	High Explosive	Fuzing	Incendiary
Preferred:	1000-lb GP or 500-lb GP or 2000-lb GP	0.01 N/ND T	AN-M50 or AN-M69 (in aimable clusters for high altitude attack).
Alternative:			AN-M47 70-lb AN-M76 500-lb
Not recommended:	Smaller GP bombs SAP or AP bombs Depth bombs		

Notes: (a) Use 0.1 N fuzes if 0.01 N fuzes are not available, and 0.01 T if ND T are not available. ND tail fuzing is recommended as most of the buildings have light roof material, and are best destroyed by blast effects.

(b) The above recommendations are on a weight for weight basis.

CAMOUFLAGE, DECOYS, AND SMOKE SCREENS

Photography of 18 June 1944 indicates disruptive roof painting on all buildings. There is no indication of smoke screens or decoys.

ADDITIONAL INFORMATION

Watanabe is believed to manufacture the following operational aircraft:

(1) Glen—SE Recce Float Plane (carried by submarines)
(2) Jake SE Recce Float Plane
(3) Tokai—2E Recce

A Navy fighter is also reported to be made but none have been recovered which can be definitely associated with Watanabe.

Two of the plants reported to be assembling the aircraft manufactured at Watanabe's Zasshonoguma plant, the Tachiarai Machine Works (TARGET 90.35-1870) and the Omura Aircraft Factory (TARGET 90.36-1627), have been severely damaged by air attacks during the latter part of March. However, since final assembly operations can be performed almost anywhere the destruction of these plants would not seriously interrupt Watanabe's aircraft output even if final assembly operations of Watanabe planes were performed there.

The Gannosu Airfield in the vicinity of Wajiro-mura about 10 miles NW is reported to be used for testing the wheeled airplanes manufactured at Zasshonoguma. There does not appear to be any aircraft assembly operations at this field although a field close by, the Hakata Airfield, has considerable building capacity which might be used for assembly and post-assembly.

Holders of Joint Target Group Folders should insert this sheet in Air Target System Folder: Japanese Aircraft in place of 90.35-662-TI, page 2.

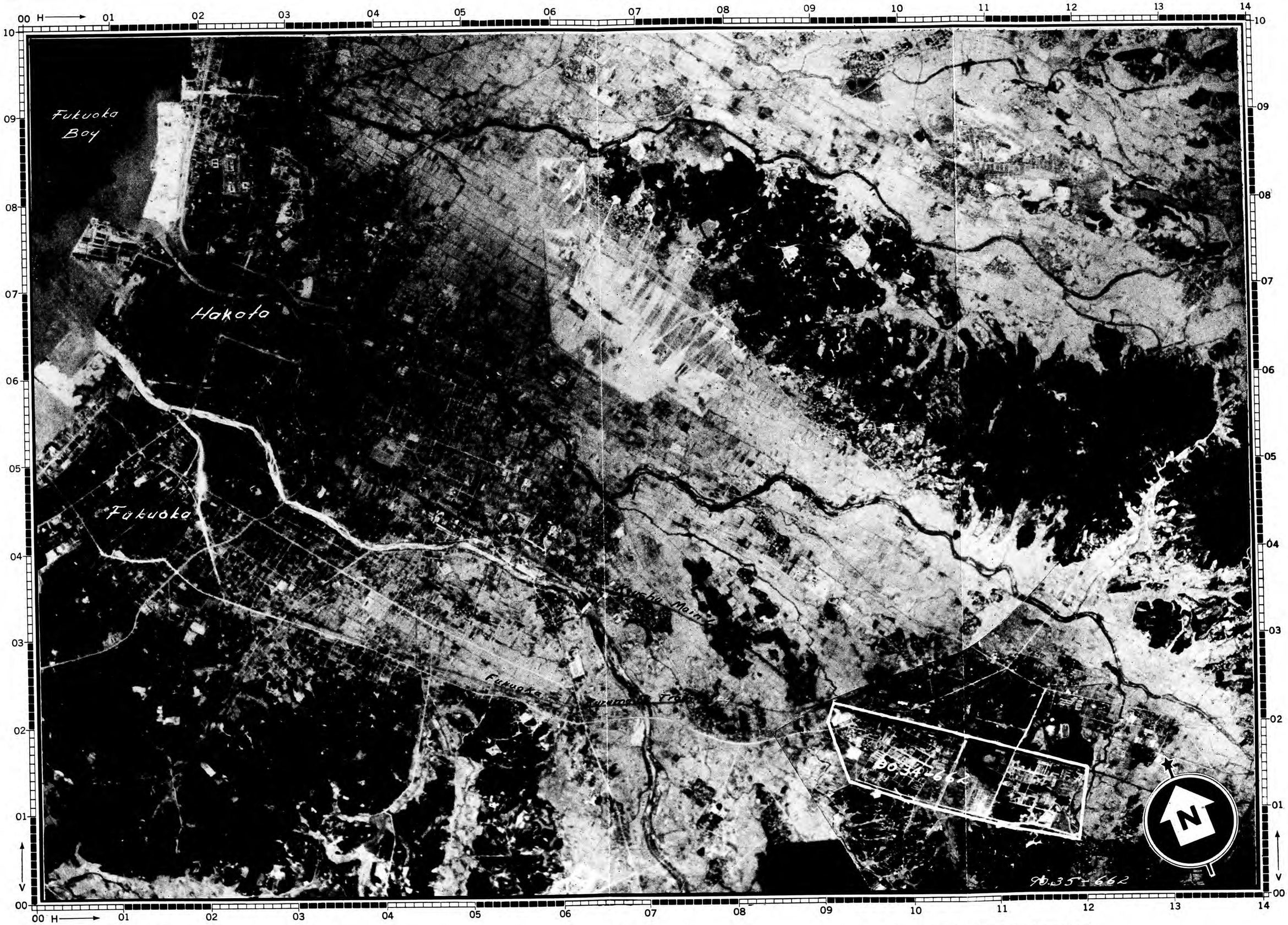
WATANABE AIRCRAFT PLANT (KYUSHU AIRCRAFT)

ZASSHONOGUMA JAPAN

0 2000 4000 6000 FEET
0 ½ 1 MILE
1:32 000 APPROX.

RESTRICTED

ILLUSTRATION No. 90.35-662 P2
DATE. . . . . 29 April 1945
TARGET No. 90.35-662
COORDINATES . . . 33°32'N 130°27'E
PHOTOGRAPHED 18 June 1944



Holders of Joint Target Group Folders should insert this sheet in Air Target System Folder: Japanese Aircraft with other 90.35-662 material.

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May be taken into the air if data is trimmed off

JOINT TARGET GROUP, WASHINGTON, D. C.

TARGET INFORMATION SHEET

SHEET . . . 90:35-2079—TI
DATE . . . . . 25 May 1945
PAGE 1

TARGET 90:35-2079
OBJ. AREA 90:35
OBJ. FOLDER . . New Target
CATEGORY
End Prdt. Ind.—AIRCRAFT

LAT. . . . . 33° 39′ N
LONG. . . . . 130° 26′ E
LAT. . . . . 10 feet

FUKUOKA SEAPLANE WORKS

FUKUOKA JAPAN

SIGNIFICANCE

This small plant at one time producing Jake float planes or possible the twin engine land plane Lorna, has recently had several buildings removed, and is of relatively minor importance in the aircraft industry. It may still be producing on a reduced scale with greater dependence on outside production of parts, or may be converting to repair or modification functions.

