of time. The number of targets presented can be readily determined, but is not immediately available. The effect of bombing aircraft factories would not be felt immediately, as it is estimated that the Germans had about 100% reserves in storage at the beginning of the Russian campaign. The eighteen principal assembly plants have been selected as targets.

[redacted]

Aluminum and Magnesium Plants. Aluminum plants are highly essential to aircraft production, and are concentrated into a small number of objectives. Aluminum production in Germany has been increased from 175,000 tons yearly in 1938 to about 300,000 tons at this time. This increase has taken the form of plant expansion of existing facilities, and six plants produce about 90% of the aluminum. These plants are located from 400 to 800 miles from England. They are precision targets requiring large destruction effort. The time factor would provide some delay in producing effective results, but sooner or later the effect would be catastrophic to the aircraft industry. Aluminum is now being used to replace fittings normally made of copper. This is the result of a critical shortage of copper.

Magnesium is equally concentrated, but the quantity of magnesium is appreciably less than that of aluminum required.

Six aluminum and six magnesium plants have been selected as targets.

DIVERSION OBJECTIVES.

h. Threats to the security of the British Isles may make it mandatory to employ bomber forces against submarine bases, invasion ports, and surface raiders. However, these targets represent a diversion from the true objective. It is believed best to avoid such commitments altogether, if possible, leaving this employment to the British bomber force, except in actual emergency.

6. Nature of Opposition to be Encountered.

The question: "is it feasible to make deep penetrations into German territory and conduct precision bombing without prohibitive losses" is vital to any consideration of a decisive air offensive in this war.

Following is a very general discussion of German air defenses:

Fighters: Up until the appearance of the British Sterling bomber and the American Flying Fortress, the German fighters have made daylight bomber operations excessively expensive. Interceptions are the rule, not the exception. The Germans are now known to be using a radio means of detecting and tracking aircraft. They also have a well organized system of ground observers.

[redacted]

[redacted]

The German fighters are armed with 20 mm cannon and .30 calibre machine guns. The Germans are producing a 15 mm machine gun with a high rate of fire.

It is difficult to analyze the disposition of the German fighter defenses. There appear to be wide gaps in the defenses. Practically all the defenses have been pushed far forward, leaving the interior of Germany practically undefended. However, it is probable that these defenses would be promptly reorganized if penetrations in daylight become more prevalent.

The German night fighter defenses are rapidly improving. One method of operation is in connection with a band of searchlights which is continuous from the Danish border for about 150 miles to the South. It is about 20 miles deep. Engagements with the night fighters is rapidly becoming the general rule. However, there appears to be a limit to the number of fighters which can operate by radio control in any sector. The Germans are using ME 110 and converted JU 88 fighters for this work, armed with cannon.

There appear to be few night fighters in the interior of Germany.

The British Sterling and American B-17 bombers provide a means, at least for the moment of coping with day fighters. The B-17's rely upon speed, altitude, and deception. However, they have been intercepted, and each time the ME 109's were capable of flying above them and of overtaking them. It is apparent that the B-17 will need defensive fire power.

At least one Sterling squadron seems to be solving the problem by fire power. It has lost two airplanes, and has shot down 22 German fighters. The Sterling has a 4-gun power turret in the tail and a 2-gun turret above and another in the nose.

In the penetration of good defenses, it is apparent that all means of protection must be used. Speed is highly important because it limits the number of attacks that may be encountered in a deep penetration and also limits the maneuver of the fighter for attack and the avenues of attack; altitude is highly important for the purpose of evading fighters, and also limiting their maneuver in combat; defensive fire power and armor are essential to stand off attacking fighters (the British are considering reducing their bomb loads by as much as 3,000 lbs. to get better armor and fire power); an escort defensive fighter to accompany bomber formations to close off the rear avenue may be necessary; and simultaneous penetration of defenses at many places in great numbers may offer tactical success. Reliance is still put on defensive formations, although the best size of such formations for large aircraft may be as little as three airplanes. Training of gunners is recognized as absolutely essential to deep penetration of defenses.

[redacted]

ARTILLERY DEFENSES

The German antiaircraft defenses are extremely good, and are still improving. They are widely scattered throughout Western Germany and the occupied countries, and are highly mobile. It is necessary for bombers to keep maneuvering to avoid being shot down, even at 18,000 feet. The Germans use radio predictions, and fire with amazing accuracy, even through an overcast.

It is believed that the effectiveness of antiaircraft fire would be reduced by increasing the number of aircraft making simultaneous approaches to the objective, so as to present simultaneously a maximum number of separate targets.

Consideration of all these factors leads to the conclusion, that by employing large numbers of aircraft with high speed, good defensive fire power, and high altitude, it is feasible to make deep penetrations into Germany in daylight.

It is believed that the degree of reliability of conducting sustained offensive air operations would be greatly enhanced by development of an escort fighter.

7. Support of a final offensive, if it becomes necessary to invade the continent.

a. Success in the air offensive against the objectives outlined above might cause a collapse of the German government. However, in the event that such an air offensive is not conclusive, it will be necessary to invade the continent. In any event, the threat of such an invasion must be emphasized.

b. The targets listed for the air offensive continue to be appropriate as bomber objectives in this final phase. In addition, targets of opportunity in the combat zone and on the battlefield proper will be revealed as the situation progresses.

c. At that time, all or a part of the bomber forces available can be thrown against such targets. It is not feasible to select such targets now.

8. SUMMARY

It is believed that the destruction of the following objectives will result in the maximum contribution of the air offensive toward defeat of our enemies in Europe.

1. Isolate principal industrial and population centers from their sources of electric power.

[redacted]

50 Targets - ~~Precision~~

2. Disrupt German system of transportation
   30 Rail targets
   17 Waterway Targets

3. Destroy the major sources of petroleum and synthetic oil
   27 Precision targets.

4. Conduct direct attacks against morales, after it begins to crack from other strain.

5. Neutralize the German Air Force by air attacks on

Assembly Plants	18 targets, precision
Aluminum Plants	6 targets, precision
Magnesium Plants	6 targets, precision

[redacted]

A-WPD/1 TAB NO. 2

ARMY AIR FORCE BOMBARDMENT OPERATIONS AGAINST GERMANY

1. THE ARMY AIR FORCE MISSIONS:

(Extracted from ABC-1 and Rainbow 5 and then condensed)

Beginning on M-Day and with increasing power until the final phase -

TO WEAKEN GERMANY,
TO RESTRICT AXIS AIR OPERATIONS,
TO SUPPORT FINAL OFFENSIVE (assault or occupation).

2. THE OBJECTIVES:

(From Tab No. 1) The available information on the German military and civil establishments leads to the conclusion that several systems of objectives are vital to the effectiveness of the German Air Force and the civil and military strength of the German nation. A study of the size of the Air Force necessary to destroy each of these systems of objectives leads to the conclusion that only certain of these objectives which are vital are also within the capabilities of an Army Air Force of the size that could be produced in the reasonably near future.

The systems of objectives, the destruction of which first will accomplish the mission and second are within the capabilities of an Air Force which we can develop, are:

Electric Power Inland Transportation The Petroleum Industry Bombing of Civil Population of Berlin	To Weaken Germany.
German Airplane Assembly Plants Aluminum Plants Magnesium Plants	To Restrict Axis Air Operations.
The Objectives listed above Military Targets in the Interior Battlefield Targets	To Support Final Offensive.

3. SIZE OF BOMBARDMENT COMPONENT OF AAF REQUIRED TO ACCOMPLISH THE MISSION:

More data and further study are necessary to afford a better analysis than is now available of the vital systems of objectives. More data is required on the specific location and detailed description of the vital points within these systems of objectives which would provide most profitable targets for air attack.

(Tab No. 2b outlines the basis for the calculations as to the size Army Air Force necessary to perform its mission and the detailed calculations with reference to specific systems of objectives are set forth in Tab No. 2c.)

SUMMARY:

The total bombardment force set up to accomplish the mission comprises 98 Bombardment Groups. Consideration of the availability of bases (Tab No. 4) and the resultant requirements for radii of action breaks this number of 98 Groups into types as indicated below:

10 Groups, M.B. (Similar to B-25 or B-26, or improved models)
20 Groups, H.B. (" " B-17 or B-24, " " ")
24 Groups, " (" " B-29 or B-32, " " ")
44 Groups, " (4,000 mile operational tactical radius of action)

98 Groups

4. INLAND WATERWAY TRANSPORTATION:

The transportation system of Germany is indispensable to the functioning of her military organization and national structure. The disintegration and failure of this system can be brought about by the neutralization of the inland waterway system and by simultaneous attack upon certain selected points in the railway system. The inland waterways carry 25% of the total freight transported in Germany and the railways could not stand up under this additional load if the inland waterways were destroyed.

It is estimated that the existing inland waterway establishment can be paralyzed by the destruction of 9 locks, 3 ship elevators and inland harbor facilities at Mannheim and Diusburg.

In 1943, a projected Rhine - Main - Danube Canal system may be completed. Additional data and further study may develop the necessity to destroy this Canal establishment also. If such proves to be the case, it may be necessary to approximately double the bombardment force set up herein to destroy the known existing inland waterway establishment. There are set up in this force, sufficient bombardment airplanes to take out three ship elevators or three locks in this canal system now under construction and about which little detailed information is available.

FORCE REQUIRED FOR DESTRUCTION OF INLAND WATERWAYS:

11 Groups of Bombardment (heavy or medium)

(For detailed description of the targets, see Tab 1; and for details as to the force required to destroy the targets, see paragraph 4, tab 2b.)

5. RAIL TRANSPORTATION:

The rail net of Germany would be unable to absorb the full freight load if the inland waterway establishment were destroyed. It is estimated that the destruction of about 15 marshalling yards and about 15 other sensitive points within the rail net, in conjunction with the attacks on the inland waterways, will cause the disintegration and failure of the transportation system of Germany.

FORCE REQUIRED FOR DESTRUCTION OF RAIL NET:

19 Groups Bombardment (heavy or medium)

(For detailed description of these targets, see Tab No. 1, and for details as to force required to destroy the targets, see paragraph 5, Tab 2b.)

NOTE: Attention is invited to the fact that the destruction of these targets calls for a large bombardment force. It is not to be inferred that this force or any other force cannot be used for other purposes. During major air operations, some of the vital elements of the

German Air Force and airplane manufacturing installations about which information is now very obscure will surely be uncovered. At that time, all or portions of this force can be diverted to attacks on the German Air Force.

6. THE PETROLEUM INDUSTRY:

27 synthetic oil plants concentrated in 3 areas in western and central Germany account for nearly 50% of Germany's supply of crude petroleum. The destruction of these establishments will not only very greatly reduce the gasoline available for the operation of the German military land and air machine, but will interfere with the production and supply of: carbon gas black (tires, ink and paints), alcohols (antiseptics, lacquers, essential oils), chemical solvents, naphthas, kerosene, furnace oil, diesel oil, waxes, heavy oils, (lubricating, emulsifying, transformer and flotation oils), asphalt, pitch, tar, sulphuric acid, synthetic plastics and synthetic rubber.

FORCE REQUIRED FOR DESTRUCTION OF PETROLEUM OBJECTIVES:

17 Groups of Bombardment (heavy or medium)

(For detailed description of these targets, see Tab No. 1, and for details as to the force required to destroy these targets, see paragraph 6, Tab 2b.

7. ELECTRIC POWER:

Although Germany's rail net is not electrified, some 80% of Germany's total production of electric power is consumed in industry. The destruction of approximately 50 electric generating stations in Germany would eliminate some 40% of Germany's total generating capacity. The denial to Germany of 40% of her electric generating capacity at the same time that the German petroleum industry and inland transportation establishment is seriously interfered with, will in all probability cause the collapse of the German military and civil establishment.

FORCE REQUIRED FOR DESTRUCTION OF ELECTRIC POWER OBJECTIVES:

32 Groups of Bombardment (heavy or medium)

(For details as to these targets, see pages 8 and 9, Tab 1. For details as to the size force required to destroy these targets, see paragraph 7, Tab 2b.)

8. BOMBING OF CIVIL POPULATION OF BERLIN:

Immediately after some very apparent results of air attacks on the material objectives listed above or immediately after some major set-back of the German ground forces, it may become highly profitable to deliver a large scale, all-out attack on the civil population of Berlin. In this event, any or all the bombardment forces may be diverted for this mission. No special bombardment force is set up for this purpose.

9. GERMAN AIR FORCE AND AIRPLANE MANUFACTURING ESTABLISHMENTS:

The German air establishment, military and civil, may include 3000 widely dispersed and carefully camouflaged manufacturing establishments. Similarly, the German Air Force is widely dispersed, well concealed and heavily defended. It is known, however, that there are 18 large airplane assembly plants, 6 large aluminum plants and 6 magnesium plants which are of great importance to the German airplane manufacturing establishment. Air units are set up to destroy these plants. As additional key establishments are located, it may be decided to divert other forces from their systems of objectives to the attack of aviation facilities or factories.

FORCE REQUIRED FOR DESTRUCTION OF KNOWN AIRPLANE MANUFACTURING ESTABLISHMENTS:

19 Groups of Bombardment (heavy or medium)

(For details as to these targets, see pages -- Tab 1, For details as to the size force required to destroy these targets, see paragraph 8, Tab 2b.)

10. MILITARY TARGETS IN THE ZONE OF THE INTERIOR AND BATTLEFIELD TARGETS IN SUPPORT OF THE FINAL OBJECTIVE:

When control of the sea has been obtained and an overwhelming air superiority has been achieved, the presence of large friendly ground forces and their offensive operations against Germany are expected. At that time, it is believed that a large portion of the bombardment force set up for operations against Germany will no longer be required for the specific missions indicated and will be properly diverted by the theatre commander to operations directly related to the success of the ground forces. For this reason, no bombardment forces is set up in this Tab for the specific purpose of supporting the final objective (except units in the Support Commands, see Tab 12).

A-WPD/1 TAB 2a

TABULATION OF BOMBARDMENT FORCE REQUIRED

1. ~~Total Bombardment~~ Airplanes ~~and Units~~ Required.

Type (1)	Group	Combat Sqs.	OTU Sqs.	Hq. Sqs	Total Planes	Initial 25% Reserve(3)	Monthly Attrition Rate (2) a	b
M/B B-26 Type	10	40	10	10	850	212	(143)	286
H/B B-24 "	20	80	20	20	1360	340	(228)	456
H/B B-32 "	24	96	24	24	1632	408	(273)	546
H/B 4000 Mile Radius Type	(44)	(176)	(44)	(44)	(2992)	(748)	(501)	-
Totals (Including 4000 mile airplanes)	(98)	(392)	(98)	(98)	(6834)	(1708)	(1145)	
Totals for initial ~~operations~~ (See Note 2 b	54	216	54	54	3842	960		1288

Notes: (1) Requirements in first three lines include those bombardment airplanes that can be based in British Isles and Suez area. Requirement on the fourth line is the difference between those required and those that can be based in British Isles and the Suez area. See Tab 4 for discussion.

(2) Current W.D. attrition rates (20% per month loss in airplanes by all units except operational training units were 3% prevails) are applied throughout.

a. Replacements required if the indicated numbers of 4000 mile radius of action airplanes are available (probably 1944 or later).

b. ~~Replacements actually required~~ until the indicated numbers of 4000 mile radius of action airplanes are available. All shorter radius of action airplanes in operation against Germany must be operated by double combat crews until that date. (See par 7 ± (4) page 9, Tab 4 for discussion) Single combat crew operation may be resumed when the 4000 mile airplanes are available.

(3) Initial 25% Reserve on basis of total planes.

2. Airplanes Required by Types of Missions. (Note 1)

Type of Objective	No. of Targets	Groups	Planes in Hq & Combat Sqdns	Planes in OTU Sqdns	Total Planes
Inland Waterway Transportation	17	11	627	143	770
Rail Transportation	30	19	1083	247	1330
The Petroleum Industry	27	17	969	221	1190
Electric Power	50	32	1824	416	2240
German Air Force and Airplane Manufacturing Establishment	30	19	1083	247	1330
	154	98	5586 (2)	1274 (3)	6860 (4)

Notes: (1) The numbers of airplanes computed herein are based on the total requirement to accomplish the mission. The lack of adequate air bases and the difficulty of manufacturing airplanes of sufficient radius of action (4000 miles) forces the expediency of employing double combat crews on shorterradius of action airplanes. (See Note 2 b, Par 1 of this Tab)

(2) The number of planes considered for combat missions.

(3) These planes not considered as performing combat missions.

(4) Difference between this total and that appearing in paragraph 1 due to factors pertaining to airdromes and difference between number of planes in medium and heavy bombardment squadrons.

A-WPD/1 TAB NO. 2b

BASIS FOR CALCULATION OF FORCE REQUIRED TO DESTROY TARGETS

1. BASIS:

The only sound method of forecasting the capabilities of a force in accomplishing a particular mission is to take past records and apply such additional factors as may be available. The application of the theory of probabilities and the Law of Errors in the determination of the bombardment force required to accomplish a given result is the best basis that can be applied.

Only a smattering of facts are available as the basis on which to answer the question, "How many bombardment airplanes should we employ in two or three years hence to penetrate the resistance which may be interposed against us at that time to reach and to find those objectives and to be practically sure that the necessary number of the proper sized bombs hit their targets and that the mission will be accomplished?" Among these facts are the following: The British bombing range standard of bombardiers accuracy is known; As a result of 15 attacks on one target, it can be deduced that the probable British bombing range error is 2½ times greater in actual operations when confronted by antiaircraft artillery, hostile pursuit, day and night conditions, favorable and unfavorable weather, some camouflage and some concealment; Precise data as to the American bombardier's current bombing range errors are known. The computations which follow are, therefore, based on increasing the American bombing range probable error by 2½ times (as was the case with the British in the only instance on which data is available) when the American bombardier moves from the bombing range into actual combat operations.

2. THE CURRENT AMERICAN BOMBARDIERS BOMBING RANGE PROBABLE ERRORS:

The probable errors considered as a basis for calculations are those obtained from ~~June through December 1940,~~ throughout the bombardment units. These probable errors are slightly larger than those of which must be met by student bombardiers before they are

graduated as 3d Class Bombardiers. These probable errors are considerably greater than those obtained by the Air Forces in previous years. More emphasis on training will reduce them considerably. However, these errors are sound data on the current American bombardier's accuracy and they must be accepted as a basis for calculation.

3. PROCEDURE IN CALCULATING THE FORCE:

a. ~~Assumptions:~~ Bombing ~~altitude~~ - 20,000 feet.

Current American Errors (Rep - 220 feet. 560
(Dep - 275 feet. 700

Assumed Average Size of Target: 100 ft. x 100 ft.

b. ~~Determination of Single Shot Probability:~~

50 ft / 220 ft Rep = .1230 Probability of hitting in Range
50 ft / 275 ft Dep = .0966 Probability of hitting in Direction
SSP in direction and range = .012

c. 90% ~~Probability of Hitting with one bomb:~~

Note: Assumption - one hit of proper size bomb on target should effect its destruction. The majority of targets will be susceptible of destruction by bombs of the smaller sizes (1000#, 500#). One hit of such size bomb indicates a high probability of other hits from remaining bombs released from plane simultaneously. Hence, for purpose of calculation, one bomb equals one airplane as a conservative basis for calculating force.

SSP of .012 results in a requirement of 220 bombs (planes) to secure one hit.

Result: To secure one hit against target of selected size -

220 airplanes (bombers) are required.