LOCATION

(Refer to Illustration No. 90:35-2079 P2.) Situated in NW Kyushu, on reclaimed land on the NE shore of Hakata Bay, about 5 miles NNE of the center of Fukuoka and 3000 feet NE of Najima Steam Power Station (TARGET 90:35-664) at the Tatara River mouth. A main highway forms the E boundary and the Kyushu RR to Moji runs about 900 feet further inland. The Fukuoka Air Station is on a tongue of land across the bay due W.

DESCRIPTION AND LAYOUT

(Refer to Illustration No. 90:35-2079 P3.) The plant occupies a narrow rectangle, measuring about 3000 feet on its main NE-SW axis and 1000 feet wide. The productive buildings were originally arranged in two rows along the main axis. Several buildings (5, 8, 15, 21) were removed between 30 December and 8 March and another (18) was in process of being dismantled. Three large buildings (12, 19, 22) and several smaller ones remained on 23 April. Sub-assembly functions, if such remain, are probably done in buildings 12 and 22, while final assembly or repair occurs in building 19. Post assembly functions are in buildings 24 and 26 at the S near the service apron and ramp.

PRIMARY OBJECTIVES

(Refer to Illustration No. 90:35-2079 P3.) The three large productive buildings still standing (12, 19, 22) house all the remaining equipment of any consequence.

CONSTRUCTION AND VULNERABILITY

Major buildings are of noncombustible, steel frame construction with roofs and probably walls of light weight sheet materials. All except one hangar are of one-story, sawtooth roof design, long span structures (HE vulnerability class V4A; see JTG/M-3/1) predominating. Other structures which occupy a relatively small proportion of the site are mostly of one-story, wood frame construction. Because of removals the site is now sparsely built-up.

WEAPON RECOMMENDATIONS

Instructions with regard to weapons will usually be given in Field or Operational Orders, but in the absence of such instructions and to assist Planners in formulating such orders the following information is given:

An attack with high explosive bombs alone is recommended. A preliminary structural and occupancy analysis of the plant indicates that weapons should be selected as follows:

	High Explosive	Fuzing	Incendiary
Preferred:	2000-lb GP or 1000-lb GP	0.01 N/ND T 0.01 N/ND T	None
Alternative:	500-lb GP	0.01 N/ND T	None
Not recommended:	100-lb GP or 250-lb GP bombs SAP or AP bombs Depth bombs		

Notes: (a) Use 0.025 N or 0.1 N fuzes if 0.01 N fuzes are not available, and 0.01 T fuzes if ND T fuzes are not available. The use of ND tail fuzing is recommended since all of the buildings have light roof material and are best destroyed by blast effects.

(b) The above recommendations are on a weight for weight basis.

CAMOUFLAGE, DECOYS, AND SMOKE SCREENS

Buildings 12 and 24 have disruptive painting; the remainder are not camouflaged. There have been no indications of smoke screens or decoys.

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T A R G E T I N F O R M A T I O N S H E E T

Ref: Obj. Folder
Sasebo-Tsushima Areas (90.36,90.39)
July 18, 1944

Place: Omura, Japan
Obj. Area: 90.36
Category: Aircraft

Lat. : 32°55'N
Long.:129°56'E
Alt. : 10 ft.

OMURA AIRCRAFT FACTORY

AAF Target No. 1627

T I S

ALL PREVIOUS SHEETS ARE CANCELLED

SIGNIFICANCE: The Omura Aircraft plant, first disclosed by reconnaissance in October 1943, appears to be a major integrated engine/aircraft assembly plant. Available intelligence is inadequate for accurate appraisal of the plant's production and importance, but its large size and general layout establish it as a key unit.

LOCATION: The plant is located on the E coast of Omura Bay, just NW of the town of Omura and about 12 miles NNE of Nagasaki. The plant compound extends along the coast and adjoins the Omura Naval Air Station on the SE. Mino Island is located about one mile to the W and the Kori River lies two miles to the north.

DESCRIPTION: The main plant compound is triangular in shape, each side measuring about one mile. A group of hangar and shop-type buildings is located along the waterfront, just N of the northwestern appex of the main plant. A very extensive army barracks and training ground area is located to the E and NE. The turf-surfaced Omura Airfield is rectangular shaped, with a number of hangar, shop and administration buildings grouped in the SW corner. Dispersal revetments, small storehouses and clusters of barracks and residences extend along the three land sides of the field.

A description of individual buildings of the Omura plant is dependent upon the completion of current photographic interpretation and the availability of more complete intelligence. At the present time, the plant may tentatively be considered as comprising five principal units:

a. A group of about 23 hangar and shop-type buildings, located just N of the northwestern appex of the main plant site, appears to be the repair and maintenance depot servicing the trainers based at the adjoining naval air station. These buildings cover an area of about 2000 by 1000 square ft. and are connected to both the main plant and the airfield by a taxi-strip and a railroad spur.

b. The northwestern appex of the main triangular compound contains the original aircraft plant, reported completed in 1942. It includes final assembly buildings, ramps and seaplane cranes along the waterfront; administration and machine shop buildings to the E.

c. Two groups of engine test stands are located in the south-central portion of the main plant compound. These include 12 stands along the SE side of the original unit ("B") and a newer group of 24 completed and 12 partially completed stands just to the SE.

d. A new unit, most of it completed since October 1943, is located in the northern appex of the compound and appears to comprise the principal large parts and engine manufacturing buildings as well as sub-assembly.

e. Another recently completed unit, located in the south-eastern appex of the site, consists of one very large assembly-type structure and a number of small to large shops, assembly and storage-type buildings.

The total area of the main triangular compound is approximately 15,000,000 square ft. and contains over 75 medium to large assembly and shop-type buildings (exclusive of storage sheds, barracks, administration buildings and very small shops). These buildings have a total floor space of approximately 2,500,000 square ft. Details as construction are unavailable, but most buildings appear to be metal or asbestos sheeting over steel frame; a few are reported constructed of concrete.

CRITICAL POINTS: Accurate evaluation of the relative importance and vulnerability of the various units of this installation will depend upon detailed photographic interpretation and the availability of more complete intelligence. Available information indicates that the machinery and large assembly shops warrant first consideration.

ADDITIONAL INFORMATION: Confirming intelligence concerning the plant's production is not available, but it is reported to have assembled RUFES during May 1942, and RUFE and ZEKE types have been tentatively identified on available photo cover. However, the recent completion of additional assembly and shop units may indicate the possibility of more diversified production. An unconfirmed PW report refers to the assembly of nine RUFES per day in the original unit during May 1942 -- a rate considered excessively high in terms of estimated total Japanese production at that date. The same source refers to the installation of Mitsubishi Kinsei engines, but their place of manufacture was not established.

The plant's management is not definitely known, but it is believed to operate under the 21st (Sasebo) Naval Air Arsenal, possibly under Mitsubishi supervision. It is believed that this plant is affiliated with the small Sasebo Aircraft Factory, from which a number of the original employees were transferred.

The repair depot to the NW is reported to do third and fourth echelon repairs to KATES, VALS and BETTYS based at the naval station, (although probable PETES and DAVES have been identified in available photo cover). The Omura Airfield is a large and completely equipped naval pilot training base.

Distribution:A

TARGET NO. 90.36-1627

OMURA AIRCRAFT FACTORY
OMURA JAPAN

ILLUSTRATION NO. 90.36-1627 PI

APPROX. COORDINATES 32° 55' N 129° 56' E

PHOTOGRAPHED 21 AUGUST 1944

7 SEPTEMBER 1944

CONFIDENTIAL

0 2000 4000 6000 FEET
0 1/2 1 MILE
1:32 000 APPROX.

TYPE A

AC/AS. INTELLIGENCE

CONFIDENTIAL

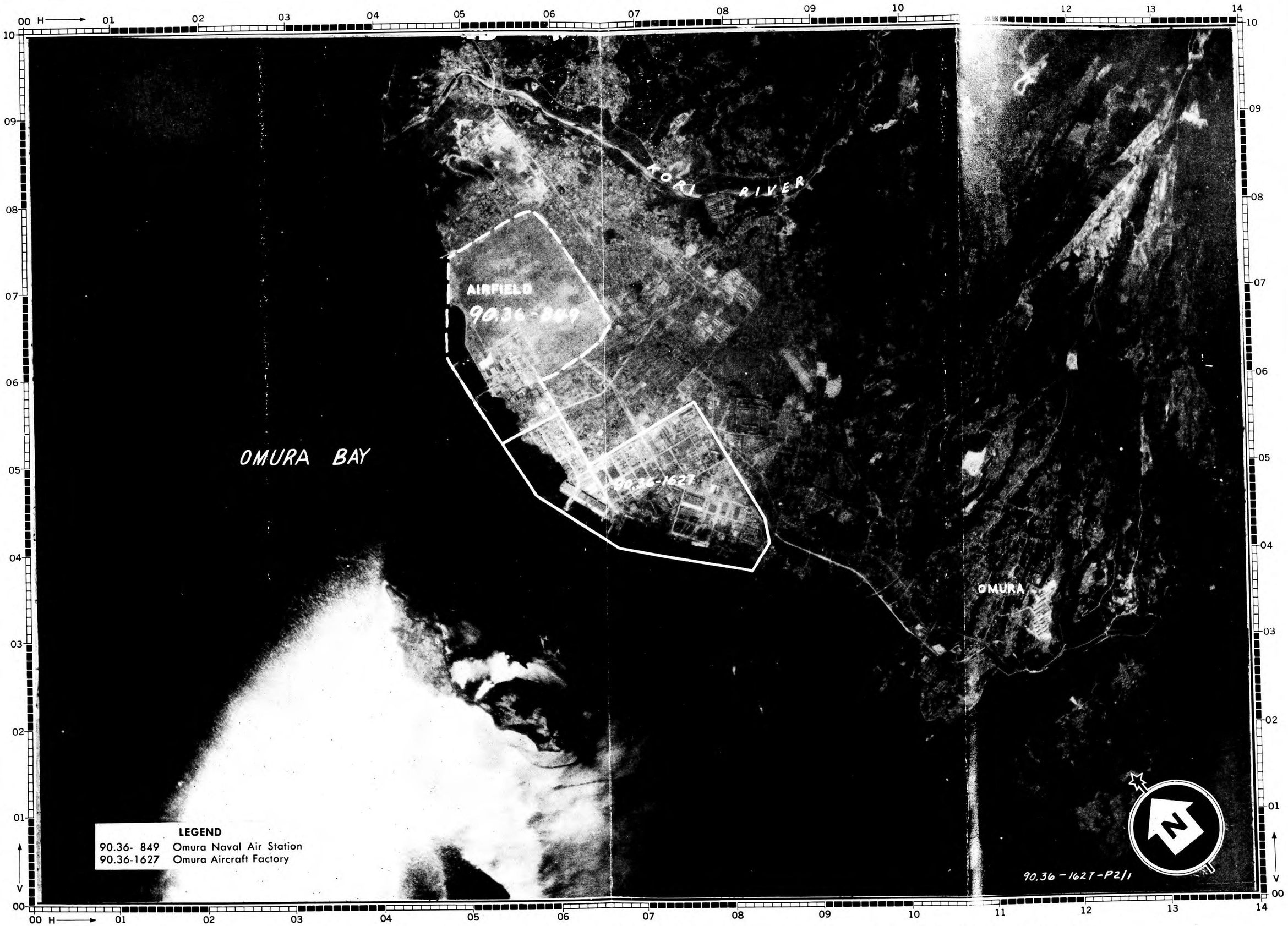
JOINT TARGET GROUP
WASHINGTON, D. C.

OMURA AIRCRAFT FACTORY

OMURA JAPAN

0 2000 4000 6000 FEET
0 ½ 1 MILE
1:32 000 APPROX.

ILLUSTRATION No. . . . **90.36-1627 P2**
DATE . . . . . **29 April 1945**
TARGET No. **90.36-1627**
COORDINATES . . . **32°55'N 129°56'E**
PHOTOGRAPHED . . . **21 August 1944**



LEGEND

90.36- 849 Omura Naval Air Station
90.36-1627 Omura Aircraft Factory

Holders of Joint Target Group Folders should insert this sheet in Air Target System Folder: Japanese Aircraft with other 90.36-1627 material.

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May be taken into the air if data is trimmed off