17

[redacted]

d. ~~Organization:~~

One bombardment group consists of 5 squadrons, one for operational training and one headquarters squadron. Each squadron consists of 13 airplanes of which 9 are employed on a combat mission.

Airplanes in Group:

Group Headquarters -	3	
Four Combat Sqdns -	52	- 36 used on combat missions
One Operational Sqdn	13	
	68	

36 planes considered used on one group mission.

e. 220 plane missions equals 6 group missions for one target per current (3d class) bombardier accuracy in peace time.

f. War time errors assumed to be 2.25 times those of peace time. The force required in war time is thus 2.25 squared or 5 times that for peace time bombing.

g. War Time Group Missions:

6 Group missions in peace x 5 - 30 Group missions required to secure destruction of one target in war. (Note: To get one hit, 30 Group missions are required. With normal bomb loadings, 30 Group missions release 1080 2000 lb bombs, 2160 1100 lb bombs or 4320 600 lb bombs.)

h. ~~Period of time devoted to destruction of each of the several classes of targets selected:~~

As a general statement, weather which favors continuous bombardment operations (See Tab 18) will be found over Germany only during the six summer months. As a result all computations are based on surely smashing each target one time during a six month operating period and prohibiting repair by an occasional attack in much smaller force.

4. INLAND WATERWAY TRANSPORTATION:

a. 14 vital points in existing canal system.
3 vital points in proposed Rhein Main Danube System.
17 vital points in inland waterway transportation system.

b. 17 targets to be hit during 6 month operating period.
17 targets x 30 group missions per target = 510 Group missions.

c. 510 Group missions ÷ 8 missions per Group per month = 64 Groups months.

d. 64 Group months ÷ 6 months (Operating period) = 11 Groups ~~required for 6 months of operation.~~

e. 11 Groups x 70 planes per Group = 770 tactical operating airplanes.

11 Headquarters and Hq. Squadrons	=	55 planes
11 Operational Training Squadrons	=	143 planes
44 Combat Squadrons	=	572 planes
		770 planes

5. RAIL TRANSPORTATION:

a. 15 marshalling yards.
15 other sensitive points within the rail net.

30 vital points in the rail transportation system.

b. 30 targets to be hit during 6 months of operation.
30 targets x 30 Group missions per target = 900 Group missions.

c. 900 Group missions ÷ 8 missions per Group per month = 113 Group months.

d. 113 Group months ÷ 6 months (operating period) = 19 Groups ~~required for 6 months.~~

e. 19 Groups x 70 airplanes per Group = 1330 operating airplanes.

19 Headquarters and Hq. Squadrons	=	95 airplanes
19 Operational Training Squadrons	=	247 airplanes
76 Combat Squadrons	=	988 airplanes
		1330 airplanes

6. THE PETROLEUM INDUSTRY:

a. 27 synethetic oil refineries comprise the vital points in the petroleum industry.

b. 27 targets x 30 Group missions per target = 810 Group missions.

c. 810 Group missions ÷ 8 missions per Group per month = 101 Group months.

d. 101 Group months ÷ 6 months (operating period) = 17 Groups required for 6 months.

e. 17 Groups x 70 airplanes per Group = 1190 airplanes

17 Headquarters and Hq. Squadrons	=	85 airplanes
17 Operational Training Squadrons	=	221 airplanes
68 Combat Squadrons	=	884 airplanes
		1190 airplanes

7. ELECTRIC POWER:

a. 50 electric generating stations represent the vital points in the electric power establishment.

b. 50 targets x 30 Group missions per target = 1500 Group Missions.

c. 1500 Group missions ÷ 8 missions per Group per month = 188 Group months.

d. 188 Group months ÷ 6 months (operating period) = 32 Groups required for 6 months.

e. 32 Groups x 70 airplanes = 2240 Airplanes.

32 Headquarters and Hq. Squadrons	=	160 airplanes
32 Operational Training Squadrons	=	416 airplanes
128 Combat Squadrons	=	1664 airplanes
		2240 airplanes

8. GERMAN AIR FORCE AND AIRPLANE MANUFACTURING ESTABLISHMENT:

a. 18 assembly plants.
6 aluminum factories.
6 magnesium factories.
30 vital points in German airplane manufacturing establishment.

b. 30 targets x 30 Group missions per target = 900 Group missions.

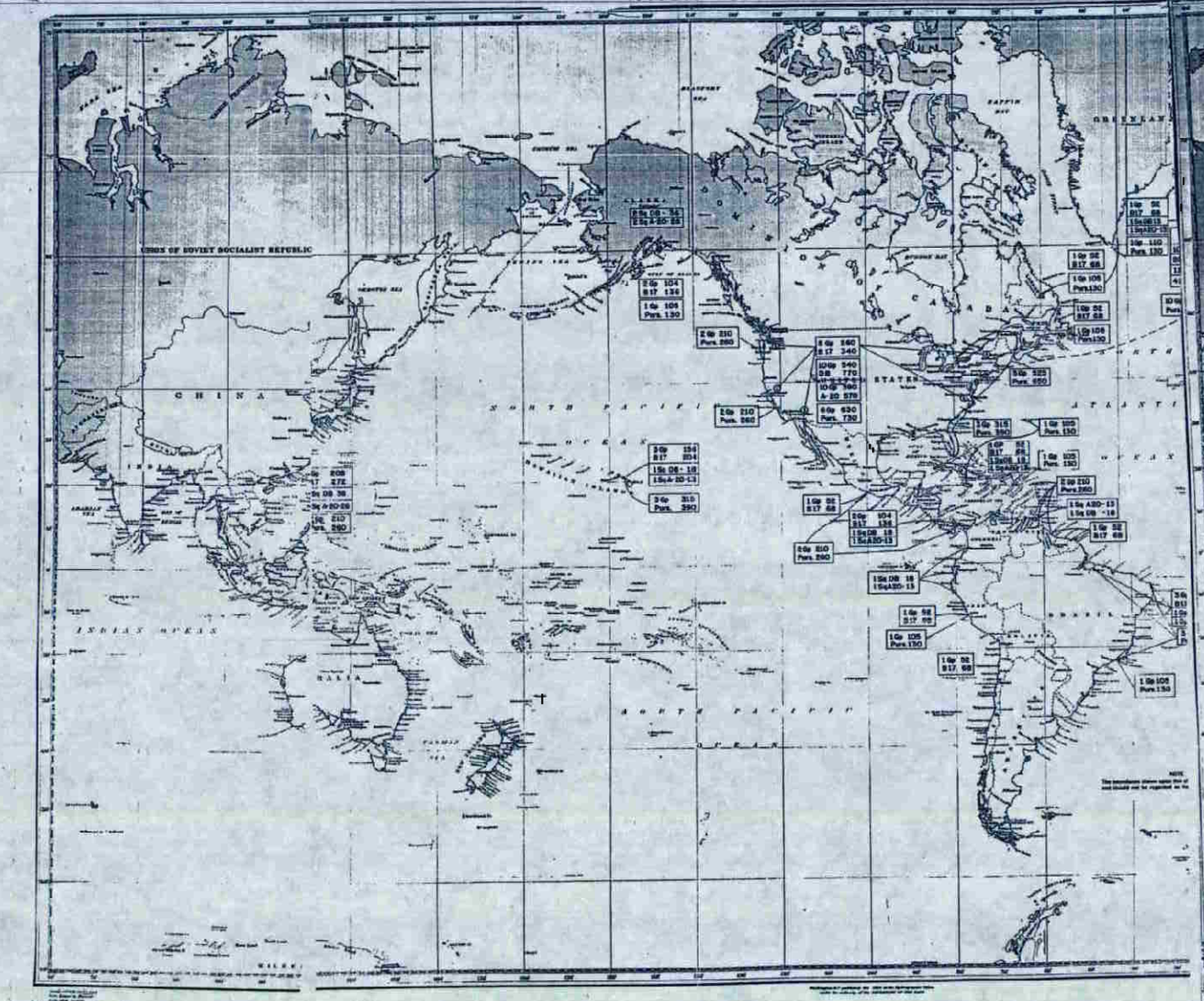
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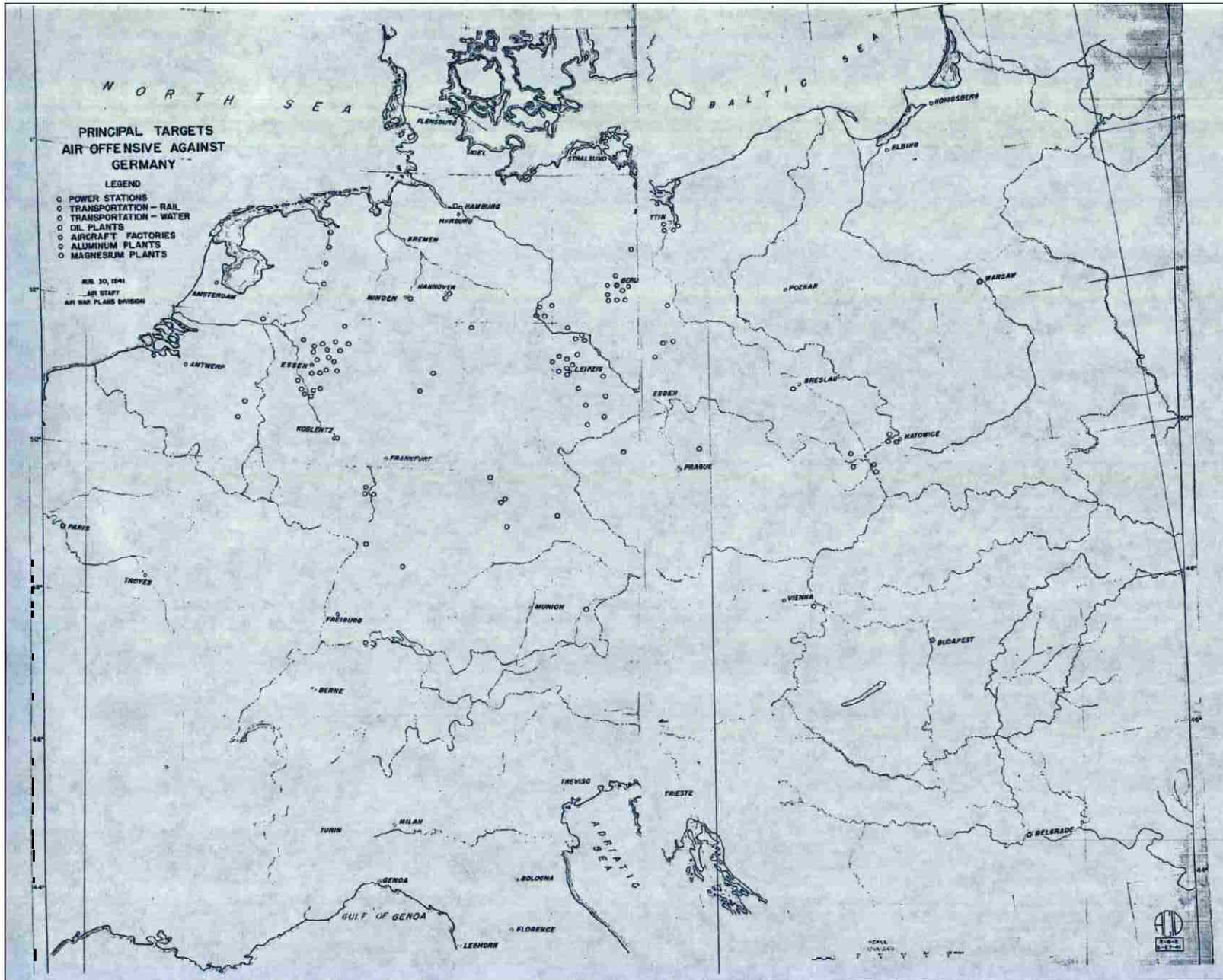
ITION OF COMBAT AIR UNITS - AWPD

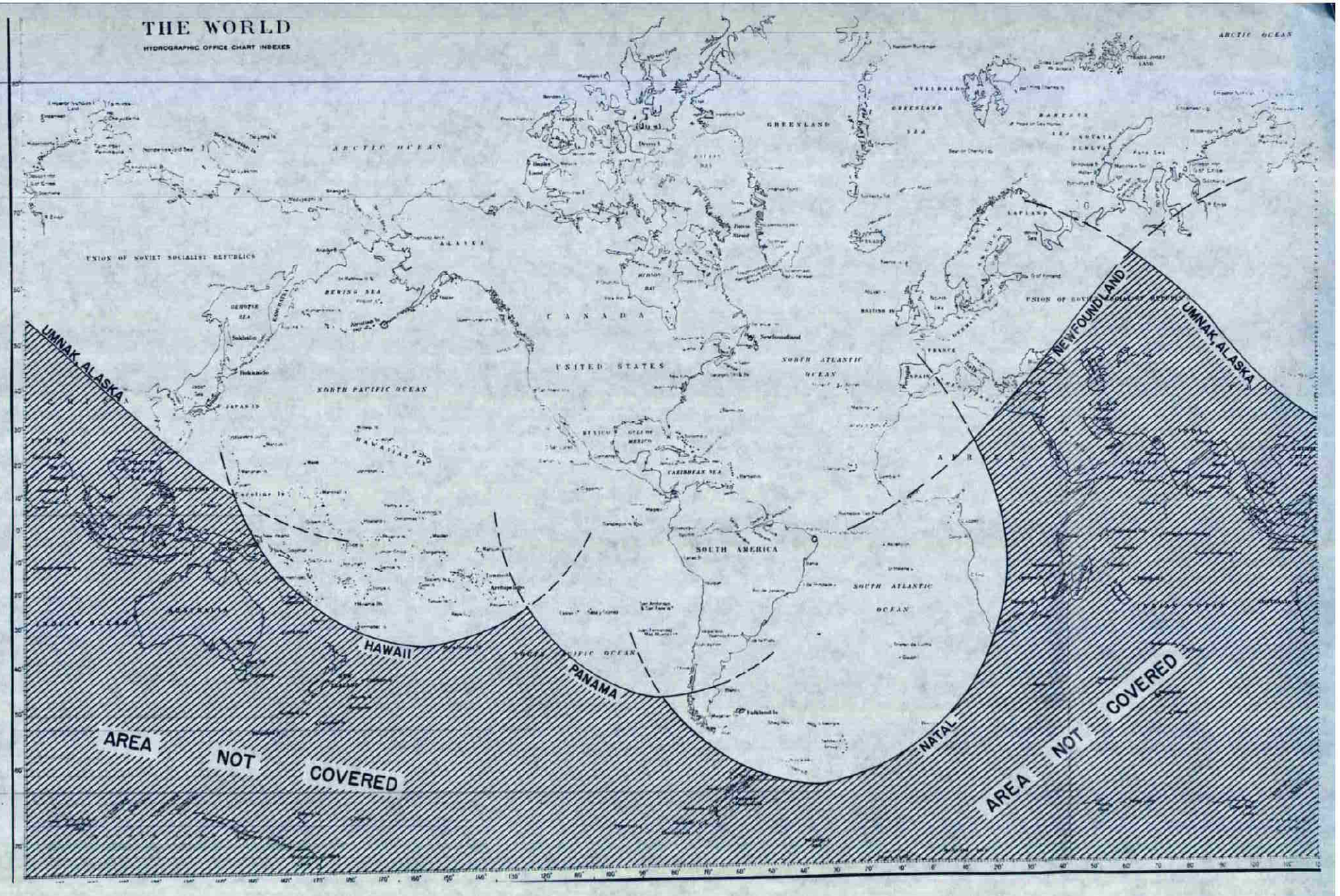


THE AIR STAFF - AWPD



THE AIR STAFF - AWPD


PRINCIPAL TARGETS
AIR OFFENSIVE AGAINST
GERMANY
LEGEND
POWER STATIONS
TRANSPORTATION – RAIL
TRANSPORTATION – WATER
OIL PLANTS
AIRCRAFT FACTORIES
ALUMINUM PLANTS
MAGNESIUM PLANTS
AUG. 30, 1941
AIR STAFF
AIR WAR PLANS DIVISION
NORTH SEA
BALTIC SEA
FLENSBURG
KIEL
STRAIT OF
HAMBURG
HARBURG
BREMEN
AMSTERDAM
MINDEN
HANNOVER
ANTWERP
ESSEN
LEIPZIG
KOBLENTZ
FRANKFURT
PARIS
TROYES
FREIBURG
MUNICH
BERNE
TREVISO
TRIESTE
MILAN
TURIN
GENOA
BOLOGNA
FLORENCE
LEGHORN
GULF OF GENOA
ADRIATIC SEA
KONIGSBERG
ELBING
WARSAW
POZNAN
BRESLAU
KATOWICE
PRAGUE
VIENNA
BUDAPEST
BELGRADE


THE WORLD
HYDROGRAPHIC OFFICE CHART INDEXES
ARCTIC OCEAN
GREENLAND
UNION OF SOVIET SOCIALIST REPUBLICS
ALASKA
BERING SEA
CANADA
UNITED STATES
NORTH PACIFIC OCEAN
NORTH ATLANTIC OCEAN
JAPAN
HAWAIIAN IS.
CARIBBEAN SEA
SOUTH AMERICA
SOUTH ATLANTIC OCEAN
AUSTRALIA
INDIAN OCEAN
UMNAK, ALASKA
HAWAII
PANAMA
NATAL
NEWFOUNDLAND
UMNAK, ALASKA
AREA NOT COVERED
AREA NOT COVERED

[redacted]

TAB 3.

ESCORT FIGHTERS

1. ~~Principal Function of Escort Fighters.~~

As the name implies, the functions of this class of aviation is the escort or close support of other classes of aviation. The escort fighter hence affords protection against the efforts of hostile pursuit and fighter aircraft to destroy the escorted formation or to prevent the accomplishment of its mission.

2. ~~Necessity for This Class of Aviation.~~

a. ~~Consideration of Bombardment Aviation.~~

(1) The effectiveness of an Air Force in contributing to the defeat of an enemy is measured by the efficiency of the Bombardment component in destroying vital enemy objectives. Day bombing, in which the target may be most readily seen, will result in the highest bombing accuracy.

(2) The German Air Force began daylight attacks against England. The efficiency of the British Air Defense system and the technical superiority of the British pursuit airplanes, well armored and mounting eight machine guns, overwhelmed the German bombardment airplanes which carried few guns of weak calibre and which were indifferently armed. Thus the German bombers met the British pursuit on unequal terms. Support by German single seater fighters failed to protect the bombers. The former had to abandon the German bombardment formation when combat took place.

(3) It is clear that the technical superiority of the British fighter airplane over the German bomber was the principle reason for the heavy losses of German airplanes, airplanes which accounted for practical abandonment of Nazi daylight attacks. The United States is endeavoring to overcome in its bombardment airplanes that technical deficiency present in the German bombers, by increased gun power in larger calibre machine guns and in cannon; in power operated turrets; in adequate armor plate protection for the combat crew and vital parts of the airplane.

(4) It has not yet been demonstrated that the technical improvements to the bombardment airplane are or can be sufficient to overcome the pursuit airplane, permitting day operations in the face of strong pursuit opposition.

[redacted]

It is hoped that the defensive measures in technical improvements will insure this. It is anticipated that the interceptor airplane and the effectiveness of its fire will be further improved and it is not impossible that the present relative superiority of the interceptor over the bomber may be maintained.

(5) The importance of day attacks is recognized in seeing hits against vital targets. It is unwise to neglect development of escort fighters designed to enable bombardment formations to fight through to the objective.

3. ~~Characteristics of the Escort Fighters.~~

This airplane must have the radius of action of the bombardment planes it supports. Slightly higher speed is essential to permit it to move from one position to another with respect to the bombardment formation. It must carry the maximum number possible of machine guns and cannon. Of the greatest importance, each member of the crew must be adequately protected by armor. The Escort Fighter must be designed to fulfill one role; defense against hostile pursuit.

4. ~~Tactics of the Escort Fighter~~.

The escort fighter would initially take positions on the flanks and rear of the bombardment formation. When combat was formed, these planes would be maneuvered to positions where the maximum hostile pursuit attack was developing. In substance, the escort fighters would be so disposed that hostile pursuit could not attack the bombardment formation with impunity, without first passing through the fire of the serial fighters, or without first disposing of them.

5. ~~Strength of the Escort Fighter Component~~.

The number of escort fighters would depend primarily upon the technical efficiency of the airplane in armament and armor. It is believed that the ~~maximum~~ number of these airplanes would be on the proportion of an escort squadron per bombardment group. These fighters will be required only when the enemy had developed an efficient air warning system. And the required number of fighters would, in the final calculations, be much less than on the ratio of an escort squadron to a bombardment group. The decision would depend upon the technical development and test.

6. ~~Recommendation.~~

a. That the possible need for the escort fighter, designed solely for defense purposes, be recognized.

b. That the Army Air Forces establish military characteristics and specifications for this type of airplane immediately.

c. That upon approval of b. above, thirteen (13) escort fighters be built by which tests of the efficiency of this weapon may be determined through the organization of an Escort Fighter Squadron.

d. That if the need for this weapon is determined our industry must be further expanded to construct these airplanes or reduction in the production of other types be made so that adequate escort fighters can be constructed.

[redacted]

TAB NO. 4a

AIRDROMES AVAILABLE
IN GREAT BRITAIN AND SUEZ AREA

1. ~~Data on British Expansion Program in England:~~

Basis - Cablegram August 1, 1941. AG 381 (8-1-40) MC No. 74 from London to The Adjutant General.

a. Ultimate RAF Expansion Program.

No. of Sqdns.	Type	Planes Per Sqdn.	Estimated Total Initial Equipment
40	Fighters, L/R	16	640
104	Fighters, S/R	16	1,664
279	Bombers	16	4,464
6	Torpedo Bombers	20	120
13	General Reconnaissance Boats	9	117
~~16~~	General Reconnaissance Land	20	320
458			7,325

b. Total Airdromes - 465 plus 23 in Erie.

Fighter Command	-	144
Coastal Command	-	44
Army Cooperative Command	-	19
Bomber Command	-	170

Total First Line Airdromes	377
Operational Training Airdromes	88
Erie (suitable for fighters and bombers)	5
(suitable for light bombers and army cooperative aviation)	4
(potential sites)	14
Total available and potential	488

NOTES: (1) Projected airdromes can be increased very little.
(2) Airdromes considered to be large enough to accommodate two squadrons.

[redacted]

2. Airdromes required for British Expansion Program and remainder ~~estimated available for American Units.~~

British Requirements	Estimated Available Airdromes(2)	Req. for British	Available for U. S.
144 Fighter Squadrons	144	72	72
279 Bomber Squadrons	170	139	31
Operational Training Airdromes	88	78 (1)	10
Airdromes projected in Eire	23	4 (4)	19 (3)
Coastal Command	44	44	-
Army Cooperative Command	19	19	-
	488	356	132

NOTES: (1) Based on British transferring 10 operational units to Canada.
(2) Army Cooperative and Coastal Command airdromes not considered for American use due to lack of more definite information.
(3) 19 out of 23 potential airdromes considered suitable for American Units.
(4) Suitable only for light bombers or army cooperative aviation.

3. U. S. air units that can be based in British Isles predicated upon ~~above data.~~

a. Ratio of 1 fighter airplane to 2 bombardment airplanes (Basis - British ratio of 2304 fighter airplanes to 4464 bomber airplanes.)

b. (132 airdromes can accommodate 264 squadrons)

Type	Gps	Combat ~~Sqdns~~	Combat ~~Airplanes~~	OTU ~~Sqdns~~	OTU A/P	Total A/P	Air- ~~dromes~~	Total A/P ~~Per Group~~
M/B B25-26 Types	10	40	690	10	160	850	25	85
H/B B17-24 Types	20	80	1100	20	260	1360	50	68
H/B B29-32 Types	12	48	660	12	156	816	30	68
(TOTALS)	42	168	2450	42	576	3026	105	
Pursuit	10	40	1050	10	250	1300	25	130
GRAND TOTAL	52	208	3500	52	826	4326	130	

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NOTES: (1) Gp Hq planes based with a combat squadron and included in combat airplane totals.

(2) Models selected on division of the British Isles in three general base areas:

Southern Area for B-25 and 26 planes
Central Area for B-17 and 24 planes
Northern Area for B-29 and 32 planes

4. U. S. Air Units that can be based in the Suez Area.

(Basis: Report of Intelligence Division, OCAC, 8/7/41, subject: "British Controlled Airfields in Africa and the Near East within 2000 miles of Berlin and believed suitable for bomber operations". Copy filed with AAF files.)

a. The number of airdromes is extremely small, when the size of the area is considered. Unquestionably, a large number can be constructed from the standpoint of available area. However, other considerations will introduce limiting factors, among which are:

(1) Availability of construction materials and difficulty in shipping them to this area from the United States or elsewhere.

(2) Difficulties in the supply and maintenance of large numbers of squadrons so far removed from base of supply.

Action has been taken to secure additional data upon which a refinement of the estimate as to airdromes in the Near East may be made.

b.

Location of Bases	Airdromes
Anglo-Egyptian Sudan	1
Cyprus	2
Egypt	7
Iran	3
Iraq	12
Palestine	3
Syria	4
Transjordan	7
Total Airdromes	39

NOTES: (1) Assumed that British will make these airdromes available.
(2) The ratio of pursuit to bombardment airplanes of 1 to 2 maintained in this area.
(3) Improvements where essential to be made.

c. (39 airdromes will accommodate 78 squadrons)

Type	~~Gps~~	~~Combat Sqdns~~	Combat A/P	OTU Sqdns	OTU ~~A/P~~	Total A/P	Air dromes	Total A/P ~~Per Group~~
H/B B-29 & B-32 type	12	48	660	12	156	816	30	68
Pursuit	6	24	630	6	150	780	9 *	130
	18	72	1290	18	306	1596	39	

* It will be assumed that these 9 airdromes can be expanded to accommodate 24 rather than 18 squadrons or that an additional 3 airdromes to accommodate 6 squadrons can be constructed.

d. Summary of U. S. planes that can be based in British Isles from standpoint of operating bases:

	Total Bombers	Combat Bombers	OTU Bombers	Tot. Pur.	Combat Pur.	OTU Pur.	Airdromes
British Isles	3026	2450	576	1300	1050	250	130
Suez Area	~~816~~	660	156	780	630	150	45
	3842	3110	732	2080	1680	400	175

5. ~~Informative Summary of British and American Aircraft.~~

		Bombers	Pursuit
British Isles	British	4464	2304
	American	3026	1300
Suez Area	British	?	?
	American	~~816~~	780
		8306	4384

6. ~~American Requirements in Bombers predicated upon operation areas.~~

Estimated Requirement		6860 (not including 25% reserve or monthly attrition
Bombers for which airdromes are available		
Medium Bombers based in G. B.	850	
B-17 type bombers " " "	1360	
B-29 " " " " "	816	
B-29 " " " " Suez Area	816	
Total U. S. Bombers		3842
Bombers estimated as required for which airdromes are apparently not available.		3018

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7. Problem in securing bases for 3018 Bombardment airplanes for which no bases appear to be available.

a. Requirements in airdromes.

The above paragraph indicates that bases for 3018 bombers are not available. With 13 planes per squadron, 2 squadrons per airdrom, an additional 117 two-squadron airdromes, within a radius of 2000 miles of the vital German industrial areas, are required.

b. The problem.

Either these airdromes must be constructed or airplanes of a greater radius of action than the B-29 or B-32 must be constructed in order to increase the availability of airdromes.

c. First solution.

Construct 117 airdromes in the British Isles, the Suez Area, Iceland, or Russia. The number of air bases projected for the British Isles cannot be increased by any appreciable amount. From the standpoint of area, it is possible to construct a large number of bases in the Suez Area. Practical difficulties, such as the supply of bases, available water, availability of material for the construction will probably limit the number of bases that can be built in that area. Further investigation is being made. Use of Russian bases will depend upon future situations that cannot be predicted.

d. Second solution.

Use double combat crews for airplanes that can be based in British Isles and Near East, to perform 16 instead of 8 missions per month. Estimate in airplane requirements based on a bombardment force of 6860 airplanes of which the 5544 operating airplanes perform 8 missions per month for six months (less approximately 25% of the latter which are held out for maintenance). Of the force of 3842 airplanes that can be provided airdromes, 3110 are operating airplanes. On the assumption that the 3110 operating airplanes (less approximately 25% of the latter which will be undergoing maintenance on the ground) employ the double operating rate, the result in theory will provide for approximately 9% more missions than would be possible with the 8 mission rate per month with the 5544 bombers.

(1) The advantages are:

(a) Maximum use would be made of the equipment.

(b) The initial production problem in aircraft would be lessened. However, the attrition rate would be increased from 20% to 40% and a higher production program would be required to maintain 3842, than to maintain 6820 aircraft.

(2) The disadvantages are that:

(a) The weather may not permit 16 operations per month.

(b) War time maintenance would be doubled in using 3110 airplanes to do the missions of 5544. Hostile bombings of airdromes, the necessity of night maintenance under field conditions, supply difficulties with aircraft so far from the source of supply will tend to cut down the 16 missions per month. Increased maintenance personnel would be needed. The units would be operating on a narrow margin of safety in endeavoring to maintain the airplanes for double missions.

(c) With a force of 5544 bombers performing eight missions per month, a reserve of force is present. At a critical period, where the breakdown of a particular enemy industry was indicated, the whole force performing for a short period missions at a heavier rate than on the basis of eight missions per month, could double the bombing effect that would be possible with 3110 airplanes. Thus 6860 airplanes with a total of 5544 operating airplanes provide, in part, a reserve for a major effect at a critical time. This reserve is lost by depending on a force of 3482 airplanes of which 3110 are operating airplanes which must perform sixteen missions per month--a maximum effect from that number of aircraft.

e. ~~Third Solution~~.

To have a war plan study made in cooperation with the British Royal Air Force to determine if the 4464 British Bombers and the 3842 American Bombers--a total of 8306, may be sufficient to accomplish the defeat of Germany from the standpoint of

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combined air force operation. (Estimates in Tab 1 are that Germany will have 7245 bombers in air fleets with 100% in depot reserve as of July 1, 1943.)

f. ~~Fourth solution.~~

Reduce the number of operational training squadrons to 1/3 of those set up, converting them to combat squadrons. This would increase operating squadrons to 38 and increase the operating aircraft to 494, and reduce airdrome requirements by 19. Obviously the gain would not compensate for the reduction in training personnel for combat which would result from this policy.

g. ~~Fifth solution.~~

(1) Eliminate the Medium Bomber (B-26 type) and the Heavy Bomber (B-17 type) substituting therefor the Heavy Bomber (B-29 type). Estimated performance data on usable ranges for purpose of comparison only are:

Model	Range	Bomb Load
B-26	1150 miles	2000 lbs
B-17	1195 "	4800 "
B-29	2410 "	16000 "

From the standpoint of maximum bomb load alone, the B-29 airplane is equivalent to:

8	B-26 planes
3 1/3	B-17 planes

Replacing the B-26 and B-17 types with the B-29 type on the basis of the former two airplanes set up for the operations against Germany, the following academic result would obtain:

850 B-26 type x 8 = 6800 on a gain of 6050 planes
1360 B-17 type x 3 1/3 = 3533 on a gain of 2173 planes
Academic increase by substituting B-29 plane 8223 planes

(2) From the standpoint of hits, however, the academic increase would be reduced considerably. In was it is best to calculate on a single release of all bombs, rather than release of each bomb singly on separate approaches. Hence the probability of hitting is not increased in proportion to the increased number of bombs carried.

(3) It is clear that substitution of the B-29 type, for the B-17 and 26 types, would reduce considerably the shortage due to unavailability of airdromes. Time limitations in preparing this tab have not permitted the thorough study that will be continued on this solution.

h. Sixth solution.

(1) To build aircraft with a 4000 mile operating radius of action to the total of 3740, which could operate against Germany from:

Newfoundland
Northeastern U. S. and Canada
Africa - Ivory Coast
Greenland
India

(2) The development of the bombardment airplane with a 4000 mile radius of action is of great importance. With such a bomber, the United States could, from bases under its control, exercise air power over all important areas. (See map at end of Tab. 4 b.) ~~The development of such an airplane has been initiated.~~ A project to manufacture such an airplane in tactical quantities (3740 required on the basis of this study) should be initiated immediately.

i. ~~Seventh solution.~~

The seizure of areas suitable for construction of air bases, from Dakar north on the West Coast of Africa or in Norway by combined air, naval and ground operations.

Conclusion:

(1) The final solution of the problem will necessarily involve the combination of the several contemplated above.

(2) That solution most acceptable is the procurement of the bombardment airplanes having an operating radius of action of 4000 miles and a maximum range of 10000 miles. With a force of airplanes of this type, the United States would be in a position to operate against Germany from airdromes far removed from the threat of German attack. A wide selection of operating bases throughout the world would be possible. Furthermore, no matter what the final outcome of the war in Europe, the Army Air Forces, in cooperation with the Navy would be able to cover with aerial operations the principal oceans of the world and could operate against bases and installations on the lands adjacent thereto - a situation highly favorable to our National interests. The procurement problem will delay the adoption of this solution.

(3) The immediate expediency which must be adopted, is the use of double combat crews as discussed under the second solution, recognizing its many disadvantages.

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TAB NO. 4

BOMBARDMENT OPERATING BASES

1. Discussion.

a. The air forces that can be employed against a hostile nation is that which can be placed within the radius of action of enemy objective from available bases.

b. The bombardment units required for operating against Germany have been estimated, together with the pursuit aircraft required for defense of the bases.

c. The radius of action of the bombardment airplanes and available bases are then considered. 6860 bombardment airplanes is the estimated requirement for operations against Germany. It develops that but 169 bases are available, which will accommodate 3842 bombers and 1690 pursuit for operations against Germany. An additional 117 airdromes to accommodate 3018 bombers are required.

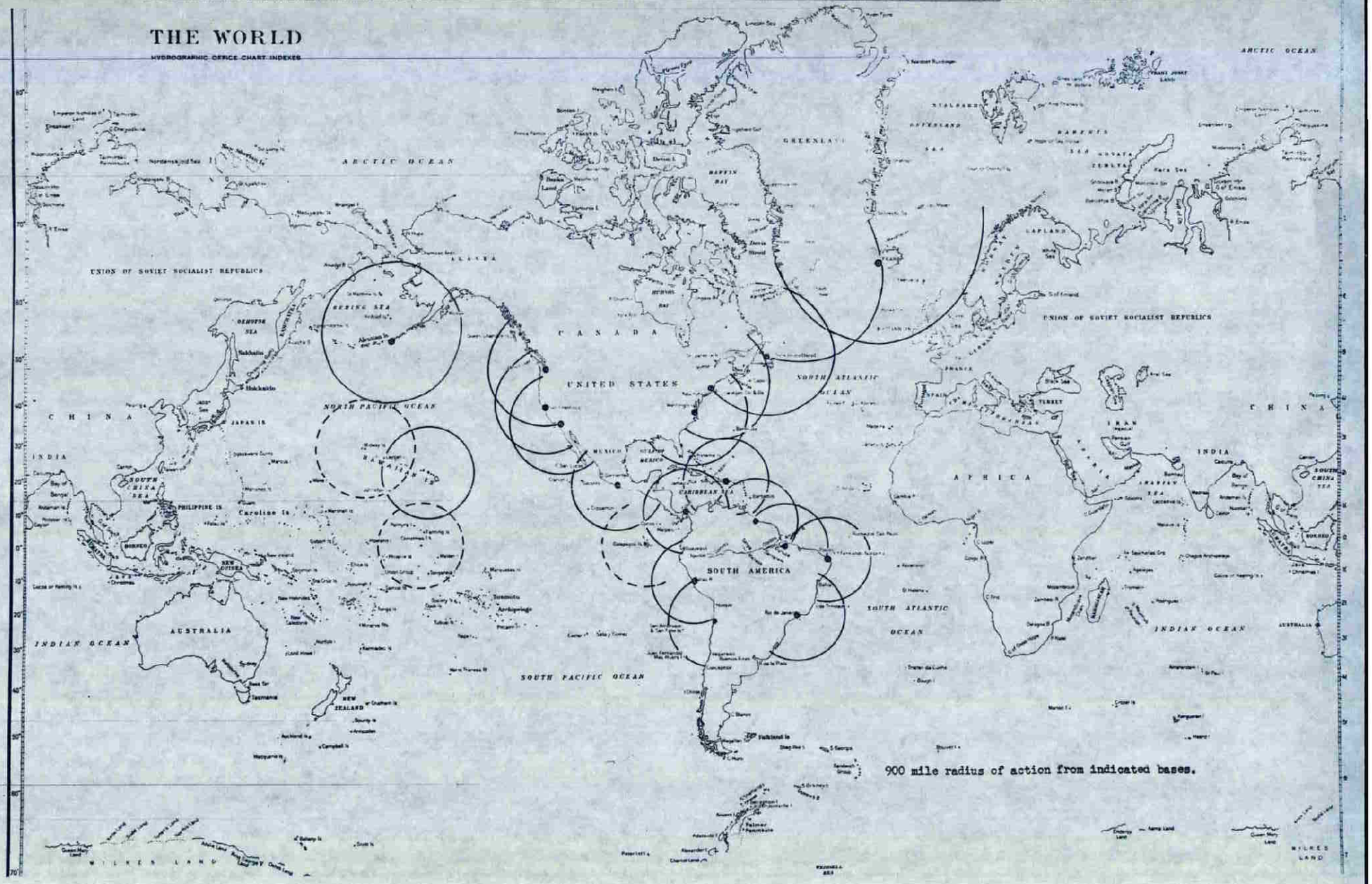
[redacted]

2. See Tab. 4 a for detailed discussion of the problem. See Tab 4 b depicting the advantage of the 4000 mile radius of action bomber from the standpoint of bases in exercise of American air power through the world.

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THE WORLD

HYDROGRAPHIC OFFICE CHART INDEXES



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A-WPD/1 TAB NO. 5

AIRCRAFT REQUIRED FOR CONTROL OF THE SEAS

1. Assumptions.

A force for this purpose has not been set up as such. An assumption is made that the aircraft included under Hemisphere Defense and for the Strategic Defensive of Asia will be adequate to the support of sea forces or for operations in lieu thereof, from the air bases at which such forces are located.

2. Use of Air Forces on this mission prior to offensive in Europe.

The building up of the air force units required for an offensive in Europe will progress gradually until completion of the program and the entire force is operating against German objectives. During this program, units will be organized and trained, gradually being moved to European or Near-Eastern bases. Prior to the offensive, such as the first units, when formed and ready for action, will be available initially for the mission of operating against hostile seacraft, in conjunction with naval forces or in lieu thereof. It is not an unreasonable assumption that such operations will succeed in this initial mission, and that special forces will not be required.