TARGET NO. 90.36-1627

OMURA AIRCRAFT FACTORY

OMURA JAPAN

ILLUSTRATION NO. 90.36-1627 P3A

APPROX. COORDINATES 32° 55' N 129° 56' E

ISSUED SEPT. 1944

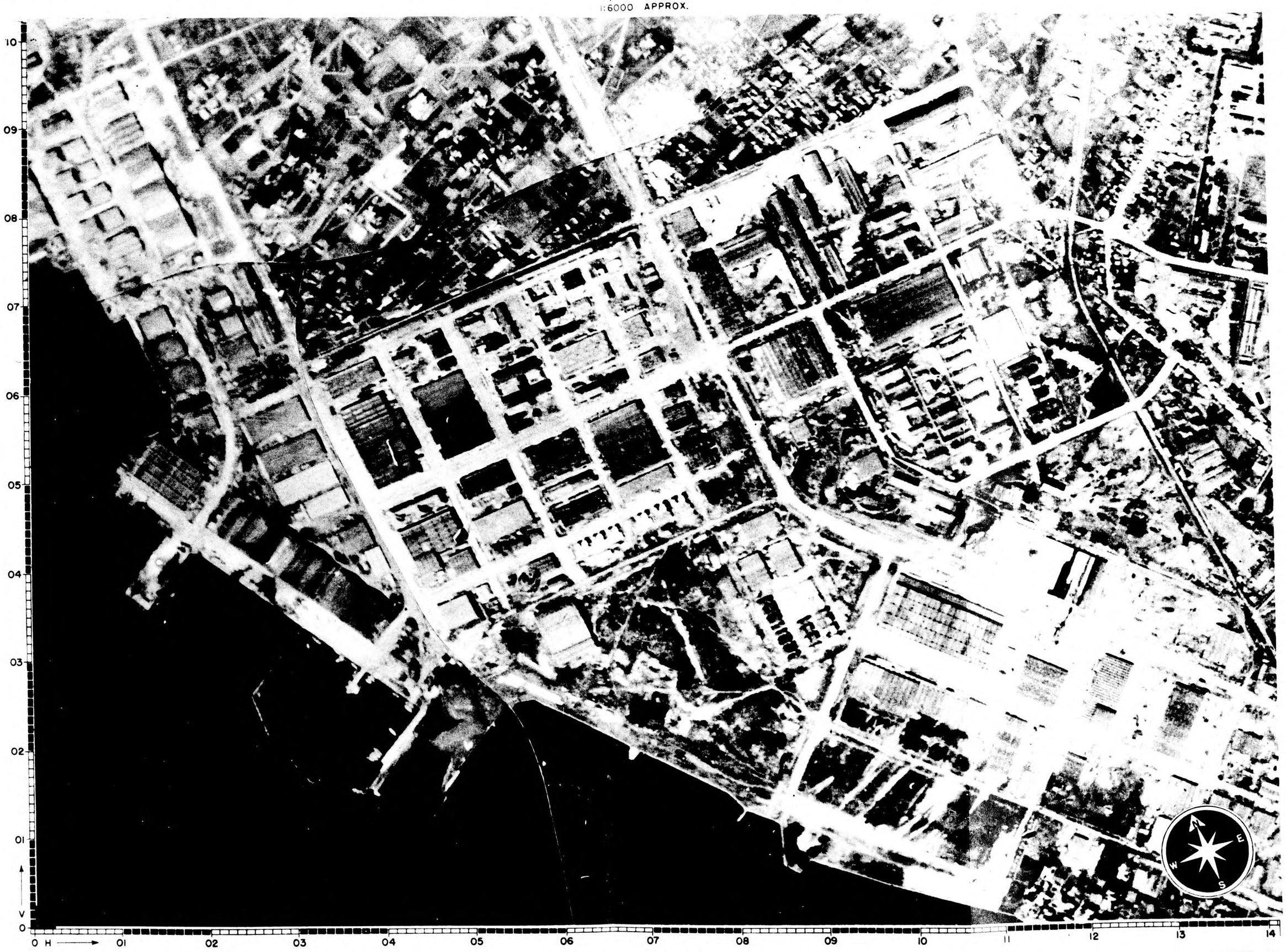
PHOTOGRAPHED 21 AUGUST 1944

CONFIDENTIAL

0 500 1000 1500 2000 2500 3000 FEET

0 1/4 1/2 MILE

1:6000 APPROX.



AC/AS, INTELLIGENCE

CONFIDENTIAL

TYPE B

TARGET NO. 90.36-1627

OMURA AIRCRAFT FACTORY
OMURA JAPAN

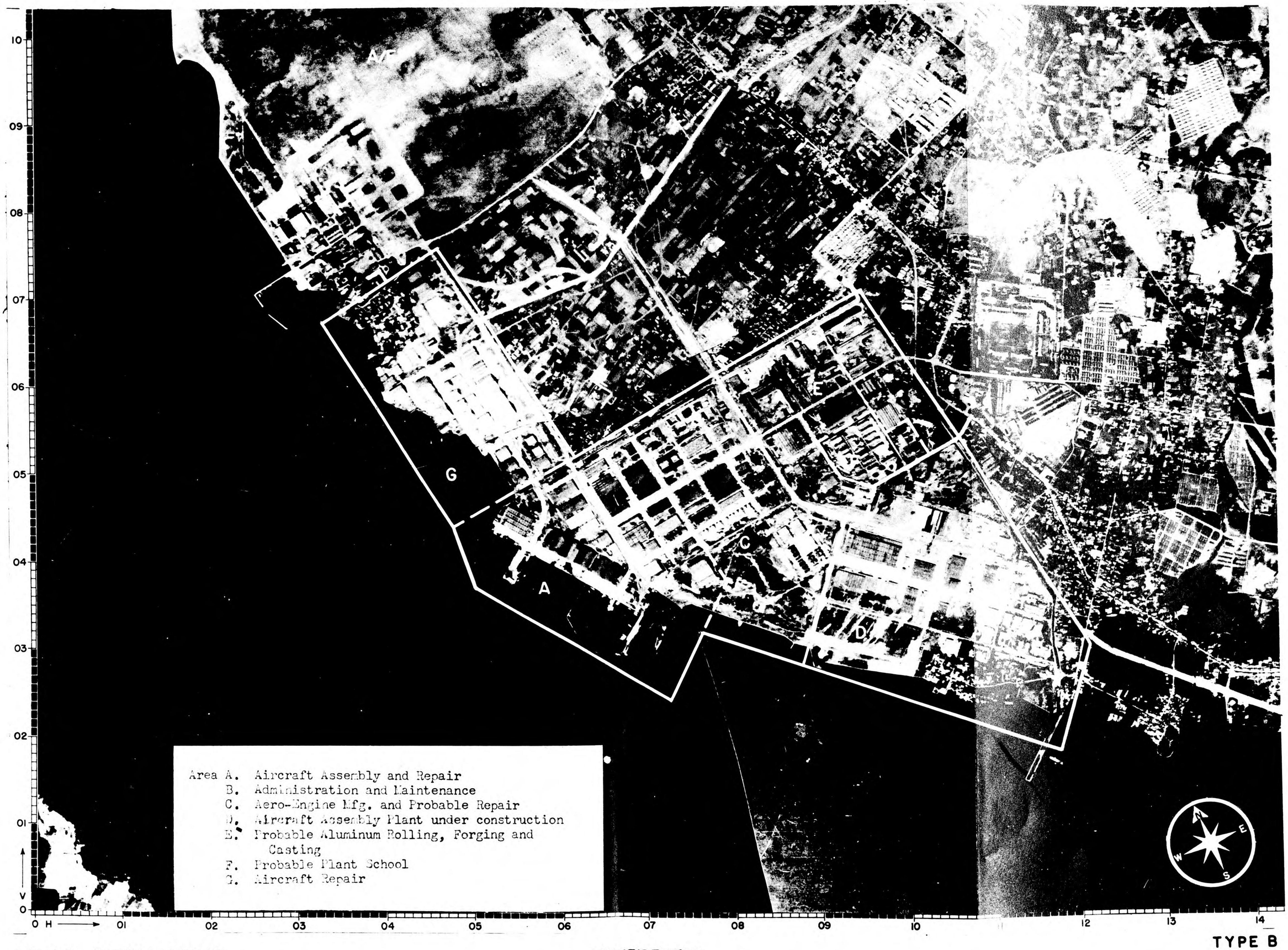
APPROX. COORDINATES 32° 55' N 129° 56' E

PHOTOGRAPHED 21 AUGUST 1944

7 SEPTEMBER 1944

CONFIDENTIAL

0 1000 2000 3000 4000 5000 6000 FEET
0 1/2 1 MILE
1:12000 APPROX.



Area A. Aircraft Assembly and Repair
B. Administration and Maintenance
C. Aero-Engine Mfg. and Probable Repair
D. Aircraft Assembly Plant under construction
E. Probable Aluminum Rolling, Forging and Casting
F. Probable Plant School
G. Aircraft Repair