3. Use of the Air Forces created for Hemisphere Defense.

The fulfillment of the mission of Hemisphere Defense includes the destruction of hostile seacraft within the operating radius of the air bases, together with reconnaissance essential thereto. The forces established for Hemisphere Defense have been held to a minimum consistent with an offensive in Europe requiring the major effort. This force, however, is estimated to be adequate.

[redacted]

A-WPD/1 TAB NO. 6

BOMBARDMENT AVIATION
REQUIRED FOR HEMISPHERE DEFENSE

PROBLEM:

To provide for Hemisphere Defense by locating, at strategic points, the minimum number of Bombardment Groups capable of performing that mission during the conduct of our strategic offensive in the European theatre.

MISSION:

a. To protect our vital economic and military objectives against carrier, or flying deck, based air attacks.

b. To defend the Pacific Triangle, Alaska and approaches to the Panama Canal.

c. To acquire data and information concerning requirements, technical and tactical, to enable the United States to institute an all-out Hemisphere Defense in the event of a forced retirement from the European theatre.

FORCE REQUIRED:

23 Groups, with a total of 1955 heavy bombardment airplanes, which figure includes a 25% reserve, with a monthly replacement requirement at 3% per month of 46 airplanes.

b. Requirements for Defense of the United States, its Foreign Possessions and Support of Ground Forces.

Types	Groups	Aircraft plus 25% Depot Reserve
Heavy Bombardment	27	2295
Light & Dive Bombers	26	2201
Pursuit	31	5038
	84	9534

c. Minimum Requirements for creation of a nucleus for an eventual offensive and for Hemisphere Defense.

The Army Air Force requirements cannot be reconciled completely with maximum aid requirements. A compromise is indicated, involving a calculated risk. Such compromise requires substituting medium for heavy bombers; reducing to the barest minimum the forces considered essential to defense of the United States and its overseas possessions, through diverting to the Anti-Axis Pool; 15% of Army aircraft scheduled between September 1, 1941 and July 1, 1942; by reducing the number of groups to the utmost. Aircraft now on hand is included in the following figures. This action will result in creating the following units:

Type	Groups	Aircraft w/o Depot Reserve	Shortage in Gps
Heavy Bombardment	8	603	9
Medium "	10	910	
Pursuit	23	3077	8
Light & Dive Bombardment	8	504	18
		5094	

The retention of the aircraft listed in the preceding paragraph will afford the Anti-Axis Pool, all Army type aircraft scheduled for Defense Aid and foreign contract production from now to July 1, 1942, plus 15% of aircraft scheduled for the Army Air Forces and aircraft recommended for diversion by the Navy, as follows:

Heavy Bombardment	420
Medium Bombardment	1144
Light & Dive Bombers	3014
Pursuit	4590
	9168

TAB NO. 6a

OPERATING BASE	GROUPS	COMBAT SQ	O T U SQ	HQ SQ	TOTAL PLANES	25% RESERVE	MONTHLY REPLACEMENT @3%
Continental United States	5	20	5	5	340	85	10
New England Area	(1)	(4)	(1)	(1)	(68)	(17)	(2)
Norfolk Area	(1)	(4)	(1)	(1)	(68)	(17)	(2)
Southern California	(1)	(4)	(1)	(1)	(68)	(17)	(2)
San Francisco Bay	(1)	(4)	(1)	(1)	(68)	(17)	(2)
Seattle, Washington Area	(1)	(4)	(1)	(1)	(68)	(17)	(2)
Greenland	1	4	1	1	68	17	2
Newfoundland	1	4	1	1	68	17	2
Puerto Rico	1	4	1	1	68	17	2
British Guniana, Georgetown	1	4	1	1	68	17	2
Brazil	3	12	3	3	204	51	6
Belem	(1)	(4)	(1)	(1)	(68)	(17)	(2)
Natal	(1)	(4)	(1)	(1)	(68)	(17)	(2)
Rio de Janeiro	(1)	(4)	(1)	(1)	(68)	(17)	(2)
Chile, Antofagasta	1	4	1	1	68	17	2
Peru, Lima	1	4	1	1	68	17	2
Mexico, Acapulco	1	4	1	1	68	17	2
Panama	2	8	2	2	136	34	4
Hawaii	3	12	3	3	204	51	6
Alaska	2	8	2	2	136	34	4
Iceland	1	4	1	1	68	17	2
TOTAL	23	92	23	23	1564	391	46

RECAPITULATION

Total Groups 23
Airplanes in Groups.....1564
Airplanes in reserve (25%).....391
Total airplane requirement.....1955

Monthly replacement @ 3%..... 46

A-WPD/1 TAB No. 6b

BOMBARDMENT AVIATION
REQUIRED FOR HEMISPHERE DEFENSE

ASSUMPTIONS:

a. That all aerial reconnaissance, over water, excepting that essential to develop the tactical situation, is to be performed by the Naval Air Service. (Attention is invited to the inability of seaplanes to operate during winter months from northern latitudes due to existence of ice in landing and take-off areas.)

b. That, while the United States is participating in a major offensive in Europe, minimum forces are required for Hemisphere defense.

c. That the size of the bombardment force mentioned herein as suitable for Hemisphere defense during this strategical phase has no relation to the number of bases that must be developed to make possible our ~~maximum~~ hemisphere defense plans if the offensive in Europe cannot be carried through.

DISCUSSION:

a. ~~Continental United States.~~

(1) Northeastern Sector - three mutually supporting Groups are provided at Norfolk, New England and Newfoundland.

(2) Pacific Coast - three mutually supporting Groups provided for the Pacific Coast sector.

b. ~~Caribbean Area.~~

Mutually supporting Groups at Norfolk, Puerto Rico and Georgetown with Reserve support in Panama are provided.

c. ~~South America.~~

Mutually supporting Groups cover all but the southern third. Extension to provide this coverage can be accomplished.

d. ~~Panama~~ Canal.

Coverage is provided by two Groups in the Canal Zone itself as well as supporting Groups at Acapulco and Lima on the Pacific side and the strong Caribbean force previously

mentioned. Coverage to the West could be doubled by the establishment of a base in the Galapagos Islands. This is strongly recommended.

e. Hawaii.

A relatively strong force is considered necessary here as this constitutes the key point in the defense of the Pacific Triangle. Three Groups are provided, and, although shown in Hawaii may be utilized from advance bases on Midway, Wake, or Jarvis Island. Reinforcement by at least one Group from the West Coast is practicable without serious weakening of that sector.

f. Alaska.

Two Groups are believed sufficient since the air defenses of this area can be speedily reinforced from the United States proper.

g. Iceland.

The placement of one Group in Iceland furnishes a force capable of rendering strong support to the Navy in its mission of maintaining freedom of the sea lanes of the North Atlantic.

h. The preponderence of strength is provided towards the west in view of the offensive effort in the east.

i. The provision for six Groups in South America is believed to be required in order to give support to our commitments regarding Hemisphere defense and to maintain our good relations and prestige with the South American Republics.

SECRET

AWPD/1 TAB NO. 7

BOMBARDMENT AVIATION REQUIRED FOR STRATEGIC DEFENSIVE IN ASIA

1. Problem.

a. The strategic concept of operations required to defeat our potential enemies directs a strategic defensive in the Far East. It also directs that we "Defend the Philippines."

b. The integrity of these islands is too important to our position in the Far East and our prestige in the world to permit it to pass under Japanese control.

c. A moderately strong Air Force, with its bases protected by ground forces would constitute a major obstacle to Japanese freedom of movement in the Far East.

d. Such a force would dominate the northern approaches to the China Sea and would set as a powerful deterrent to Japanese penetration in the Netherlands East Indies and would divert enemy strength away from the Malay barrier.

e. These factors, together with a noticeable tendency towards a strengthening of our national policy in the Far East, make imperative that plans be considered at once for a substantial increase in our forces in the Far East.

2. A study of the Far Eastern theatre indicates:

a. That four groups of B-17 or B-24 type airplanes, in the Philippines, would seriously threaten the northeastern approaches to the China Sea.

b. That the same groups would provide a strong defense to any overseas operations directed against the Philippines.

c. That B-29 or B-32 type airplanes operating from Alaska, with one refueling area in Russia, could conduct bombing operations against sensitive and vital points in Japan.

d. That similar operations could be conducted by the same type of airplanes based in the Philippines.

3. The potentialities created by basing a moderately strong Air Force in the Far East are so great that it is considered essential to give serious thought to:

A. Strengthening the garrison of the Philippines to provide protection for present, or near future, air bases.

SECRET

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d. Movement, as soon as possible, of four heavy bombardment groups to the Philippines.

e. Conduct conversations with Russia regarding the use of a refueling area in Siberia at such time as B-29 or B-32 airplanes may become available.

4. Bombardment Strength Recommended.

Operating Base	Type	Number Required	Monthly Replacement	Number Squadrons	Number of Groups	Operating Range and Bomb Load
Philippines:	B-17	272	54	20	4	1500 mi - 2000 lb
	B-24					
Alaska or	B-29	136	27	10	2	4000 mi - 2500 lb
Philippines:	B-32					

17

[redacted]

[redacted]

A-WPD/1 TAB NO. 8

PURSUIT AVIATION
REQUIRED TO SUPPORT AIR OFFENSIVE AGAINST GERMANY

1. SUMMARY OF REQUIREMENTS:

a. Defense of American bases in British Isles 10 Groups

b. " " " " " Near East 6 "

c. " " " " " other areas 0 "

TOTAL 16 Groups

d. Airdromes required, at 2 operating squadrons each, for 16 Groups, or 80 Squadrons = 40 Operating airdromes
5 OTU
45 Total Airports

2. DISCUSSION OF TOTAL REQUIREMENTS:

a. More than helf of all our pursuit aviation is required for employment in the strategic defense. (See Tab 8a) The reasons for this are:

(1) The principal mission of pursuit is defensive; i.e, protection of bases and vital areas. In the European theatre the bases to be defended are compressed into small areas compared with the great dispersion of bases and other vital areas in the Western Hemisphere and in the Far East.

(2) Limitations are imposed by the relatively small number of existing and potential airdromes available for our pursuit operations in the "offensive" theatre. (Only sufficient for 10 Groups in England, 6 Groups in the Suez Area.)

8

[redacted]

(3) It is necessary to maintain a strong force engaged in Hemisphere Defense, based on the assumption that no pursuit units established in the Eastern Hemisphere can be returned to the

[redacted]

Western Hemisphere in event of a withdrawal from Europe, Africa or Asia. Units sent abroad can not be depended on when counting the total available for Hemisphere Defense.

b. Compared to the German Air Force as of July 1, 1943, German interceptor and fighter aviation of all types in the Air Fleets is estimated at approximately 6000 airplanes, with an equal number in depot reserve. (The 100% depot reserve is certainly less than four times as valuable compared to a 25% reserve, because of obsolescence and maintenance problems.) Add other Axis air force components plus the advantages in available airdromes which the Germans will have, and it must be concluded that a decisive numerical superiority over Germany is not to be sought in pursuit aviation. It could only be attained at the expense of our bomber aviation which is, in the Air Offensive, our real striking force. (See paragraph 5)

c. As air supremacy will not be gained by superiority in number of fighters, it must be attained otherwise. For defense of American bases, the British R.A.F. has indicated the solution - a highly integrated Aircraft Warning and Interceptor Control System directing squadrons of superior interceptor pursuit airplanes manned by well trained, determined airmen.

d. To attain air supremacy over hostile territory, superior fighting ability will count still more heavily. For further discussion of this phase, see paragraphs 5 and 6.

3. NUMBER OF PURSUIT GROUPS REQUIRED TO DEFEND AMERICAN BASES IN GREAT BRITAIN (See Par. 1a) WAS ESTIMATED AS FOLLOWS:

a. Total bomber and pursuit force which can be operated from bases available in Great Britain was estimated in Tab 4, and the proportion of bombers to pursuit was taken to be 2 - 1, as a reasonable proportion. Allowing an average of 2 squadrons per available and potential airdrome, the pursuit allowance of bases is then enough for only 10 Groups.

b. Assuming American responsibility to defend its own bases, and guessing at the territory involved, then all 10 Groups may be needed in defense of our bases. This is an arbitrary guess, and must be, until the distribution and location of American bases is known and a join plan for Air Defense is worked out with the British Fighter Command.

[redacted]

c. Assuming further the possible concentration of the bulk of the German Air Force against Britain, and allowing for the enemy capability of greatly increasing the number of airdromes in northern France and the Low Countries, then a strong interceptor pursuit defense of our bomber and naval bases is essential. Without British cooperation, 10 Groups are obviously inadequate. It must be assumed, however, that the R.A.F. will continue to defend its homeland, and our responsibility will be limited to the defense of our own bases.

4. TO DEFEND AMERICAN BASES IN THE NEAR EAST (See Par 1 b) THE ESTIMATE OF THE PURSUIT FORCE NEEDED WAS REACHED AS FOLLOWS:

a. Hostile air bases are either remote, or on a relatively narrow front.

b. The number, spread and location of American bases to be defended are not definitely known.

c. The capacity of the terrain to provide airdromes is unlimited, but water supply and other material considerations limit the force of bombers and pursuit which can base in this area. The estimate of bomber force to be based in Near East, and potential air fields, available limits the number of airdromes available for pursuit to 9. Assuming that more airdromes can be built, or allowing more squadrons per airdrome, it is estimated 6 groups can be based and supplied in the Near East. No smaller number would insure adequate defense of the American air bases in that theatre. (The factors involved in this estimate are too intangible at this time to support more than a reasonable guess as to the actual amount of pursuit needed.)

5. DEFENSE OF OTHER AREAS. (See Par. 1 c)

a. Except for the British Isles and the Near East, only Russia can provide bases near enough to Germany to support the air offensive. Neutral countries and axis-controlled territory are assumed to be not available. Because Russian territory west of the Ural Mountains appears likely to come under German control very soon, no Air Bases have been planned for that area. Therefore, no pursuit aviation is needed for protection of bases other than those so far discussed.

b. Should additional base areas be set up, then pursuit protection must be provided from units in strategic reserve, or the estimate of total pursuit force required must be revised.

[redacted]

6. STRATEGIC RESERVE. (See Par. 1 d)

a. An additional force of 6 groups is required for what may be called a strategic reserve. It is needed for the following purposes:

(1) To reinforce defense of bases in emergency.

(2) To attain local air supremacy in any area chosen, within range of its bases.

(3) To support the independent air operations of our bombardment aviation.

(4) To support ground forces for combined air and ground offensives.

(5) To provide pursuit aviation for other task forces.

b. Requirement for Strategic Reserve. The estimate of force required was based on the following assumptions:

(1) Number of bases available is limited. In this respect the estimate given in Tab 4 allows no additional airdromes in Great Britain and Iceland. A strategic reserve is essential, or the mission of pursuit will not be achieved. Therefore, more airdromes must be found, or squadrons will have to double up again on existing bases, or other measures must be undertaken to secure new bases. Initially, the Strategic Reserve must be located in the Western Hemisphere.

(2) The bomber force can not be materially reduced to provide more bases for pursuit units.

(3) A successful ground offensive must have air support and local air supremacy.

(4) Initial air supremacy must be attained locally to enable a ground force to establish itself in hostile territory.

(5) The number of groups in strategic reserve needed for achieving the air supremacy which is a pre-requisite to establishing ground forces in hostile territory will be sufficient to maintain air supremacy in support of further operations of those ground forces in the new theater. No units will be organically assigned to armies or held exclusively for Army support.

(6) To insure efficient practical coordination of pursuit and AWS units with Armies in the field, a minimum of one group and one mobile AWS regiment, per army must take part in all Army field exercises in peace or war. These training missions must be provided for from strategic reserves at home or abroad. Whenever possible, the group (and AWS reg't.) that trained with an army will accompany it in the field.

7. PURSUIT TYPES REQUIRED.

a. A special type of interceptor pursuit airplane is needed for night operations. It must have performance equal or superior to hostile bombers. It works best alone or in pairs, has a 3-man crew, is bi-motored and has a greater endurance and useful load than the day interceptor. Because of its size and load, it is less maneuverable than the day interceptor. It has both fixed and turret guns. Because it is not employed en masse, for a given area defense, the number needed is less than needed for day fighting. It is assumed after careful study, that adequate air protection demands the best defense possible both by day and by night. The proper proportion of day to night pursuit is as shown in Tab 8-a.

b. For day interceptors more than one type is needed. To engage hostile fighters at extreme altitude, a very high-flying type is needed. The large engine and supercharger required may make this airplane inferior in maneuverability and speed at low altitude. Hence a combination of types similar to the Spitfire-Hurricane team has advantages. The DI (day interceptor) airplanes in one group should be all of one type. However, every effort must be made to achieve practical fighting superiority on which depends, more than on numbers, aerial supremacy.

c. To accompany bombers, a large, heavily gunned long-range escort fighter is needed. In lieu of such a fighter, additional interceptors for short-range support of bombardment should be provided, if the escort fighters can not be built. As no prototype even exists, it would be wrong to count on this new type, but the tactical requirement for such an airplane exists and a program for development of the type should not be neglected.

TAB NO. 8-a.

PURSUIT CHART.

A-WPD/1

TAB NO.	TYPE	TOTAL GROUPS	TOTAL SQDNS.*	COMBAT SQDNS.	O.T.U. SQDNS.	HQS. SQDNS.	OPER. AIRP.	DEP. RES.	TOTAL AIRP.	AIRP.** R/NO.
8										
Offensive against Germany	I	21*	84	63	21	21	2205	551		334
	NI	-	21	21	-	-	525	131		80
Totals		21	105	84	21	21	2730	682	3412	414
*5 Groups initially stationed in Western Hemisphere.										
9										
Hemisphere Defense	I	31	124	93	31	31	3255	814		98
	NI	-	31	31	-	-	775	194		23
Totals		31	155	124	31	31	4030	1008	5038	121
10										
Strategic Defense in Asia	I	2	8	6	2	2	210	53		33
	NI	-	2	2	-	-	50	12		8
Totals		2	10	8	2	2	260	65	325	41
TOTALS, BY TYPES	I	54	216	162	54	54	5640	1417		465
	NI	-	54	54	-	-	1350	337		111
Total all Pursuit		54	270	216	54	54	7020	1755	8775	576

Note: Tab 11, "Pursuit Required in Support of Ground Arms": No additional pursuit required.

More Notes on next page.

*Operating Squadrons only, i.e., Headquarters Squadrons and Control Sqdns. excluded.

**Replacements needed for estimated attrition, monthly rate.

NOTES TO ACCOMPANY PURSUIT CHART:

1. Each Interceptor Group is assumed to have 130 airplanes and seven Squadrons, as follows:

3 Combat Squadrons, 1 (day interceptor)	75-I	
1 Combat Squadron, NI (night interceptor)		18-NI
1 O.T.U. Squadron, I	25-I	7-NI
1 Hq. Squadron, I	5-I	
1 Control Squadron, I (Communications)	____	____
Total airplanes	105-I	25-NI

In the event that sufficient 3-place night interceptor airplanes can not be made available for all I Groups, then an I squadron of 25-I airplanes will be substituted for the NI Combat Squadron and NI O.T.U. Flight.