TYPE B

TARGET NO. 90.36-1627

APPROX. COORDINATES 32° 55' N 129° 56' E

PHOTOGRAPHED 21 AUGUST 1944

OMURA AIRCRAFT FACTORY
OMURA JAPAN

0 500 1000 1500 2000 2500 3000 FEET

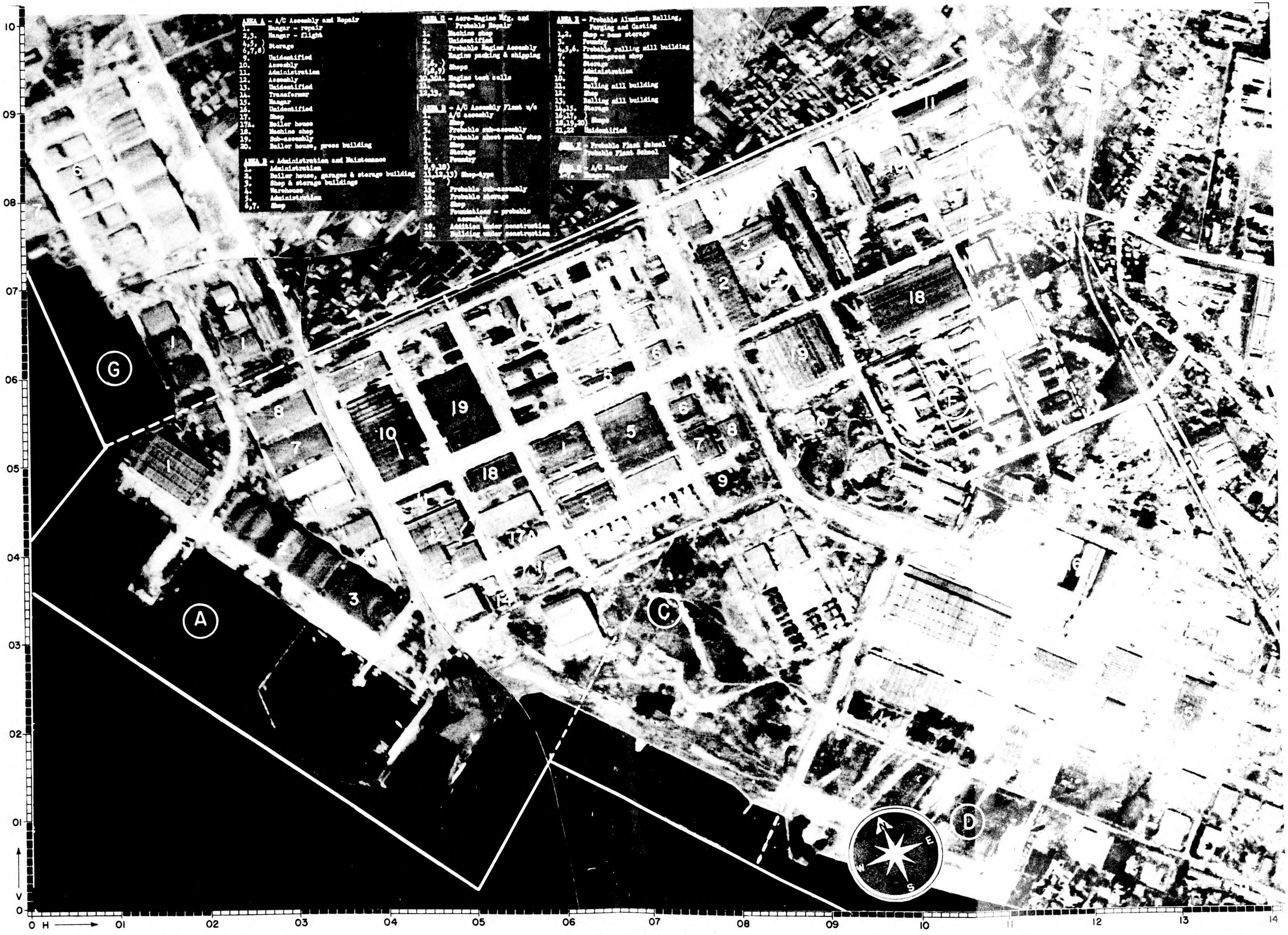
0 1/4 1/2 MILE

1:6000 APPROX.

ILLUSTRATION NO. 90.36-1627 P4A

ISSUED SEPT. 1944

CONFIDENTIAL



AC/AS, INTELLIGENCE

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TYPE B

TARGET NO. 90.36 - 1627
90.36 - 849

APPROX. COORDINATES 32°55′ NORTH
129°56′ EAST

PHOTOGRAPHED 20 AUGUST 1944

JOINT TARGET GROUP-WASHINGTON, D. C.

OMURA FACTORY AND NAVAL AIR STATION

OMURA, KYUSHU

ILLUSTRATION NO. 90.36 - 1627 - P5
90.36 - 849

ISSUED 11 DECEMBER 1944

CONFIDENTIAL

SCALE 1:6000

500 0 500 1000 Feet

OMURA BAY

THIS AREA BEING FILLED

OMURA NAVAL AIR STATION 90.36/849

AREA "B"

AREA "A"

OMURA AIRCRAFT FACTORY 90.36/1627

FIRE SUSCEPTIBILITY PLAN

PRIMARY BUILDINGS	P	FIRE WALL, CERTAIN	
SECONDARY BUILDINGS	S	FIRE WALL, PROBABLE	
BUILDINGS		CONTENTS	
COMBUSTIBLE		NON-COMBUSTIBLE	
NON-COMBUSTIBLE		SLIGHTLY COMBUSTIBLE	
FIRE RESISTANT		MODERATELY COMBUSTIBLE	
COMBINATION I.E. COMBUSTIBLE ROOF RESISTANT FLOORS		HIGHLY COMBUSTIBLE	
		EXTREMELY COMBUSTIBLE	
WATER TANK	W	INTERMEDIATE VALUES	

AREAS IN ACRES	PRIMARY BUILDINGS	ALL BUILDINGS SHOWN
PLAN AREA	16.0	53.6
TOTAL FLOOR AREA	16.7	55.5
SITE AREA	270	

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T A R G E T I N F O R M A T I O N S H E E T

Ref: Formosa, Interim Report February 1944

Place: Okayama, Formosa
Objective Area: 91.6
Category: Aircraft

Lat. : 22°48'N
Long.: 120°16'E
Alt. : 30 feet

OKAYAMA AIRCRAFT PLANT

AAF Target No. 166

T I S

ALL PREVIOUS SHEETS ARE CANCELLED

SIGNIFICANCE: The Okayama Aircraft Plant is believed to be one of the principal aircraft repair/maintenance/modification plants outside of Japan Proper, and possibly a secondary assembly plant as well. It is a strategically located plant (see ADDITIONAL INFORMATION below).

LOCATION: The plant is situated in southwestern Formosa, three miles in from the W coast and between the Okayama Airport and the town of Okayama. It is located on an open coastal plain, marked by extensive sugar cane fields to the N and S and by the Takao-Keelung Railway Line which runs N/S along the E side of the town. Two isolated hills rise about four miles to the NNE; one very small hill is located midway between the plant and the coast.

DESCRIPTION: The plant adjoins a group of hangar and administration buildings at the SE side of the airport. (See accompanying reconnaissance photography). A workers' housing development is situated just to the E and several groups of storehouses are located to the N.

The plant compound is roughly rectangular and measures approximately 2900 ft. E-W by 1400 ft. N-S. It comprises some 50 assembly and shop-type buildings which have a total floor space of about 1,200,000 square feet. While the operations in individual buildings have not been identified with certainty in most cases, the plant may be broken up into four general functional units:

a. The southeasternmost group of buildings appear to be the parts and sub-assembly units (possibly also engine manufacturing) with tubing, benchwork, etc., shops. This group also contains the administration buildings. Four engine test blocks are located at the NW edge of this unit, near the center of the plant compound.

b. The material preparation unit is located near the SW corner of the compound, and includes heat treating and hardening shops; probable dye making, cutting, stamping, and testing buildings.

c. The modification, repair and/or assembly buildings are located along the northern and northwestern sides of the compound. Taxi strips lead W and N to the airfield and dispersal sites.

d. Receiving and storage sheds are located in the southwesternmost section.

TARGET INFORMATION SHEET (Cont'd.)

The predominant construction appears to be sheet metal (or possibly asbestos sheeting) over steel frames.

CRITICAL POINTS: Accurate evaluation of the character and relative importance of the various units of this plant is dependent upon a more detailed intelligence as to type and volume of production, location of key equipment, etc.