2. AWS (Signal Corps) Units adequate for controlling Interception missions, day and night, are assumed for all I units.

3. One control squadron for each pursuit group is assumed, to provide ground radio and wire communications for both administrative and tactical purposes. Telephone and teletype wire lines over long distances must be provided by other agencies.

4. Attrition is assumed at the following rates:

20% per month for all combat squadrons in active combat areas;
3% per month for all other units;
None for airplanes in depot reserve.

The O.T.U. and Headquarters Squadrons are <u>not</u> considered "combat squadrons". All groups listed in Hemisphere Defense are considered to be <u>not</u> in combat areas — hence 3% per month. All other groups <u>are</u> in combat areas — hence their attrition rate is 20% for combat squadrons, or 20% for 93 I per Pursuit Group (I), and 20% for 100-F per Pursuit Group (F).

5. It is assumed that 10 Groups (I) will be needed for defense of bases in Great Britain and Ireland, and 6 more for defense of bases in the Near East. Also, that additional units will be needed to support bombardment missions over Germany, and to support offensive sweeps over nearby hostile areas.

[redacted]

6. Airdromes for but 10 Pursuit Groups in British Isles and 6 in the Near East are assumed in Tab 4. Attainment of Air Supremacy over Germany will require more than purely defensive action by Pursuit.

7. No additional Pursuit is listed for Support of Ground Forces. Five of the 6 Groups in Hemisphere Defense reserve should train with the Five Support Commands. When an Army takes the field, it will be given Pursuit (I) protection of one or more Groups depending on the situation, the size of the area to be defended and density of pursuit defense necessary. (See Note 6.).

DIVISION RESPONSIBLE: Air War Plans Division
OIC: Lt. Col. R. C. Moffat (AFCC)
ASSOCIATE: Maj. H. S. Vandenberg (A-3)

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TAB NO. 9

PURSUIT AVIATION REQUIRED FOR HEMISPHERE DEFENSE

A-WPD/1

1. SUMMARY. The following summarizes the pursuit required to protect vital establishments and to garrison the bases needed for hemisphere defenses:

a.	Continental United States	12 Groups @ 130 a/c each
b.	Iceland	1
c.	Newfoundland, Greenland and Labrador	2
d.	Bermuda	½
e.	Bahamas and Jamaica	½
f.	Puerto Rico	1
g.	Antigua)	
h.	Saint Lucia)	1½
i.	Trinidad)	
j.	British Guiana)	
k.	Other Latin-American and U. S. Needs	6
l.	Panama	2
m.	Hawaii	3
n.	Alaska	1½
	TOTAL	31 Groups, 4030 airplanes
	Add 25% for depot reserve	1007 "
	Force required by 7-1-43	5037 "

Additional Pursuit units assigned to offensive against Germany but initially employed in Hemisphere defense:

Air Base Defense, Brazil	3 Groups	390 A/P
Metropolitan Defense, Rio de Janeiro	1 Group	130 A/P
Air Base Defense, Chile and Peru	1 Group	130 A/P
	5 Groups	650 A/P

These airplanes are listed under offensive against Germany.

[redacted]

Monthly production after 7-1-43, to maintain
H.D. force, at 3 % per month (.03 x 4030) 121 airplanes

Or: 1450 airplanes per annum.

2. BASIS FOR ESTIMATE. For figuring the requirements summarized in paragraph 1 above, calculations were based on the following assumptions:

a. That the Air Force is conducting offensive operations against Germany and the probability of hostile attacks is limited.

b. That if we are forced to hemisphere defense exclusive of European and Asiatic adventures, no pursuit which was employed in the Eastern Hemisphere will be abailable for Western Hemisphere defense. However, the productive capacity set yp to maintain the offensive force will provide enough additional pursuit airplanes for effective hemisphere defense.

c. That our pursuit is individually equal to its task of defeating hostile aircraft engaged. This includes airplane performance, armor and armament, training, etc.

d. That adequate Aircraft Warning Service is available and under Interceptor Command, trained and equipped to permit ground-controlled interceptions - (NOTE: Requirements for AWS are large, and are discussed separately.)

e. That replacements in personnel as well as in equipment and supplies will be adequate to maintain the HDF (Hemisphere Defense Force).

3. COMPOSITION OF UNITS. The composition of one Pursuit Group (1) is assumed to be as follow:

Squadrons	Airplanes		Total
1 Hq. Sq.	5 (1)		5
1 Control Sq.	---		---
3 Operating Sqdns.	75 (1)		75
1 Operating Sq.		17 (NI)	17
1 O.T.U. Sq.	25 (1)	8 (NI)	33
7			130

(1) is for Interceptor, single-seater.
(NI) is for Night-Interceptor, three-seater.
(NOTE: No fighter pursuit is included, as no basis for its employment in Hemisphere Defense is available. No fighter airplane exists now in our Air Force.).

5. DISPOSITIONS. The following is a discussion of items listed in paragraph 1:

a. Continental United States.

12 groups disposed as follows:

1 AF Area	6 frontier regions (Buffalo to Boston to Norfolk)	5
2 AF Area	2 frontier regions (Seattle and Portland)	2
3 AF Area	5 frontier regions (Wilmington to Miami)	3
4 AF Area	2 frontier regions (San Francisco and Los Angeles)	2

b. Iceland.

1 group (No discussion necessary) 1

c. Newfoundland, Greenland and Labrador.

(1) To defend American bases, air and naval, Botwood - Gander Lake, Tor Bay, and Argentia 1

(2) For defense of staging fields and intermediate sub-bases from Stephenville, Newfoundland, to Greenland and for defense of Greenland bases and Cryolite mine 1

d. Bermuda.

Terrain limitations and nature of point defense indicate less than a full group. ½

e. Bahamas and Jamaica.

To defend American patrol base in the Bahamas, air and naval bases in Jamaica, and possible temporaty bases in Cuba, ½ group ½

f. Puerto Rico.

Containing a highly important naval base, as well as air bases, requires a minimum of one group. 1

g., h., i., j. Trinidad, Antigua, Saint Lucia and British Guiana.

These constitute one integrated defense, as no pursuit is needed at Antigua unless bombers move in. Saint Lucia similarly needs pursuit only when Air or Naval forces are concentrated there. It is believed that the importance of Trinidad as keystone of the arch requires at least ½ group to be based there, with approximately a whole group available

for dispersion, averaging one squadron each, to Antigua, St. Lucia and Georgetown. All or part of the reserve group could move quickly to reinforce any of the three sub bases, as the situation demands. Hence, 2 groups are provided. 2

k. Other United States and Latin-American needs.

In this category should be included Canada.

(1) In the event that Canada fails to defend, with pursuit (1) the western termini of her transcontinental railroads, and the Nova Scotia bases, American units should be prepared to take over, or reinforce those regions as the situation may require. Unless some reserve force is available for such pruposes, a gap in hemisphere defense may occur.

(2) Also, to reinforce any weak point in our continental frontier regions, a mobile reserve is necessary.

(3) To provide units for possible task forces to South America, to protect bases in Brazil, etc., a mobile reserve is needed.

(4) To Provide mobile groups for air support forces in training with Armies in the Strategic Reserve, 5 groups are needed.

(5) The disposition of the 6 groups available "for other purposes" is recommended as follows:

2 each in 1 AF and 3 AF Areas, and
1 each in 2 AF and 4 AF Areas,

TOTAL 6

1. Brazil.

To defend the air bases in the important northeast salient of Brazil, three groups are provided. An additional group is set up

to provide a local metropolitan defense of Rio de Janeiro. Failure to provide pursuit defense of this important Brazilian city would seriously impair relations between the United States and Brazil, in the event that Rio was subjected to air attack - or even seriously threatened.

These four groups are earmarked for use in the offensive in Europe if and when we seek to establish a local air superiority for the employment of our ground forces in the European theatre. Presumably the air threat to Brazil will be small at that time. 4

m. Chile and Peru.

To defend air bases. 1 Group 1
This group is also earmarked for the offensive against Germany.

n. Panama.

The importance of this base and of the Panama Canal indicates a minimum of two groups, stationed one near each coast. 2

o. Hawaii.

The importance of this citadel and naval base, and of naval forces which may be concentrated there, plus the difficulty of reinforcing the garrison, indicates a garrison of 3 groups. A part of this force may be required to garrison Midway. 3

p. Alaska.

To carry out the Army mission of defending Naval Bases, requirements for defense of Unalaska, Anchorage, Kodiak, Sitka and Fairbanks call for a widespread scattering of local pursuit units. Also, some force may be needed to defend any advanced air base established nearer Bering Straits to intercept raids from Siberia should the latter suddenly come under Axis control. For the many small tasks involved, and because of the difficulty of reinforcing these defenses, and because local operating conditions are such that any reinforcements not experienced in them are of doubtful value, a garrison of at least 1 group is indicated. 1

6. NIGHT-INTERCEPTOR SQUADRONS. For a total of 31 groups, 775 night fighter aircraft are required. These airplanes are not employed in mass as are day-interceptors, so only 18 airplanes per squadron are recommended. They depend entirely on ground control for effective night operations. Day pursuit can reinforce night interceptors on clear, moonlight nights, and also when pursuit-searchlight cooperation is applicable, but in general, night operations must depend on specially equipped night-interceptors.

[redacted]

TAB NO. 10

PURSUIT AVIATION
REQUIRED FOR STRATEGIC DEFENSIVE IN ASIA

A-WPD/1

1. Summary of Requirements.

It is estimated that two groups will be required.

2. No bases are contemplated outside of the Philippine Islands. Disposition of the two groups required is as follows:

a. For the defense of Manila, naval forces and vital establishments in the vicinity, 1 group

b. For defense of advanced bombardment air bases in Northern Luzon, 1 group

3. Should task forces be needed for operations in other areas in the Far East then the total requirements for pursuit aviation must be increased in the amount needed. It is not considered feasible to reduce in any way the size of pursuit forces allotted for Hemisphere Defense or to support an air offensive against Germany. As any further increase in the total pursuit requirements would necessarily be at the expense of other military effort, it is considered that the two groups allotted for defense of Philippine base are all that are justified in the Far East.

4. For tabulation of requirements see Tab No. 8-a.

[redacted]

TAB NO. 11

PURSUIT AVIATION
REQUIRED FOR SUPPORT OF GROUND FORCES.

1. DISCUSSION:

a. Peace time training.

For effective training in joint air-ground operations involving an aircraft warning service and air support operations, an appropriate pursuit force should be provided. To meet this need, five of the pursuit groups provided from reserves set up in the four (4) Air Forces should be made available and designated to train with the five air support commands in all joint air-ground operations.

b. War time employment.

For war operations, pursuit requirements for specific theaters will be determined by a specific estimate of the force required to provide effective support to the operations of the ground arms. One or more of the pursuit groups trained to operate with an Air Support Command should habitually form the neucleus of any pursuit force assigned to a ground theater.

c. Pursuit forces available.

(1) Six (6) groups are set up in reserves of Air Forces which can be made available to the support of ground arms for hemisphere defense.

(2) Five (5) groups are set up in general reserve for the British Isles which can be employed in support of ground forces in Western Europe. (Initially disposed in Brazil, Chile, and Peru.)

(3) Additional pursuit support in any ground theater may be assigned from active air defense units whenever the air and ground situation justifies such a transfer in employment.

[redacted]

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[redacted]

TAB NO. 12

AIR SUPPORT AVIATION
REQUIRED FOR SUPPORT OF GROUND FORCES

1. DISCUSSION:

a. The following estimate of airplane requirements is based on the estimated strength and composition of the ground forces considered necessary to accomplish national objectives. Assumption is made that preponderant air superiority has been attained prior to the operations of these aviation units in any specific theater of operations. In arriving at estimated requirements, it has been recognized that all available combat aviation is able to and in appropriate situations, should support the theater operations of the ground arms.

b. It is recognized that air superiority within a theater may be highly variable and, against an undefeated enemy, never absolute, The need for pursuit aviation forces within the theater will be present, therefore, in varying strength, until the theater objective has been accomplished. In addition, there exists a tactical need for peace time training in joint air-ground operations, which is provided for. Detailed consideration of pursuit needs in supporting operations is treated in Tab 11.

c. Replacement rates are computed on the assumption that 40% of operating aircraft suffer a 20% monthly attrition rate with the remaining 60% computed at 3%.

2. Estimated requirements are tabulated below.

a. Bombardment aircraft, Light (A-20 Type).

(1) Initial Force:

Operating Airplanes		-	757
Depot Reserve		-	189
	Total	-	946
Squadrons	"	-	65
Groups	"	-	13

(2) Monthly replacement rate - 74

[redacted]

(3) Initial Disposition:

Air Support Commands	-	10 Groups
Iceland	-	1 Squadron
Brazil	-	1 Group
Puerto Rico	-	1 Squadron
Trinidad	-	1 "
Panama	-	1 "
Columbia-Ecuador-Peru	-	1 Squadron
Alaska	-	2 "
Hawaii	-	1 "
Philippines	-	2 "

b. Bombardment (dive bomber type)

(1) Initial Force:

Operating Airplanes	-	1004
Depot Reserve	-	251
Total	-	1255
Squadrons "	-	65
Groups "	-	13

(2) Monthly replacement rate - 98

(3) Initial Disposition:

Air Support Commands	-	10 Groups
Iceland	-	1 Squadron
Brazil	-	1 Group
Puerto Rico	-	1 Squadron
Trinidad	-	1 "
Panama	-	1 "
Columbia-Ecuador-Peru	-	1 "
Alaska	-	2 "
Hawaii	-	1 "
Philippines	-	2 "

c. Observation aircraft:

(1) Initial Strength:

Operating Airplanes	-	1521
Depot Reserve	-	380
Total		1901
Squadrons "	-	108

(2) Monthly replacement rate - 149

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(3) Initial Disposition:

Armies	-	5 Squadrons
Corps	-	54 "
Armored Divisions	-	39
Iceland	-	1 Squadron
Brazil	-	3 "
Puerto Rico	-	1 "
Panama	-	1 "
Columbia-Ecuador-Peru	-	1 "
Alaska	-	1 "
Hawaii	-	1 "
Philippines	-	1 "

(Note: Squadrons for armored divisions to have 16 planes; all others to have 13.)

d. Photographic (mapping).

(1) Initial Strength:

Operating Airplanes	-	114
Depot Reserve	-	29
Total	-	143
Squadrons "	-	10
Groups "	-	2

(2) Monthly replacement rate - 23

(3) Initial Disposition - GHQ - for use in theater of operations.

e. Transport - Air Infantry.

(1) Initial Strength:

Operating Airplanes	-	1216
Depot Reserve	-	304
Total	-	1520
Squadrons "	-	95
Groups "		19

(2) Monthly replacement rate - 75

(3) Initial Disposition:

Brazil - 4 groups		- 256	Airplanes
Caribbean Defense Command			
1 group		- 64	"
Alaska) 1 group	2 sq.	- 32	"
Hawaii)	2 sq.	- 32	"
Continental U.S. 8 groups		- 512	"
Strategic Reserves 5 groups		- 320	"
Total		-1216	"

f. Gliders - Air Infantry:

(1) Initial Strength:

Operating Gliders	-	2400
Depot Reserve	-	600
Total	-	3000

(2) Monthly replacement rate - 153

(3) Initial Dispostition:
To be determined by terrain analysis of specific areas.

Note: Gliders should relieve the transport load requirements in areas and tactical situations favorable to their use.

g. Supporting Pursuit Aircraft.

(1) Initial Strength:

Operating Airplanes	-	650
Depot Reserve	-	162
Total	-	812

(2) Monthly replacement rate - 64

(3) Initial Disposition:

One group to be available for operations with each air support command.

Note: This pursuit requirement is included in estimates established in Tab 9.

[redacted]

TAB NO. 13

13

[redacted]

TRANSPORT AVIATION REQUIRED TO MAINTAIN AERIAL LINES OF COMMUNICATION

1. This tab is designed to set forth the number of air transports required to effect the movement of critical essential aircraft and engine spares and supplies within the United States, between the United States and distant air bases or theaters and within theaters. The derived requirements are based in part on the rendering of a routine service and in part on the daily air movement of a fixed proportion of the total tonnage required to support an average operating group.

2. It must be accepted as inevitable that the production of certain essential aircraft and engine spares will be so limited as to necessitate holding to the minimum the quantities in the supply distribution system. The establishment of centralized stockages at the expense of local stockages to accomplish this, will, however, result in a material increase in the number of airplanes in the combat units that are out of service awaiting repair unless some method of ultra-rapid transportation is utilized to move critical items from the central stock point to the point of use. Air transportation has been found the most rapid and flexible method of effecting such movement and any war plan must provide such transportation if the number of combat unit airplanes held out of service for repair is to be held to the minimum.

3. Air transportation of air supplies may be considered under two broad headings:

i. Long Range (trans-oceanic, as to a European, African or Asiatic theater).

ii. Medium Range (Intra-theater and to bases near the zone of the interior.)

a. Long range air transportation of supplies must be considered as purely an emergency expedient. Insofar as practicable, the supplies so transported should be limited to light-weight, small bulk articles.

[redacted]

For this type of trans-oceanic air transport service, the transports should have range and weight carrying characteristics at least comparable to those of the B-24. B-29 or B.-32 characteristics would be preferable.

b. It is estimated that to provide a routine daily service of sufficient capacity to at least meet requirements initially and to insure a sufficient operating reserve to meet major emergencies, the following quantities of long-range high-capacity transports are required:

(1) U. S. - United Kingdom,	24 airplanes,	1½ squadrons
(2) U. S. - Brazil - Africa	24 airplanes,	1½ squadrons
(3) U. S. - Oceana	24 airplanes,	1½ squadrons
(4) U. S. - Alaska	16 airplanes,	1 squadron
(5) Zone of Interior operating Reserve	40 airplanes,	2½ squadrons
Total	128 airplanes	8 squadrons, 2 Groups.
25% Replacement	32	
Total	160	

4. Medium range air transportation of supplies includes intra-depot and depot-to-air base movement. As with long range transportation, it should be utilized for the distribution of only those supplies which are not available in sufficient quantities to permit adequate local stockages. Air transportation is not considered justified in theaters of such limited geographical extent that surface forms of transportation provide approximately the same overall speed of distribution.

a. In arriving at the overall transport requirements for intra-theater and zone of interior service, it is thought best to first establish the service capacity of the basic transport unit - the squadron, equipped with 16 one-ton capacity transports. A serviceability factor of 3/4, a loading of 75 per cent capacity and an operational rate of 1½ trips every 2 days are arbitrarily assumed. It is further arbitrarily assumed that the average of all operating airplanes requires 4000 lbs.

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of all types of supplies per month, other than ammunition bombs, fuel and oil and that not in excess of 20% of this material will have to be moved by air. On the foregoing basis, one squadron can move by air in one month 405,000 lbs.

(1) If one average airplane requires 800 lbs. of air transported materiel, one 16-airplane air transport squadron can furnish routine support to 500 "average" airplanes. This is considered the equivalent of six groups. It is realized that the materiel requirements for a heavy bombardment airplane may be considerably in excess of those for a pursuit airplane, but it is thought that the differences in airplane strength and operational rates and other influencing factors will generally tend to equalize requirements as between different types of groups.

(2) The basic plan contemplates a total force equal to 232 groups. 62 will be stationed in the British Isles where airdrome considerations practically prohibit the assignment of any material transport force, regardless of the need therefore. Hence only two transport squadrons are included for the British Isles. It is estimated that the equivalent of 18 groups will be located in areas wherein internal air transportation of supplies is not a vital requirement because of their limited geographical extent. No transport units are set up initially for such areas.