ADDITIONAL INFORMATION: Okayama is part of an aircraft staging, supply and pilot training complex which includes Formosa and several surrounding theaters. The plant is believed to operate under the control of the 61st Naval Air Arsenal and at least part of its function probably includes servicing and maintenance of intermediate and advanced trainers based at Okayama and other Formosan airfields. There has been no consistent line-up of planes near the assembly or modification buildings, but the predominant types appear to be Nakajima 95 (DAVES) with ground gears instead of floats, and probable BETTYS and NELLS -- all reported used as trainers at the field.

The Okayama Airport is a large and completely equipped intermediate and advanced bomber training field. It has two large groups of hangar and storage buildings, four surfaced runways and extensive dispersal revetments.

A large, underground storage depot is located at the base of a 400 ft. hill, four miles NNE of the field. A 75 ft. wide taxiway and a railroad spur connect this depot with the airport and the aircraft plant. It has not been possible to determine the function of this depot, but it is presumed to be a storage for materiel and possibly also for dismantled or partially finished aircraft. A large radar installation has been identified on a hill just to the N of this depot.

Distribution:A

TARGET NO. 91.6-166

APPROX. COORDINATES 22° 48' N 120° 16' E

PHOTOGRAPHED 12 JANUARY 1944

OKAYAMA AIRCRAFT PLANT

OKAYAMA, FORMOSA

0 2000 4000 6000 FEET

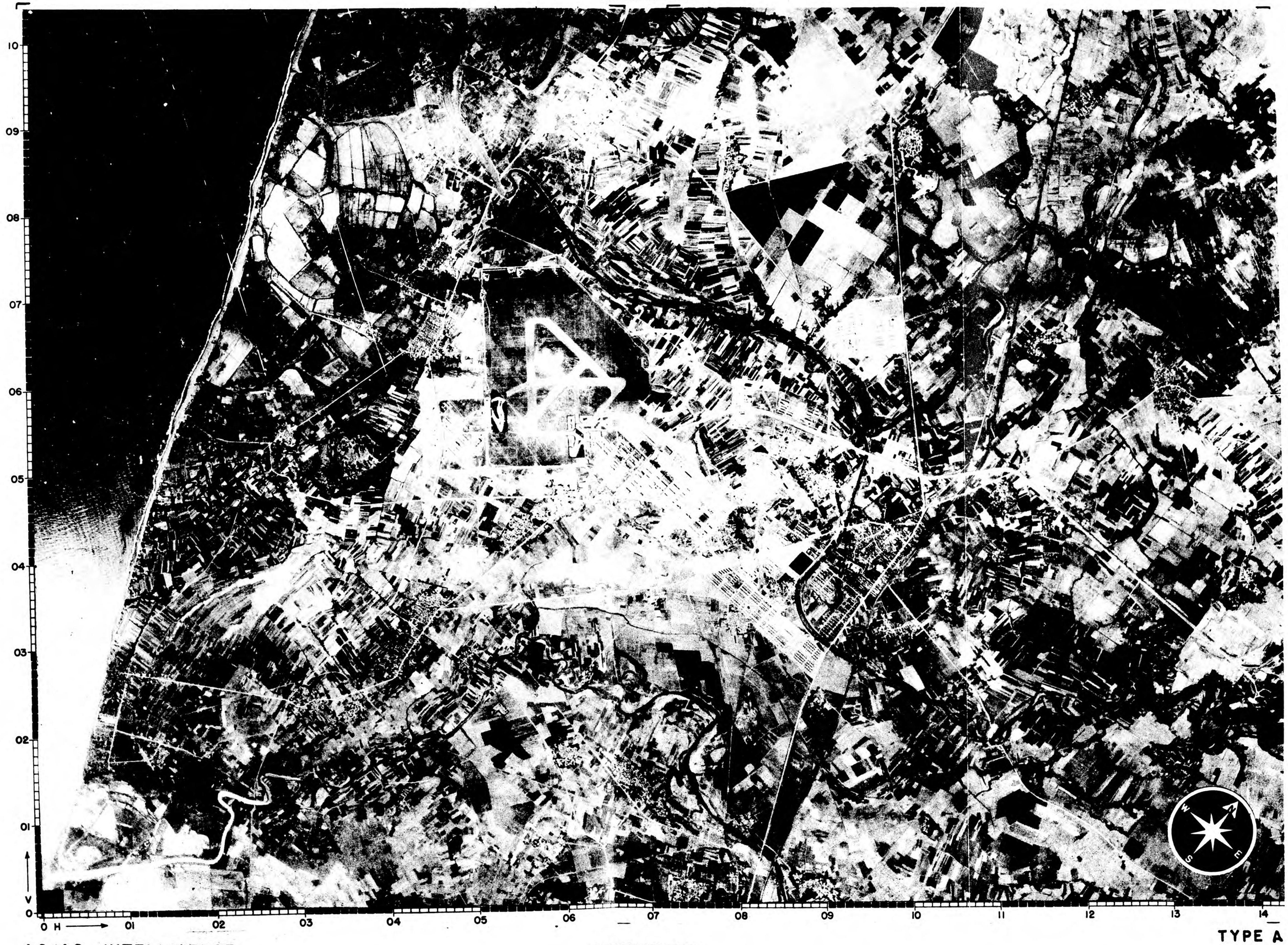
0 1/2 1 MILE

1:32 000 APPROX.