(3) The derived ratio is applied to the remaining 152 groups and indicates a requirement for 26 transport squadrons.

(4) Within the Continental United States, it is arbitrarily estimated that three transport squadrons are required to serve each of the three training centers; that three squadrons are required for maintenance command interdepot service and an additional four squadrons are required for an Army Air Force operational reserve.

(5) The intermediate type air transports and transport units necessary to support the planned combat units and training activities and to provide a small operating reserve thus total:

704 airplanes - 44 squadrons - 11 groups.
25% replacement: 176
Total Medium Transports 880

5. Summary - Maintenance Command Air Transports (including 25% Reserve)

4-engine long range transports	160
2-engine medium range transports	880
Grand total Maintenance Command	1040

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6. Monthly Replacement Requirements.

On the basis of an attrition rate of 3% per month, the following monthly transport replacements are required.

4-engine transports.....4

2-engine transports.....22

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[redacted]

TAB NO. 14

[redacted]

AIR CORPS REQUIREMENTS

1. The Air Corps requirements with respect to Maintenance Command, Base Service and other service elements have not been Calculated. A study on this subject is predicated upon decision as to aircraft to be provided, the combat units to be served and the air bases to be utilized in cases treated. Upon announcement of a decision, study will proceed on this subject.

[redacted]

A-MPD/1

TAB NO. 15

TRAINING AIRCRAFT REQUIRED TO MEET THE OBJECTIVE

1. BASIS FOR CALCULATIONS:

The calculations hereinafter are based upon two plans considered in Tab. 4. This latter tab indicates that base facilities will not permit accommodating but 3842 bombardment airplanes on the British Isles and in the Near East. The estimated requirement for bombardment operations against Germany is 6860 airplanes.

2. Tab No. 4 suggests as a solution that double combat crews be provided for the 3842 airplanes with a view to gaining the number of missions from those airplanes, which would be possible with 6860 airplanes at the rate of 8 missions per month. This latter expediency is referred to as Plan No. 2. Plan No. 1 contemplates the total 6860 bombardment airplanes with one combat crew per airplane.

3. Tab No. 15a - Training Aircraft Required under Plan 1.
Tab No 15b - Training Aircraft Required under Plan 2.

TAB NO. 15

A-WPD/1

Training Aircraft Required to Meet the Objective.

The two plans included are based directly upon the personnel requirements (Tab 16), paragraph 3 and paragraph 4. Paragraph 3 of Tab 16 deals with Plan 1 and paragraph 4, Tab 16 deals with Plan 2. Plans 1 and 2 of Tab 15 refer to the same numbered plans in Tab 16 and are based upon data in those corresponding plans.

Training Airplane Requirement for Plan I.

1. In this Plan Primary Training starts May 15, 1942 and requires a yearly pilot graduation rate of 108,528.

2. By initially operating at 50% of the desired technician strength the Primary School will be in full operation by July 15, 1942. The first full capacity class will graduate March 1, 1943.

The pilots available by March 1, 1943, based upon current plans will be

31,320
1,320 - peace attrition
30,000 - by March 1, 1943

New pilots to graduate to include July 1, 1943, will be 36,136, or a total at that date of 66,136.

The total requirements for pilots in tactical units is

	73,360	
Pilots for flying schools	27,360	
Overhead	~~2,000~~	
	102,720	- Required by July 1, 1943
	66,136	- Available by July 1, 1943
	36,584	- Shortage by July 1, 1943

3. With monthly pilot production of 9,044 (the 108,528 rate), it will take four months. Therefore, we can fully equip the contemplated program with pilots under these assumptions November 1, 1943.

4. In order to establish the 108, 528 pilot graduation rate, we will need 72.3 type schools. To meet the dates indicated above we will need

Primary Trainers required 10,845 by March 15, 1942
~~4,325~~ on hand
6,520 short, which should be on hand Feb. 15, 1942.

Basic Trainers required 11,206 by June 1, 1942
3,525 on hand by June 1, 1942

Leaving a balance required of 7,681 which should be on hand May 1, 1942

Two-engine Trainers required 7,302 by Aug. 15, 1942
2,954 on hand
4,348 short, which should be on hand July 15, 1942

Advanced Single-engine Trainers required		3,760 by Aug. 15, 1942
	On Hand	Sufficient
Bombardment Medium Airplanes required		2,530 by Aug. 15, 1942
	On Hand	Sufficient
Observation Airplanes required		434 by Aug. 15, 1942
	On Hand	Sufficient
Transport Airplanes		72 by Aug. 15, 1942
	On Hand	~~Sufficient~~

GRAND TOTAL TRAINING 36,149

5. Again it is believed that the controlling factor is the availability of airplanes. The 6,520 Primary Trainers could be produced by June of 1943, based on current estimates.

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Training Airplane Requirement for Plan 2.

1. In this Plan Primary Training starts May 15, 1942 and requires a yearly pilot graduation rate of 85,236.

2. By initially operating at 50% of the desired technician strength the Primary School will be in full operation by July 15, 1942. The first full capacity class will graduate March 1, 1943.

The pilots available by March 1, 1943, based upon current plans will be

31,320
1,320 - peace attrition
30,000 - by March 1, 1943

New pilots to graduate to include July 1, 1943, will be 28,412, or a total at that date of 58,412.

The total requirements for pilots in tactical units is

Pilots for flying schools	61,623
Overhead	21,567
	2,000
	85,190 - Required by July 1, 1943
	58,412 - Available by July 1, 1943
	26,778 - Shortage by July 1, 1943.

3. With monthly pilot production of 7,103 (the 85,236 rate), it will take four months. Therefore, we can fully equip the contemplated program with pilots under these assumptions November 1, 1943.

4. In order to establish the 85,236 pilot graduation rate, we will need 56.8 type schools. To meet the dates indicated above we will need

Primary Trainers required	8,520 by March 15, 1942
	4,325 on hand
	4,195 short, which should be on hand Feb. 15, 1942.
Basic Trainers required	8,804 by June 1, 1942
	3,525 on hand by June 1, 1942
Leaving a balance required of	5,279 which should be on hand May 1, 1942
Two-engine Trainers required	5,736 by Aug. 15, 1942
	2,954 on hand
	2,782 short, which should be on hand July 15, 1942

Advanced Single-engine Trainers required		2,954 by Aug. 15, 1942
	On Hand	Sufficient
Bombardment Medium Airplanes required		1,988 by Aug. 15, 1942
	On Hand	Sufficient
Observation Airplanes required		341 by Aug. 15, 1942
	On Hand	Sufficient
Transport Airplanes		57 by Aug. 15, 1942
	On Hand	Sufficient

GRAND TOTAL TRAINING 28,400

5. Again it is believed that the controlling factor is the availability of airplanes. The 4,195 Primary Trainers could be produced by June of 1943, based on current estimates.

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SECRET

~~Personnel Requirements~~

1. The attached plans and charts cover the two most practicable plans for providing personnel for AWP-1.

2. Charts show breakdown of requirements in the various specialties for the Air Forces as required in AWP-1.

3. In Plan #1 it is assumed that money will be available Sept. 1, 1941 and that all technicians over and above that now set up in the 54 Group Program will be diverted for the expansion of training facilities. It is also assumed that the airplanes shown on the attached chart will be manned by single combat crews.

4. In Plan #2 it is assumed that money will be available Sept. 1, 1941 and that the B/4000 type airplanes will not be available and no personnel provided for them. The B/2000, B-17, and Medium Bombardment in the Combat area will be provided with two combat crews per airplane. It is also assumed that all technicians over and above that now set up for the 54 Group Program will be diverted for the expansion of the training facilities.

SECRET

[redacted]

Total ~~Personnel~~ Requirements

	Plan No. 1	Plan No. 2
Officers		
Pilots	103,482	90,391
Navigators	21,462	19,866
Bombardiers	7,387	8,125
Observers	3,195	3,195
Non-Flying	40,798	39,214
Services	19,355	18,607
Total	195,679	179,398
Enlisted Men		
Technicians	862,439	813,951
Non-Technicians	614,403	588,267
Services	~~492,395~~	~~479,503~~
Total	1,969,237	1,881,721
Grand Total	2,164,916	2,061,119

[redacted]

AIR CORPS — GROUND ~~PERSONNEL~~ FOR PLAN NO. 1 AND PLAN 2 SERVICES [redacted]

Airplanes	#	Grd. Officers A.P.	Technicians	Non-Technicians	Officer Services	Enlisted Men
B/4000	(44)	1584	48488	26136	748	12892
B/2000	(24)	864	26448	14256	408	7032
B/17	(47)	1692	51794	27918	799	13771
B/25	(10)	420	10920	5880	170	2930
B/L	(13)	455	9204	4953	234	5109
B/B	(13)	455	9204	4953	234	5109
P/I	(54)	2754	45090	24246	810	10638
P/LR	(6)	270	6354	3420	90	1182
Obs.	(108 sq.)	540	14796	7992	108	864
Photo	(2)	72	2204	1188	34	586
Transport	(32)	1024	18656	10048	160	640
Air Base	(245)	7995	149940	80605	8575	122500
Air Depot*	(157)	2198	49926	18369	1784	44919
Total T.U.		19923	443024	229964	14154	228172
Tot.Tech.Sch. 27 a		7344	66582	66582	1728	43200
Tot.Fly.Sch. 56.7 b		7484	120771	94008	1701	50519
Tot.Fly.Sch. 74.1 c		9781	157833	122857	2823	66023
Total Overhead		2000	25000	25000	500	5000
A.W.S.					750	150000
Miscellaneous		950	90000	90000		
Colored		800	80000	80000		
Grand Total	b	38501	825337	585354	18833	476891
	c	40798	862439	614403	19355	492395

* One Air Depot Group for Bomb. H
and two Depot Groups for all other combat Groups.

For Plan No. 2 Subtract all Personnel for B/4000

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[redacted]

PLAN NO. 1

Airplanes Type	Groups	No. of Operating Airplanes	Pilots Factor	Pilots Number	OFFICERS Navigators	OFFICERS Bombardiers	OFFICERS Obs. Gunner	OFFICERS B.I.	ENLISTED MEN Combat Crews Bombardiers	ENLISTED MEN Combat Crews Radio	ENLISTED MEN Combat Crews Engr.	ENLISTED MEN Combat Crews Arm.	Monthly Pilot Attrition
B/4000	(44)	2992	7.5	22440	8976	2992				8976	5984	2992	3758
B/2000	(24)	1632	5.5	8976	3264	1632				3264	1632	1632	1502
B/17	(47)	3266	3.5	11431	3266	1698			1568	3266	3266	3266	1113
B/25	(10)	850	3.5	2975	850	400			450	850	850	850	501
B/L	(13)	757	1.5	1136	757	159			598			757	63
D/B	(13)	1004	1.5	1506								1004	84
P/I	(54)	8970	1.5	13455									1014
P/LR	(6)	780	3.5	2730	780		1560					1521	441
Obs.	(108 Sq.)	1521	1.5	2282	1521	506	1521		1015			1521	147
Photo	(2)	114	2.5	285			114			114	114	114	58
Transport	(32)	2048	3.0	6144	2048		2048			2048	2048		306
Air Base	(245)												
Air Depot	(157)												
Total T.U.		23934		73360									
Tot. Tech. Sch. 27			24	648									8987
Tot. Fly. Sch. 72.3		36149	380	27474									
Total overhead				2000									
Grand Total		60985		103482	21462	7387	3195		3631	18518	13894	12136	8987

* 1 per B/4000 Gp. and B/2000 Gp.
1 per other two Groups.

PLAN NO. 2

OFFICERS

Airplanes Type	Groups	No. of Operating Airplanes	Pilots Factor	Pilots Number
B/2000	(24)	1632	9.5	15504
B/17	(20)	5266	5.5	7480
	(27)		3.5	6426
B/25	(10)	850	5.5	4675
B/L	(13)	757	1.5	1136
D/B	(13)	1004	1.5	1506
P/I	(54)	8970	1.5	13455
P/LR	(6)	780	3.5	2730
Obs.	(108 Sq.)	1521	1.5	2282
Photo	(2)	114	2.5	285
Transport	(32)	2048	3.0	6144
Total T.U.		23934		61623
Tot. Tech. Sch.	27 a		a 24	648
Tot. Fly. Sch.	57 b		b 380	21660
Tot. Fly. Sch.	74 c	28400	c 380	28120
Total overhead				2000
Grand Total		52334		b 83931 c 90391

ENLISTED MEN
Combat Crews

Navigators	Bombardiers	Obs. Gunner	B.I.	Bombardiers	Radio	Engr.	Arm.	Monthly Pilot Attrition
6528	3264				6528	3264	3264	2594
6532	3396			1568	6532	6532	6532	1254
								315
1700	800			450	1700	1700	1700	787
757	159			598			757	63
							1004	84
								1014
780		1560						441
1521	506	1521		1015			1521	147
		114			114	114	114	58
2048					2048	2048		306
								7063
19866	8125	3195		3631	16922	13658	14892	7063

a - Requirements for 27 Technical Schools.
b - Requirements for 56.8 type Flying Schools (See par. 6 of Plan No. 2). Do not add (c) if this number of schools used.
c - Requirements for 74.1 type Flying Schools (See par. 9 of Plan No. 2). Do not add (b) if this number of schools used.

[redacted]

Military Use	Tactical	Trainer	Total		
Army	25,290	18,133	43,320		
Navy	7,683	186	9,544		
Army Defense Aid	7,557	1,900	9,457		
Navy Defense Aid	450	150	600		
British	7,305	1,090	8,395		
Other Foreign	578	186	764		
Total Military	48,863	23,320	72,183	.....	72,183
Commercial Transport Use					
United States			295		
Other Foreign			58		
Total Commercial Transports			353	.....	353
Total Program (Excluding Fill-in)			72,536		
Fill-in Program			16,437	.....	16,437
Grand Total			88,973	.....	88,973

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[redacted]

III. THE ARMY PROGRAM.

1. Pursuit Airplanes.

Present Army schedules contemplate the procurement of some 9600 airplanes by June 30, 1943. 1600 will be two-engine and the remainder single-engine. Allowing arbitrarily for a peacetime operational loss of about 1900, the Army should have on hand about 7700 pursuit airplanes. By the letting of "fill in" contracts, total procurement cna be increased some 500 two-engine and 2300 single-engine airplanes. If these additional airplanes are allocated to the Army, the Army can have some 9900 pursuti airplanes in service by June 30, 1943.

2. Heavy Bombardment Airplanes.

Under present schedules, the Army will receive some 3400 heavy bombardment airplanes by June 30, 1943. Of this total, about 3300 will be fifty thousand pound airplanes, 2 will be seventy-five thousand pound airplanes, and the remainder, (about 105), one-hundred thousand pound airplanes. Allowing arbitrarily for a loss of 500 airplanes due to peacetime operations, the Army should have on hand by June 30, 1943 some 2900 heavy bombardment airplanes. "Fill-in" orders will not appreciably affect the total quantity that can be obtained prior to 1 July, 1943, but will exercise a material influence on deliveries after that date.

3. Medium Bombardment Airplanes.

By June 30, 1943 the Army under present procurement programs will receive some 4400 medium bombardment airplanes. Allowing for the number now on hand and for an arbitrary loss of some 800 because of peacetime operations, the total in service by June 30, 1943 should be about 3700. The letting of "fill-in" orders at this time will increase total production some 1100 airplanes. If these additional airplanes are allotted to the Army, there will be in service on June 30, 1943 some 4600 medium bombardment airplanes.

4. Light Bombardment Airplanes (including dive bombers).

Present procurement schedules provide the Army with some 1350 light and dive bombers by June 30, 1943. Considering the airplanes

on hand and allowing arbitrarily for a loss of some 300 due to peacetime operations, the total in service on that date should be about 1050. By the letting of "fill-in" orders, the output of light and dive bombers can be increased some 1800 airplanes. If these additional airplanes are allocated to it, the Army will have some 2600 light bombardment and dive bombing airplanes.

It is to be noted that present production schedules provide no reconnaissance airplanes as such. Current plans contemplate the utilization of a light bomber type for the purpose. The number of airplanes actually available for light bombardment purposes will therefore be dependent on the number of light bombardment airplanes utilized for reconnaissance purposes.

5. Observation Airplanes.

The Army is scheduled to receive 443 observation airplanes (C & D) by February 28, 1942. With an arbitrary peacetime loss total of 80, there should be some 350 on hand serviceable by June 30, 1943.

6. Transport and Amphibian Airplanes.

a. Under present schedules the Army will have received the following quantities of transports by the dates indicated:

Transports, 4-Engine -	Jan. 31, 1943	61
Transports, 2-Engine -	June 30, 1943	1235
Amphibians	Dec. 31, 1942	150

It is arbitrarily assumed that about 50 four-engine and 1000 two-engine transports and 90 amphibians will be in service by June 30, 1943.

b. By the letting of "fill-in" contrasts at this time, some 40 additional four-engine and 493 additional two-engine transports can be produced by June 30, 1943. If they are allocated to the Army, the Army should have in service some 80 four-engine and 1400 two-engine transports at that time.

7. Training Airplanes.

a. Under the present schedules, the Army will have secured the following airplanes by the dates indicated.

(1) Primary trainers: Aug. 30, 1942 - 4216. Estimated quantity on hand June 30, 1943, including those now in service: 5000.

(2) Basic trainers: June 30, 1943 - 5085. Estimated quantity then on hand, including those now in service: 5000.

(3) Advanced trainers: March 31, 1943 - 3033. Estimated quantity on hand June 30, 1943, including those now in service: 3100.

(4) Transition, crew and navigation trainers: March 1943 - 3606. Estimated quantity on hand June 30, 1943, including those now on hand: 2800.

b. By letting "fill-in" orders, the following additional trainers can be produced by June 30, 1943.

(1) Primary trainers	3150
(2) Basic trainers	2123
(3) Advanced trainers	2095
(4) Transition, crew and navigation trainers	2200

8. Attrition rates.

In deducing the number of airplanes the Army reasonably may be expected to have in service on June 30, 1943 under present production programs an arbitrary peace-time attrition rate has been employed that is somewhat less than the accepted war-time rate of 3% per month. The change in the method of building airplanes and the nature of the materials used, as well as the intensive training pilots are receiving render th value of previous attrition tables somewhat doubtful. On the other hand, previous experience would indicate that for peace-time operations, an attrition rate of 3% per month is high.

9. Army Defense Aid Procurement.

The figures cited in this section for the Army Program do not include Army Defense Aid Procurement. To round out the Army Procurement picture as a whole the following totals of Army Procurement for Defense Aid are included:

Pursuit - 1E	Oct. 31, 1942	2413
Heavy Bomber	June. 30,1943	1000
Medium Bomber	Feb. 28, 1943	1250
Light & Dive Bomber	Feb. 28, 1943	2359
Transport - 2E	Dec. 31, 1942	435
Transport - 1E	Jan. 31, 1942	100
Trainers, Adv.	Feb. 28, 1942	1600
Trainers, Basic	June 30, 1942	300
Total		9457

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IV. ARMY AIRPLANES ON HAND - JULY 31, 1941.

The Army had on hand as of July 31, 1941 the following airplanes suitable for employment in the accomplishment of their basic missions.