ILLUSTRATION NO. 91.6-166 P I

7 SEPTEMBER 1944

CONFIDENTIAL



AC/AS. INTELLIGENCE

CONFIDENTIAL

TYPE A

TARGET NO. 91.4-166

APPROX. COORDINATES 22° 48' N 120° 16' E

PHOTOGRAPHED 12 JANUARY 1944

OKAYAMA AIRCRAFT PLANT

OKAYAMA, FORMOSA

0 2000 4000 6000 FEET

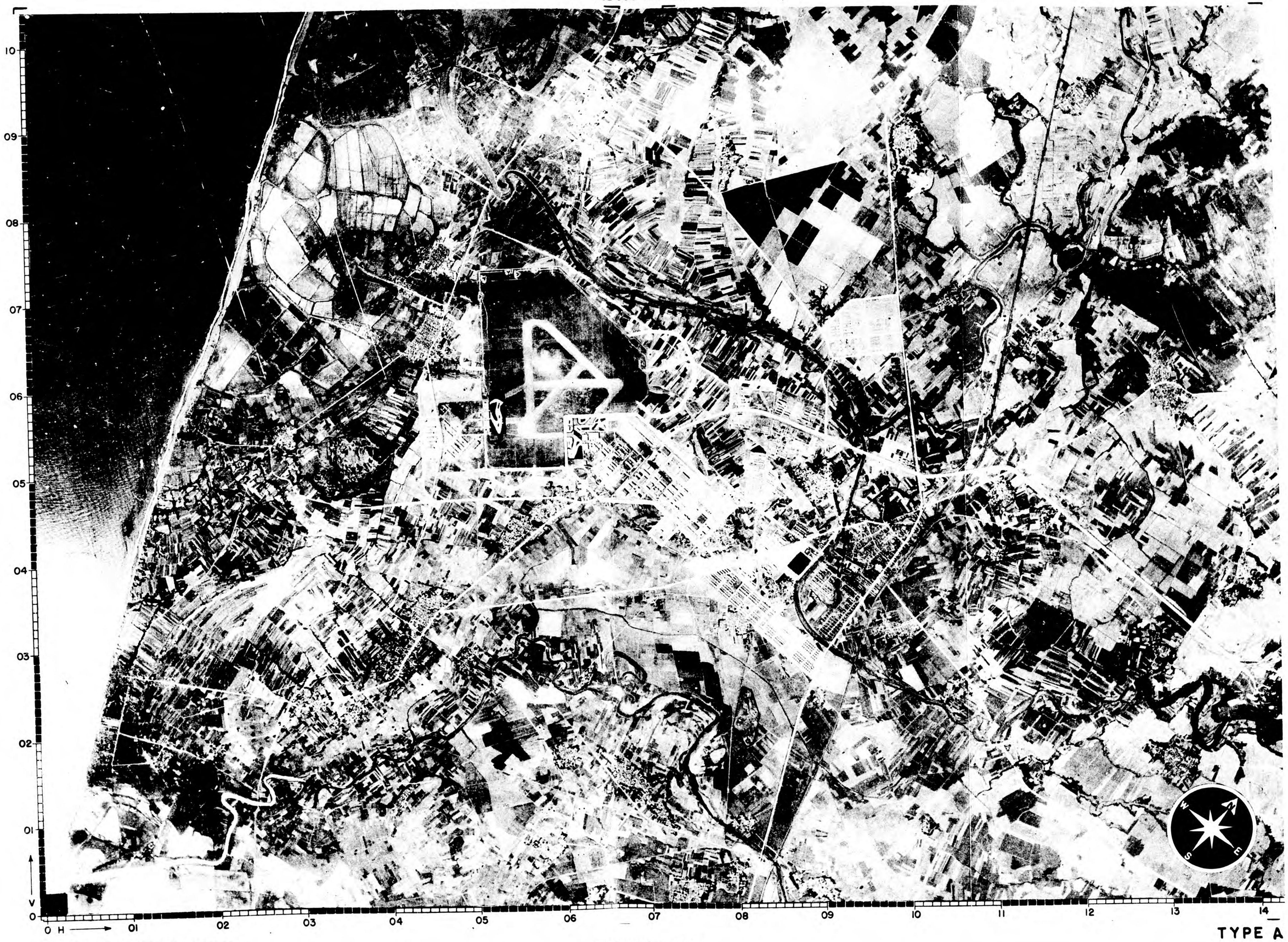
0 1/2 1 MILE

1:32 000 APPROX.

ILLUSTRATION NO. 91.6-166 P2

7 SEPTEMBER 1944

CONFIDENTIAL



TYPE A

TARGET NO. 91.4-166

OKAYAMA AIRCRAFT PLANT
OKAYAMA, FORMOSA

ILLUSTRATION NO. 91.6-166 P3

APPROX. COORDINATES 22° 48'N 120° 16' E

15 SEPTEMBER 1944

PHOTOGRAPHED 29 JUNE 1944

0 500 1000 1500 2000 2500 3000 FEET
0 1/4 1/2 MILE
1:6000 APPROX.

CONFIDENTIAL

AC/AS. INTELLIGENCE

TYPE B

TARGET NO. 91.6-166

APPROX. COORDINATES 22° 48' N 120° 16' E

PHOTOGRAPHED 25 AUGUST 1944

OKAYAMA AIRCRAFT PLANT
OKAYAMA, FORMOSA

0 500 1000 1500 2000 2500 3000 FEET

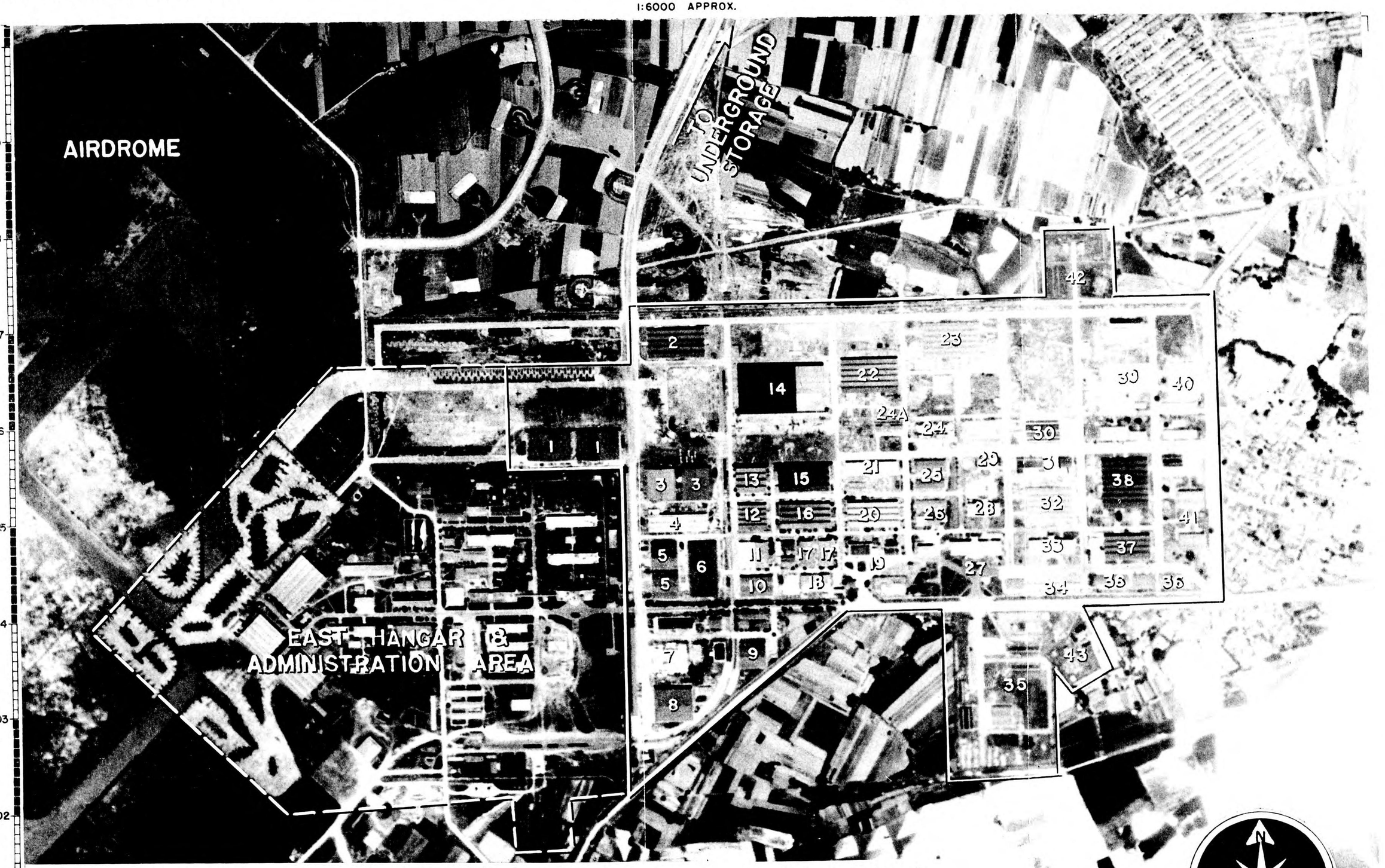
0 1/4 1/2 MILE

1:6000 APPROX.