Pursuit - Interceptor	457
Pursuit - Fighter	1
Heavy Bombers	70
Medium Bombers	167
Light Bombers	121
Photographic	14
Transport	89

Training:

Primary	2080
Basic	1435
Advance - 1E	938
Advance - 2E	94

V. NATIONAL MONTHLY PRODUCTION RATE.

The scheduled overall monthly production rate in June 1943, plus the production that would result from the "fill-in" program discussed in 8-F is as follows:

Type	Procurement Program	"Fill-in" Program	TOTAL MONTHLY PRODUCTION RATE
Heavy Bomber	500		500
Patrol Bomber 4E	40		40
Medium Bomber	275	235	510
Patrol Bomber 2E	67	20	87
Light Bomber	50	355	405
Torpedo Bomber	45		45
Pursuit 2E	50	30	80
Pursuit 1E	294	491	785
Observation 2E			
Observation 1E		50	50
Transport 4E		8	8
Transport 2E	62	88	150
Transport 1E		17	17
Amphibian 2E			
Trainers. Crew		40	40
Trainers. Navigation			
Trainers. Transition		275	275
Trainers. Advanced		435	435
Trainers. Basic	25	350	375
Trainers. Primary		270	270
TOTAL	1408	2664	4072

[redacted]

PERSONNEL REQUIREMENTS - TECHNICIANS

PLAN NO. 1a and 2a.

1. a. If funds available September 1, 1941 new technical schools can open March 1, 1942.
   b. Assumption has been made that required airplanes will be made available from somewhere.
   c. First graduate available 5½ months from March 1, 1942 or August 15, 1942.

2. a. Technicians required for combat units 443,033
   Technicians required for Pilot schools 120,950 (56.7 type schools
   Technicians required for Technical schools 35,000 assumed
   598,983

   b. Shortage on 8/15/42 598,983 - 121,256 = 477,727
   Technicians trained in existing schools
   8/15/42 to 7/1/43 87,497
   390,230 shortage.

3. From present technical training facilities
   Technicians available 8/1/41 43,056
   School graduates 8/1/41 to 8/15/42 78,200
   121,256

4. a. Increase in annual technical training rate effective 8/15/42 446,592
   b. Additional type schools - 22
   c. Annual technical training rate (output) 546,592

[redacted]

PERSONNEL REQUIREMENTS - PILOT

PLAN NO. 1

1. a. Technicians required for 54 Group Program are on hand or now being trained in Technical Schools or Units.

   b. Technicians required for 30,000 Pilot Training Pilot Training Program will graduate from Technical Schools by April 30, 1942.

   c. An output of 9,000 technicians per month will be available for additional pilot training expansion starting in May 1942.

2. From present pilot training facilities

   a. Pilots available 3/1/43 — 31320
   Less 2½% per year attrition — 1320 (approximate)
   30000

   (1) 30,000 pilots on hand 3/1/43
   36,136 pilot increase from 3/1/43 to 7/1/43
   66,136 on hand 7/1/43.

   b. (1) Pilots required for combat units — 73,360
   (2) Pilots required for Pilot Schools — 27,360
   (3) Pilots required for overhead — 2,000
   102,720

   c. Shortage (b - a) — 72,720

   d. Annual rate of attrition including schools — 108,528

   e. Schools required to sustain this rate
   108528 ÷ 1500 = — 72.3

   f. Annual rate of attrition governs.

3. Expansion of Pilot Training

   a. Primary training can start May 15, 1942 and by operating with 50% of technicians required can be in full operation by July 15, 1942.

   b. First full capacity class will graduate March 1, 1943.

4. Pilot output per month for 72.3 type schools = 9,044

5. Status on July 1, 1943

Pilots required	102,720
Pilots on hand	66,136
Short	36,584

6. Date objective can be met
   9044/36131 / 4

7. From 5 and 6 above add 4 months to 7/1/43 = November 1, 1943

8. We can't go to war prior to November 1, 1943 without moving date of completion ahead in proportion to war time attrition.

9. Present set-up will be required to operate for six months on 50% of required technicians.

[redacted]

PERSONNEL REQUIREMENTS - PILOT

PLAN NO. 2

1. a. Technicians required for 54 Group Program are on hand or now being trained in Technical Schools or Units.
   b. Technicians required for 30,000 Pilot Training Program will graduate from Technical Schools by April 30, 1942.
   c. An output of 9,000 technicians per month will be available for additional pilot training expansion starting in May, 1942.

2. From present pilot training facilities.
   a. Pilots available 3/1/43 — 31,320
      Less 2½% per year attrition — 1,320 (approximate)
      30,000

      (1) 30,000 on hand 3/1/43
      28,412 increase from 3/1/43 to 7/1/43
      58,412

   b. (1) Pilots required for combat units — 61,623
      (2) Pilots required for Pilot schools — 21,567
      (3) Pilots required for Overhead — 2,000
      Total — 85,190

   c. Shortage. b - a = 55,190.

   d. (1) Annual rate required for attrition — 85,236
      (2) Number schools required - 56.8 type schools

   e. Annual attrition rate governs.

3. Expansion of Pilot Training
   a. Primary training can start May 15, 1942 and by operating with 50% of technicians required can be in full operation by July 15, 1942.

   b. First full capacity class will graduate March 1, 1943.

4. Status on July 1, 1943.

Pilots required	85,190
Pilots on hand	58,412
Short	26,778

5. Date objective can be met
   7/103/26,778 / 3.76

6. From 4 and 5 above — 7/1/43
   + 4 months
   November 1, 1943.

[redacted]

7. We can't go to war prior to November 1, 1943 without moving date of completion ahead in proportion to war time attrition.

8. Present set-up will be required to operate for six months on 50% of required technicians.

9. By providing 74.1 type Pilot schools instead of 56.8 type Pilot schools, program can be met by September 1, 1943.

TAB NO. 18

WEATHER--ITS INFLUENCE IN ALL THEATRES

INDEX (con't)

Subtab.

18 e. Near East and Africa.

Chart (1)
Summaries:
India
Near East
North Africa
West Africa
Central Africa
South Africa

TAB NO. 18 a.

WESTERN HEMISPHERE

ICELAND

General Flying Conditions:

The weather is generally quite unfavorable for flying. The most favorable months for flying operations are June, July and August. During the remainder of the year and particularly in the mid-winter months, there are almost continuous storms centered over the Icelandic region. The yearly average cloudiness is between 6 and 8 tenths. During the winter months there are severe icing conditions almost continuously.

GREENLAND

General Flying Conditions:

The east coast of Greenland has slightly better weather than Iceland. The west coast of Greenland has considerably better weather than the East Coast.

For the east coast of Greenland the summer months are the most favorable for flying operations. In winter this region is subject to much low cloudiness, fog and frequent high winds of gale force. There is relatively little precipitation.

For the west coast of Greenland the most favorable flying months are during the winter period when the average cloudiness is from 3 to 5 tenths. The summer months are marked by 6 to 8 tenths cloud cover and 2 to 4 inches of precipitation.

NEWFOUNDLAND

General Flying Conditions:

The yearly average of flying conditions for this region is not great. Over the eastern district there is widespread and abundant fog throughout the entire year. The average summer cloudiness is about 6 tenths. The summer is relatively short, from the middle of April to the middle of September.

During the winter period there is an abundant low cloudiness and frequent periods of stormy weather. This region lies in the path of most of the storms which originate in the United States and move off to the northeast. The winter period is marked by very poor flying conditions, when low ceilings and severe icing conditions will prevail much of the time.

ALASKA

General Flying Conditions:

The region south and west of the mountain ranges is not favorable to flying operations during any period of the year. Frequent cloudiness and much precipitation marks this region. The most favorable months for this region are from June through August.

North and east of the mountain ranges there is generally good flying conditions throughout the entire year with the best possible conditions prevailing from November through March. During this period there is an average cloud cover of from 4 to 6 tenths. There is relatively little precipitation, averaging something less than 2 inches per month.

BERMUDA

General Flying Conditions:

Very good during the summer period from April to October; good during the winter period.

During the winter period, there are occasional periods when storms generating off of the southeast coast of the United States move over the Bermuda area and may limit flying operations for several days.

THE CARIBBEAN

General Flying Conditions:

This area is marked by generally good flying weather the year around. The most unfavorable period for flying operations is during the months of August through November when this area may be subject to equally weather and hurricanes. During the winter there are occasional line squalls, but they are usually of little consequence to flying operations.

NORTHWESTERN SOUTH AMERICA

General Flying Conditions:

Conditions limited by heavy rains and cloudiness in the mountainous regions from Panama through Ecuador. The best flying conditions could be expected during the period November through February. Heavy rains persist in the mountains and coastal region throughout the entire year.

NORTHERN SOUTH AMERICA AND BRAZIL

General Flying Conditions:

Heavy rains particularly in the afternoon prevail along the north coast of South America with the maximum rainy season from January through June. The eastern part of Brazil does not lie in this heavy rain belt. Cloud cover decreases from west to east. Over the eastern half of Brazil and extending down to the area of Rio de Janeiro there is a marked decrease in the monthly average of cloudiness. The average cloud cover is from 4 to 5 tenths.

The east coast of Brazil has bery favorable flying weather throughout the entire year. However, the winter period in that region south of Victoria may have periods of several days when flying operations would be limited.

SOUTHERN SOUTH AMERICA

General Flying Conditions:

From Peru to central Chile the most favorable flying months are from November through March, but conditions are generally good throughout the entire year. Low stratus clouds will prevail along the coasts of Peru and Chile reaching a maximum in the period March through October; and there are frequent and widespread storms over the mountain ranges during the afternoon periods.

From southern Brazil to central Argentina flying conditions are most favorable from November through February, and are generally good throughout the entire year. This region is, however, frequently subject to weather disturbances during the period from April through September which would limit flying operations.

The region of southern Chile and Argentina is generally very poor throughout the entire year, having continuous storms, cloudiness and precipitation.

TAB NO. 18 b.

EUROPE

THE BRITISH ISLES

General Flying Conditions:

The most favorable flying weather is in the period from March through June. This is commonly known as the dry period or when there is the least frequency of storms passing over the British Isles. The average sky cover for this period ranges between 6 and 7 tenths. Icing levels are quite low in March and April.

The rainy season starts in August and continues through January. Winter storms pass both north and south of the Islands and frequently center over the Islands. There is an abundance of low cloudiness and severe icing conditions. Throughout England there is much fog and poor visibility especially to the windward side of the industrial regions.

SOUTHERN EUROPE

General Flying Conditions:

Northern France has weather very similar to that in western Germany and in southeastern England. The summers are favorable for flying whereas the winters will have frequent and long periods of poor flying weather.

The central European region is marked by heavy cloudiness and much precipitation during the months from September through March. Flying conditions are poor during this period. During the summer period they improve considerably, but would be somewhat limited during the afternoon periods due to frequent convectional storms in the mountain regions.

Southern Europe is marked by good to excellent flying conditions during the months of May, June, July, August and September. There is very little cloudiness and rain over this region during this period. During the winter months, there is about 6 tenths average cloud cover and frequent periods when flying operations would be limited due to low clouds and low level icing conditions.

Met. Report GERMANY

Time:

Winter, (December, January, February)

General Flying Conditions:
Poor; frequent and long periods of low ceilings, poor visibilities. and severe icing conditions.

Cloud Cover:
On the average more than 75%.

Ceilings:
50% are less than 3500 feet.
12% are between 3500 and 10,000 feet.
12% are between 10,000 and 25,000 feet.
26% are more than 25,000 feet.
(These statistics must be further interpreted. They indicate the percentage of the time when the ground is visible from a designated altitude. Decks of lower broken clouds may be expected most of the time. Hence, it is believed that not more than 5 to 10 per cent of the time will there be a ceiling of more than 20,000 feet.)

Precipitation:
An average of 15.3 days per month.

Thunderstorms:
Rare; only an occasional one with a cold front passage.

Fog:
December: 6 days, (20%)
January: 6 days, (20%)
February: 5.2 days, (17%)

Visibility:
25% of morning periods less than 2 miles
15% of afternoon periods are less than 2 miles.

[redacted]

Met. Report GERMANY

Time:
Autumn (September, October, November)

General Flying Conditions:
September: Good
October: Fair, occasional periods bad weather.
November: Poor, frequent occasions of bad weather and winter conditions.

Cloud Cover:
More than 6 tenths cover from Frisian Islands to Brocken.
Eastern and southeastern Germany have about 5 tenths cover in September, increasing through October and November.
Average cloud cover in November is about 75%.

Ceilings:
50% are 4000 feet or less.
15% are between 4000 and 20,000 feet.
9% are between 20,000 and 30,000 feet.
25% of the time the ground may be seen from 30,000 feet.
(These statistics must be further interpreted. They indicate the percentages when the ground may be seen from the designated altitude. Decks of lower broken clouds may be expected a great part of the time. Hence it is believed that not more than ten per cent of the time will a ceiling be found of more than 20,000 feet.)

Precipitation:
An average of 14.6 days per month.
A decrease from west to east over Germany.

Thunderstorms:
September: Few Scattered.
October: Rare.
November: Rare.

Fog:
September: 3 days, (10%)
October: 5 days, (17%)
November: 6 days, (20%)

Visibility:
Approximately 20% of the time the visibility will be less than 2 miles during the morning period; 8% of the time it will be less than 2 miles all day. The industrial areas have greater frequency of poor visibility.

[redacted]

Time:
Summer (June, July, August)

General Flying Conditions:
Good in western and northern Germany.
Excellent in southeastern district north of the mountains.
Fair in the mountainous region of southern Germany.

Cloud Cover:
Approximately 6 tenths; somewhat less in the southeastern district; cumulous types of clouds prevail.

Ceilings:
50% are 9,000 feet or less.
10% are between 10,000 and 20,000 feet.
8% are between 20,000 and 30,000 feet.
32% are more than 30,000 feet.
(These above percentages should be somewhat modified, since they represent the percentage of frequencies when the ground was visible from the designated altitude. It is believed that not more than 10 to 15 per cent of the days will be found with a ceiling more than 30,000 feet.)

Precipitation:
An average of 14.2 days per month.
Rain principally of the shower type. As many as 18 days per month in the Northwest district of Germany.

Thunderstorms:
Very common.
Six per month at most stations during the months of June and July.
Frequency even higher in the mountains of southern Germany.

Fog:
Rare.
Sometimes occurs during the morning periods in or near industrial areas.

Visibility:
Fair to good.

Time:
Spring (March, April and May)

General Flying Conditions:
March: Poor, frequent low ceilings, icing and fog.
April: Improving slowly.
May: Fair, approaching summer conditions.

Cloud Cover:
Coastal Region averages 6.5 to 7 tenths
Lowland central region 6 tenths
Mountainous Region 7 to 7.5 tenths

Ceilings:
50% are 5000 feet or less
14% are between 5000 and 20,000 feet.
10% are between 20,000 and 30,000 feet.
26% of the time the ground may be seen from 30,000 feet.
(These statistical figures are subject to further interpretation. They indicate the percentage of frequencies when the ground is visible from the heights indicated. Therefore in view of the method of arriving at the above statistics it must be assumed that there are frequent conditions of visibility of the ground from a designated altitude in spite of a rather heavy cloud cover at a lower altitude. It is believed that not more than ten per cent of the days of this period will be found with an actual ceiling of more than 20,000 feet.)

Precipitation:
Average of 13 days per month.

Thunderstorms:
March: An occasional thunderstorm
April: An average of one at most stations.
May: An average of two to three at most stations.

Fog:
March: Four days.
April: Two days.
May: One day.

Visibility:
Frequent general low visibility during early morning.
10% of the days will have visibility of less than 2 miles.

Time:
Winter: November, December, January and February

General Flying Conditions:
Poor, frequent and long periods of low clouds, and poor visibility; severe icing conditions.

Cloud Cover:
More than average 8 tenths cloud cover in most areas; days with little cloud are rare; clouds are generally of the sheet type and very low.

Ceilings:
60% are 1600 feet or less;
12 to 15% are more than 8000 feet.

Precipitation:
Average 15 days per month; chiefly snow.

Thunderstorms:
Rare.

Fog:
November; 6 days (20%)
December: 5.5 days (18%)
January: 4.0 days (14%)
February: 3.4 days (11%)

Visibility:
25% of the mornings are less than 2 miles.
12 to 15% of the afternoons are less than 2 miles.

Time:
Autumn: September and October.

General Flying Conditions:
Very good in September but becoming very limited in the latter part of October.

Cloud Cover:
Broken cumulous types in September which become stratocumulous in October.
Low sheet type clouds are common in October.
Average cloud cover 6.3 tenths.

Ceilings:
25% are less than 1000 feet.
50% are less than 2000 feet.
25% are more than 8000 feet.

Precipitation:
Average of 14 days per month.

Thunderstorms:
One day in September; rare in October. More frequent in the Carpathian Mountains.

Fog:
September; 3 days (10%)
October: 4.9 days (16%)

Visibility:
12% of morning periods are less than 2 miles.
5% of afternoon periods are less than 2 miles.

Time:
Summer (May, June, July and August)

General Flying Conditions:
Very good to excellent.

Cloud Cover:

Average amount 5.85 tenths.
Broken cumuliform clouds predominate.

Ceilings:
15% are less than 1000 feet.
50% are 3500 feet or less.
35% are more than 8000 feet.

Precipitation:
Considerable rainfall principally of the shower type.
Average of 14 days rain per month.

Thunderstorms:
Normal Frequency of 5 per station per month.

Fog:
May: 1.4 days
June: .96 days
July: 1.0 days
August: 1.2 days

Visibility:
Generally very good.

Time:
Spring, (March and April)

General Flying Conditions:
Coastal Region poor with progressive improvement.
Inland Region slightly better than coastal region.

Cloud Cover:
Frequent periods of low clouds especially over the coastal region and the Carpathian Mountains.
Sky more than 8 tenths covered from 10 to 12 days of the month.

Ceilings:
50% are 3000 feet or less.
35% are more than 8000 feet.

Precipitation:
13.1 average days per month.
4 to 6 days snow in west region in March.
6 to 8 days snow in east region in March.
2 to 3 days snow in first part of April.

Thunderstorms:
Rare in March.
Most stations report an occasional storm in April

Fog:
3.2 days in March
1.8 days in April

Visibility:
10% of morning periods less than 2 miles.
3% of afternoon periods less than 2 miles.

[redacted]

TAB NO. 18c

PACIFIC

HAWAII

General Flying Conditions:

Very good throughout the year. The average cloudiness is less than four tenths.

THE PHILIPPINES

General Flying Conditions:

Flying is generally limited by the tropical nature of the weather. Certain local areas are greatly affected due to orographic features. The general period of heavy rains and storms is from June through December. The most favorable flying conditions may be expected from January through May.

SOUTH SEA ISLANDS

General Flying Conditions:

The most favorable period for flying operations is from May through September. From November through April there is considerable cloudiness and frequent storms. The average cloudiness during this period is from six to seven months.

AUSTRALIA AND NEW ZEALAND

General Flying Conditions:

Generally excellent the year round. New Zealand and the western and northeastern part of Australia have rather heavy rain and considerable cloudiness from December through March. In these areas during this period flying operations may be expected to be subject to frequent weather interruptions.

DUTCH EAST INDIES

General Flying Conditions:

Flying operations could be expected to be somewhat limited throughout the entire year due to the heavy rains, squalls and violent thunderstorms. The morning periods should be found to be reasonably favorable for flying, and certain sections of the islands would have very good flying weather throughout the day. The average cloudiness is about six tenths with a marked increase after the noon hour.

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[redacted]

TAB NO. 18d.

ASIA

CHINA

General Flying Conditions:

Best conditions should be expected during the months of December, January, February, March and April. There is little precipitation with the exception of the southeastern region, and the average monthly cloud cover should be from 3 to 5 tenths.

During the months from May to December is the monsoon season when the region is usually marked by 6 to 9 tenths cloud cover, and has an abundance of precipitation.

JAPAN

General Flying Conditions:

Flying operations would be greatly limited during the summer months of March through November. This is the period marked by moist air, much cloudiness and frequent rain. The maximum rain and cloudiness period is the period June through July.

The most favorable flying months are during the winter. However, there are regions of heavy precipitation on the island during the winter months. There are frequent passages of storm centers from the South China Sea to the Bering Straits.

BURMA, SIAM AND INDO CHINA

General Flying Conditions:

Reasonable clear sky conditions may be expected to prevail during the last half of November, December, January, February, March, April and May. Less than 4 inches of precipitation per month can be expected in December, January, February and March. The rains start increasing in April and reach a maximum of over 16 inches per month in August and September.

Met. Report SIBERIA

Time:
Summer, June, July, August

General Flying Conditions:
Artic Region: Very good
West Central Region: Very good
East Central Region: Very good to Excellent
Amur and Southeastern Region: Very good

Cloud Cover:
Arctic Region: 10 to 15 percent clear; 30 to 50 percent overcast.
West Central Region: 10 to 15 percent clear; 30 to 50 percent overcast.
East Central Region: 10 to 15 percent clear; 25 to 40 percent overcast.
Amur and Southeastern Region: 8 to 10 percent clear; 30 to 50 percent. overcast; along the coastal region and Kamchatka Island there is a high percentage of low overcast and coastal fog.

Precipitation:
Arctic Region: An average of 14 days per month; light
West Central Region: An average of 14 days per month; light
East Central Region: An average of 9 days per month; light
Amur and Southeastern Region: An average of 10 days per month; moderate.

Thunderstorms:
Arctic Region: None.
West Central Region: An average of 3 to 5 per month
East Central Region: Rare
Amur and Southeastern Region: An average of 2 to 3 per month.

Fog:
Arctic Region: Occasional
West Central Region: Rare
East Central Region: Rare
Amur and Southeastern Region: Inland districts rare, but frequent and widespread areas along the coast from Vladivostok to the Bering Straits. Along this area there will be fog from 50 to 60 percent of the month.

Remarks:
The summer in Siberia is very short. During this period there is relatively warm weather with an average temperature of about 60 degrees Fahrenheit.

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Met. Report SIBERIA

Time:
Winter: September through May

General Flying Conditions:
Very good to excellent

Cloud Cover:
Arctic Region: 8 to 9 clear days per month
West Central Region: 5 to 7 clear days per month
East Central Region: 10 to 15 clear days per month
Southern Region: Generally clear, average less than 4 tenths sky cover.

Precipitation:
Arctic Region: Light; about ten days per month of snow.
West Central Region; Less than 1 inch per month; average of 8 to 14 days per month, principally light snow.
East Central Region: Less than 1 inch per month; average 5 to 10 days per month of light snow.
Amur and Southeastern Region: Less than 1 inch per month; average 2 to 8 days per month half of which is snow.

Thunderstorms:
None in Arctic Region; Occasional one in May and September in the West Central Region; none in the other regions.

Fogs:
Few radiation types; more frequent heavy frost.

Remarks:

Winters are extremely dry and cold. The average temperature through the Central Region is on the order of minus 30 to 40 degrees Fahrenheit for the mid-winter period.

Met. Report RUSSIA

General Flying Conditions:

January:
Fair: generally little precipitation but 7 to 8 tenths cloud cover.

February:
Fair:
Western Russia, 7 tenths average sky cover.
Eastern Russia, 4 to 6 tenths average sky cover.
Turkestan area generally clear.

March:
Fair to good;
Western Russia 6 to 7 tenths average sky cover.
Eastern Russia 4 to 5 tenths average sky cover.
Turkestan area clear to 4 tenths average sky cover.

April:
Good;
Average sky cover from 5 to 6 tenths; less than 2 inches of precipitation.

May:
Good;
Average sky cover of 5 to 6 tenths; 2 to 4 inches of precipitation.

June:
Very good;
Average sky cover 5 tenths; 2 to 4 inches of precipitation.

July:
Very good;
Average sky cover 4 to 5 tenths; 2 to 4 inches precipitation.

August:
Very good;
Average sky cover 4 to 5 tenths; 2 to 4 inches precipitation

September:
Very good;
Average sky cover 4 to 5 tenths; 2 to 4 inches precipitation.

October:
Northern Russia; Poor; much low cloudiness, average 8 tenths sky cover.
Southern Russia: Good; Average sky cover 3 to 6 tenths

November:
Poor: Average sky cover 7 to 8 tenths.

December:
Poor: Average sky cover 7 to 8 tenths.

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[redacted]

TAB NO. 18 e

NEAR EAST AND AFRICA

INDIA

General Flying Conditions:

Reasonably fair skies and favorable flying conditions may be expected during the last half of November, December, January, February and March. The Monsoon or rainy season begins in April and reaches a maximum of more than 16 inches per month in July. The rainy season may be expected to greatly limit flying operations. In northern India along the mountain ranges the rain is extremely heavy.

NEAR EAST

General Flying Conditions:

The most favorable flying weather may be expected during the months of June, July, August and September for the region around Asia Minor. There is very little rain and cloudiness during this period. From Asia Minor east to the border of India, flying conditions are very good to excellent during the entire year. The skies are generally clear and there is very little rain.

NORTH AFRICA

General Flying Conditions:

Very good the year around. Occasional sandstorms will limit flying principally during the winter months.

[redacted]

WEST AFRICA (DAKAR--LIBERIA--MORROCCO)

General Flying Conditions:

Very good to excellent conditions from Dakar north through Morrocco during the entire year. In the region of Sierre Leone and Liberia there is weather of a more tropical nature with considerably more rainfall and cloudiness. The wet season in this region is in the period from June through September, with the maximum rainfall in August.

CENTRAL AFRICA

General Flying Conditions:

Best conditions should be expected in November, December, January ad February. The remainder of the year finds this area marked by moderate to heavy rains expecially along the coastal region from Senegal to the Congo River. There is a maximum rainfall in June and September with heavy rains generally from April through October. Inland over the region south of the Sahara, conditions are quite favorable for flying the year around. Dense desert haze similar to fog, however, may limit flying for several days.

SOUTH AFRICA

General Flying Conditions:

Along the wet coast the conditions are reasonably good during the entire year, but most favorable from April through October. From November through May, there is an increase in rainfall.

Along the east coast and in the central region, there is heavier rainfall and considerably more cloudiness during the entire year. The best months for flying operations are May through September.

AIR CORPS — GROUND PERSONNEL FOR PLAN NO. 1 AND PLAN 2 — SERVICES [redacted]

Airplanes	#	Grd. Officers A.P.	Technicians	Non-Technicians	Officer Services	Enlisted Men
B/4000 (44)		1584	48488	26136	748	12892
B/2000 (24)		864	26448	14256	408	7032
B/17 (47)		1692	51794	27918	799	13771
B/25 (10)		420	10920	5880	170	2930
B/L (13)		455	9204	4953	234	5109
B/B (13)		455	9204	4953	234	5109
P/I (54)		2754	45090	24246	810	10638
P/IR (6)		270	6354	3420	90	1182
Obs. (108 sq.)		540	14796	7992	108	864
Photo (2)		72	2204	1188	34	586
Transport (32)		1024	18656	10048	160	640
Air Base (245)		7995	149940	80605	8575	122500
Air Depot*(157)		2198	49926	18369	1784	44919
Total T.U.		19923	443024	229964	14154	228172
Tot.Tech.Sch. 27 a		7344	66582	66582	1728	43200
Tot.Fly.Sch. 56.7 b		7484	120771	94008	1701	50519
Tot.Fly.Sch. 74.1 c		9781	157833	122857	2823	66023
Total Overhead		2000	25000	25000	500	5000
A.W.S.					750	150000
Miscellaneous		950	90000	90000		
Colored		800	80000	80000		
Grand Total	b	38501	825337	585354	18833	476891
	c	40798	862439	614403	19355	492395

* One Air Depot Group for Bomb. H
and two Depot Groups for all other combat Groups.

For Plan No. 2 Subtract all Personnel for B/4000

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[redacted]

Airplanes Type	Groups	No. of Operating Airplanes	OFFICERS Pilots Factor	Pilots Number	Navigators	Bombardiers	Obs. Gunner	B.I.	ENLISTED MEN Combat Crews Bombardiers	Radio	Engr.	Arm.	Monthly Pilot Attrition
B/4000	(44)	2992	7.5	22440	8976	2992				8976	5984	2992	3758
B/2000	(24)	1632	5.5	8976	3264	1632				3264	1632	1632	1502
B/17	(47)	3266	3.5	11431	3266	1698			1568	3266	3266	3266	1113
B/25	(10)	850	3.5	2975	850	400			450	850	850	850	501
B/L	(13)	757	1.5	1136	757	159			598			757	63
D/B	(13)	1004	1.5	1506								1004	84
P/I	(54)	8970	1.5	13455									1014
P/LR	(6)	780	3.5	2730	780		1560					1521	441
Obs.	(108 Sq.)	1521	1.5	2282	1521	506	1521		1015			1521	147
Photo	(2)	114	2.5	285			114			114	114	114	58
Transport	(32)	2048	3.0	6144	2048		2048			2048	2048		306
Air Base	(245)												
Air Depot	(157)												8987
Total T.U.		23934		73360									
Tot. Tech. Sch. 27			24	648									
Tot. Fly. Sch. 72.3		36149	380	27474									
Total overhead				2000									
Grand Total		60985		103482	21462	7587	3195		3631	18518	13894	12136	8987

* 1 per B/4000 Gp. and B/2000 Gp.
1 per other two Groups.

SECRET

Airplanes Type	Groups	No. of Operating Airplanes	Pilots Factor	Pilots Number	Navigators	Bombardiers	Obs. Gunner	B.I.	Bombardiers	Radio	Engr.	Arm.	Monthly Pilot Attrition
		OFFICERS							ENLISTED MEN Combat Crews				
B/2000	(24)	1632	9.5	15504	6528	3264				6528	3264	3264	2594
B/17	(20)	3266	5.5	7480	6532	3396			1568	6532	6532	6532	1254
	(27)		5.5	6426									315
B/25	(10)	850	5.5	4675	1700	800			450	1700	1700	1700	787
B/I	(13)	757	1.5	1136	757	159			598			757	63
D/B	(13)	1004	1.5	1506								1004	84
P/I	(54)	8970	1.5	13455									1014
P/LR	(6)	780	3.5	2730	780		1560						441
Obs.	(108 Sq.)	1521	1.5	2282	1521	506	1521		1015			1521	147
Photo	(2)	114	2.5	285			114			114	114	114	58
Transport	(32)	2048	3.0	6144	2048					2048	2048		306
													7063
Total T.U.		23934		61623									
Tot. Tech. Sch.	27 a		a 24	648									
Tot. Fly. Sch.	57 b		b 380	21660									
Tot. Fly. Sch.	74 c	28400	c 380	28120									
Total overhead				2000									
Grand Total		52334		b 93931 c 90391	19866	8125	3195		3631	16922	15658	14892	7063

a - Requirements for 27 Technical Schools.
b - Requirements for 56.8 type Flying Schools (See par. 6 of Plan No. 2). Do not add (c) if this number of schools used.
c - Requirements for 74.1 type Flying Schools (See par. 9 of Plan No. 2). Do not add (b) if this number of schools used.

SECRET

SECRET

TAB NO. 17

PRODUCTION PROGRAM IN AIRCRAFT

I. GENERAL DISCUSSION.

1. Incontestable figures on the national capacity to produce aircraft under an "all-out" effort are almost impossible to derive from the currently available data on production. Because time limitations render it impracticable to assemble or develop more suitable data than that contained in O. P. M. Aircraft Report No. 8-F, dated July 18, 1941, the data contained in that report has been accepted at face value.

2. Because of the limitations imposed by management, labor, machine tool and raw material considerations, it is considered that for the next two years, the production rates given in 8-F, supplemented by the proposed "fill-in" program, are the maximum rates obtainable and that therefore the production shown in the next section hereof under the heading "National Aircraft Production Program" represents the maximum national output obtainable during the period July 18, 1941 - June 30, 1943.

3. Material increase in the rate of production after June 30, 1943 will necessitate the letting of purchase contracts in the immediate future.

4. Material change in the models of aircraft to be produced will result in a decrease in the overall rate of production and hence in the total quantities produced.

II. NATIONAL AIRCRAFT PRODUCTION PROGRAM.

1. The figures cited include only airplanes on contract under current procurement programs uncompleted as of July 1, 1941, plus airplanes approved for production or on new programs approved as of July 18, 1941, plus a "fill-in" program of those airplanes which could be built after the completion of currently planned programs without exceeding currently planned productive capacity. The "fill-in" program has no official status, but is included to indicate capacity that may be available for additional procurement of production items. Statistics are taken from O. P. M. Aircraft Report 8-F.

[redacted]

[redacted]

TAB NO. 18

WEATHER--ITS INFLUENCE IN ALL THEATRES

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18 a. Western Hemisphere.

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Summaries:
Iceland
Greenland
Newfoundland
Alaska
Bermuda
Caribbean
Northwestern South America
Northern South America & Brazil
Southern South America

18 b. Europe.

Chart (1)
Summaries:
British Isles
Southern Europe
Germany
East Prussia & Poland

18 c. Pacific.

Chart (1)
Summaries:
Hawaii
Philippines
South Sea Islands
Australia and New Zealand
Dutch East Indies

18 d. Asia.

Chart (1)
Summaries:

China
Japan
Burma, Siam and Indo China
Siberia
Russia

17

[redacted]

COMPARISON OF HOSTILE AIR FORCES

Ref: July 9 directive of President to Secy War to set up objective "to exceed by an appropriate amount that available to our enemies". (TAB A)

On July 1, 1943 (Assuming RAF will be approaching ultimate strength)

(Page 9, Tab 1) GAF WILL HAVE:		(Page 1, Tab 4a) RAF, IN UK, WILL HAVE:		(Tab 17) AAF vs GERMANY	RAF+AAF	% Superiority of GAF over RAF	over AAF	over RAF+AAF
Bombers	7,245*		4,464*	0*	4,464	62%		62%
Dive Bombers	2,075		-	-	-	-	-	-
Pur. (1-Eng.)	4,092	Fighters S/R	1,664	1,680	3,344	146%	144%	22%
Fighters(2-Eng.)	1,972	Fighters L/R	640	400	1,040	208%	393%	90%
		Torpedo Bombers	120	-	120	-	-	-
		Boats-Gen. Rcn	117	-	117	-	-	-
		Gen.Rcn.Land Aps	320	-	320	-	-	-
Total Combat A/P	15,384		7,325	2,080	8,405	110%	640%	83%

2,080

* Including 800 airplanes better than B-17's or 24's (over 1000 mi R/A

* Including dive bombers and including less than 100 B-29's. Note RAF bomber strength must be less than 4464 - see next column.

* To support 4464 RAF bombers, 1100 replacements per mo. are required - G.B. can mfg 500, U.S. can mfg 500/mo by 7/1/43.

SECRET

or 24's (c or 1000 mi R/A

bomber strength must be less than 4464 - see next column.

U.S. can mfg 300/mo by 7/1/43.

In 1944 - ?

When "Interim Expedient" AAF is completed - and RAF has reached ultimate strength and GAF has not expanded at all.

GAF WILL HAVE:		RAF, IN UK, WILL HAVE:		(Page 1, Tab C) AAF vs GERMANY	RAF+AAF	% Superiority of GAF over RAF	over AAF	over RAF+AAF
Bombers	7,245*		4,464*	3,842*	8,306	62%	89%	-15% (GAF interior)
Dive Bombers	2,075		-	-		-		
Pur. (1-Eng.)	4,092	Fighters S/R	1,664	1,680(DI)	3,344	146%	144%	22%
Fighters(2-Eng.)	1,972	Fighters L/R	640	2080 400(NI)	1,040	208%	393%	90%
		Torpedo Bombers	120	-	120			
		Boats-Gen. Rcn	117	-	117			
		Gen.Rcn.Land Aps	320	-	320			
Total Combat	15,384		7,325	5,922	13,247	110%	159%	16%

* Incl. 800 better than B-17

* Incl. Dive Bombers, also incl. ? Sterling's (Superior to B-17's)

* Incl. 850 M B's, 1360 B-17's and 1632 B-29's

In 1945-46 - ?

When "Ultimate" AAF is completed
and RAF has r ached ultimate strength
and GAF has not expanded at all

GAF WILL HAVE:		RAF, IN UK, WILL HAVE:		(Page 2, Basic Study & Tab 2) AAF vs GERMANY	RAF+AAF	% Superiority of GAF over RAF	over AAF	over RAF+AAF
Bombers	7,245*		4,464*	6,834*	11,298	62%	6%	-59%
Dive Bombers	2,075		-	-		-		
Pur. (1-Eng.)	4,092	Fighters S/R	1,664	1,680(DI)	3,344	146%	144%	22%
Fighters(2-Eng.)	1,972	Fighters L/R	640	2080 400(NI)	1,040	208%	393%	90%
		Torpedo Bombers	120	-	120			
		Boats-Gen. Rcn	117	-	117			
		Gen.Rcn.Land Aps	320	-	320			
Total Combat	15,384		7,325	8,914	17,089	110%	84%	-11%

* Incl. 800 better than B-17

* Incl. Dive Bombers, also incl. ? Sterling's (Superior to B-17's)

* Incl. 850 M B's, 1360 B-17's 1632 B-29's and 2992 4000 mi radius of action Aps.

SECRET



BURMA AIRFIELDS

4. KAMAING—

A. The necessary work required to place this field for all weather use will require approximately 30 days or more. The work should include the following items:

(1) Clearing of approximately the entire area, 50 to 60 acres;

(2) Construct drainage ditches on both sides of the runway;

(3) Excavate the strip along the edge of the runway so as to have a slope of 6" in 50 feet;

(4) Construct runway 100' wide and 4200 feet long with 6" crown in subgrade and with 6" base material;

(5) All taxi and hardstand to have crown in subgrade and with 6" of base material;

(6) All earth fills to be compacted by rolling and blading.

A summary of the work is as follows:

Excavation	4000 Cu. Yds.
Base Material	11900 Cu. Yds.
Clearing	60 acres.

B. (1) Two companys of Avn Engr will require 4 to 5 weeks to complete this airport for A/W use.

(2) 6 to 7 mile haul on base material.

(3) It may be necessary to construct dykes to prevent flooding of the site.

GENERAL INFORMATION

Runway — Photo shows tree and brush growing on site no work indicated.
Deep wash indicated across present site.

Taxiway — None — Must be cleared.

Hardstand — None

Materials: Limestone in the vicinity. Needs investigation.

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WAR DEPARTMENT
Headquarters Army Air Forces
Office Chief of the Air Staff
Washington, D.C.

Date _____

TO:

Base Sales

Gp	Combat Avn	Org Sq	Hdqrs	Avn Sq
10	40	10	1350	250

Ferry Command

3	12	3	390	8
13 Gp	52 CS	13 Org	1690 Pl	33 Sq

Cab 4

A-W.P. DIVISION

X-225-E, A.C.