ILLUSTRATION NO. 91.6-166 P 4

ISSUED 10 OCT. 1944

CONFIDENTIAL



1,14.	Repair hangars	18,30,36,39,40,41.	Building, use not established	34.	Garages (probable)
2.	Repair shops	19,26,27,28,29,33.	Administration & offices	35.	Vehicle shops (probable)
3,5,13,15.	Assembly hangars	21,23,32.	Building storage	42.	Walled-in area, not determined
4,6,16,20.	Sub-assembly shops	22,25,29.	Engine Shop (probable)	43.	Transformers
7,8,9,10.	Shipping & receiving (probable)	24.	Engine test cells (4)		
11,12,17,37,38.	Shops - general	24A.	Engine test sheds (probable)		
17,31.	Boiler house				

V 0 01 02 03 04 05 06 07 08 09 10 11 12 13 14 H

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CONFIDENTIAL

JOINT TARGET GROUP, WASHINGTON, D.C.
TARGET INFORMATION SHEET

Sheet No. 93.3-41-TI
Date 2 Feb. 1945
Page No. 1 (5 pages)

Obj. Folder 93.1-5
Obj. Area 93.3
AAF Target No. 93.3-41

Place Fushun (Manchuria)
Air Target
System Petroleum

Lat.: 41° 50'N
Long: 123° 48'E
Alt.: 280 feet

NAME OF TARGET SMR COAL LIQUEFACTION PLANT

ALL PREVIOUS SHEETS CANCELLED

SIGNIFICANCE

Small synthetic oil plant. Estimated capacity believed not to exceed 150,000 bbls, or approximately one per cent of Inner Zone petroleum. Ground intelligence indicates that this plant produces synthetic oil from coal mined in nearby open pits (refer to illustration No. 93.3-41 P2).

LOCATION

About 3 miles SW of Fushun. The SMR Shale Oil Plant (TARGET 93.3-40) is about 2 miles to the NE. The Hun River, flowing generally E-W, lies about 4500 feet to the N at its nearest point. A SE-NW flowing tributary of the Hun is crossed by three RR and one highway bridges about 2600 feet to the E. The Mukden-Kirin RR running generally E-W on the opposite side of the Hun River, passes about 1.4 miles to the N. The RR from Mukden to Fushun via Suchiagun Junction (TARGET 93.3-173) just S of Mukden, entering the district from the W bounds the target on the N. The compound is bounded on W by the Manchuria Light Metals Co. (TARGET 93.3-32), on the E by open ground, and to the S by the beginning of a large waste dump extending for about 3 miles to the WSW. The target complex is adjacent to a newly built-up area of workers' homes on the N and to open country on the W, S, and E.

DESCRIPTION AND LAYOUT

(Refer to Illustration No. 93.3-41 P3, P5, and P6). The total target area is about 800 x 1500 feet, rectangular in shape with the major axis lying in an E-W direction. The compound is 20 per cent built-up. An area to the S (1500 x 400 feet) is not as yet built-up and further to the E and S is another possible area for future expansion. A majority of the buildings and installations remain unidentified since the exact type of synthetic process in use has not been determined.

The plant layout bears little resemblance to typical synthetic oil installations using either the Bergius process (direct hydrogenation of coal, tar, or low grade petroleum), or the Fisher-Tropsch process (synthesis of water gas which is produced by blowing steam over hot coke): neither does it resemble the low temperature carbonization process (distillation of volatile products from coal). Some characteristics of all three processes appear to exist.

Building 14 may possibly be analogous to the hydrogenation stalls of the Bergius process, although many characteristics of the typical German installations are absent. Nos. 18 and 19 may contain contact (gas synthesis) ovens for use in the Fisher-Tropsch process or they may contain sulfur removal columns for purification of gas in either the Bergius or Fisher-Tropsch process.

The gas holders (24, 25, 30, 31, 32), cooling tower (4), storage tanks and possible refining area (3), and the coal storage area along the RR spur through the center of the plant are indicative of some type of synthetic oil process; however, the dissimilarity to known processes suggests the possibility, as has been reported, that the Japanese have originated a new type of synthesis having characteristics of its own or using a combination of the known processes. No gas producing or purification equipment is identifiable.

Available intelligence, as well as stocks of coal within the plant, indicates that coal is the raw material; however, the nearby SMR Shale Oil Plant at Fushun should not be overlooked as a source of low grade petroleum or tar for hydrogenation.

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BRITISH SERVICES FOR THE USE OF ALLIED FORCES.

PRIMARY OBJECTIVES

(Refer to Illustration No. 93.3-41 P3, P5, and P6). Because information is not at present available as to the exact synthetic process used at this plant and the function of the various buildings is mainly indefinite or unknown, no primary objectives are selected.

For high level attack, it is suggested that building 17 be selected as the aiming point. The entire target lies within a 1000-foot radius of this point.

CONSTRUCTION & VULNERABILITY

(Refer to Illustration No. 93.3-41 P3, P5, and P6).

Areas:	Area of buildings	205,000 sq. ft.
	Area of tanks (steel)	32,000 sq. ft.
	Area of cooling tower and other miscellaneous structures	5,000 sq. ft.
	Total built-up area	242,000 sq. ft.
	Per cent built-up	20 per cent
Construction Type:	Buildings with load bearing walls	58 per cent
	Reinforced concrete framed and steel framed buildings	34 per cent
	Wood framed buildings	8 per cent
Roofs (buildings and tanks):	Combustible	7 per cent
	Fire resistant	19 per cent
	Non-combustible	74 per cent

Floors: Generally of fire-resistant material.

Number of Stories: Generally single-story.

The Fire Susceptibility Plan (Illustration No. 93.3-41 P5) indicates the vulnerability to fire of buildings, tanks, and other equipment. Contents of the refinery equipment and tanks, being coal or oil products, are of high combustibility.

WEAPON RECOMMENDATIONS

The most effective weapon for high level attack against this target is:

AN-M57 250-lb G.P. bomb fuzed 0.01 sec. nose (M139) and 0.01 sec. tail. (If the M139 is not available, use 0.1 sec. nose fuzing.)

This plant is 20 per cent built-up. Each building is small, the average area being less than 4000 square feet, and exists merely as covering over equipment. The function of the units is for the most part unidentified.

Because of these factors no primary objectives within the complex are selected, and the aim of the attack is to cause serious damage to the plant as a whole.

The 250-lb is the smallest G.P. bomb capable of effectively damaging the average type and size of equipment in the plant. Larger G.P. bombs are less efficient, weight for weight, because fewer direct hits will be obtained on the small and equally important units. The 500-lb has been calculated to be 75 per cent as efficient as the 250-lb G.P. bomb.

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The use of 0.01 sec fuzing gives best expectancy of achieving widespread damage. The average height of buildings is low and bomb detonations will be obtained in proximity to equipment within. This fuzing will also be the most effective against tanks and piping underground.

Ground surveys of bombed refineries and synthetic oil plants show that fires are initiated by HE bombs when explosions release contents from ruptured equipment. It is expected, therefore, that a very considerable amount of fire damage will be added to destruction by primary HE effects. The extent of this fire damage is unpredictable but always considerable and thus limits the level of damage to be aimed at by HE alone. To insure complete ignition and produce maximum fire spread and damage it is recommended that incendiaries amounting to approximately 10 per cent of the HE load listed in the loading table below be dropped after the HE bombs. The AN-M69 incendiary bomb (in M18 clusters) is the best for this purpose.

The following Loading Table, computed for the most effective weapon, shows the per cent of serious damage by primary HE effects to the target which can be expected for different weights of attack and various accuracies of bombing. Accuracy is measured by the per cent of bombs dispatched expected to fall within 1000 feet of the aiming point. (Reference should be made to Joint Target Group Memorandum No. 3, "Explanation of Weapon Recommendations and Loading Tables Given in Target Information Sheets", dated 27 December 1944.)

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Table I

LOADING TABLE - MOST EFFECTIVE WEAPONS

HE: AN-M57 250-lb G.P. fuzed 0.01 sec. nose and 0.01 sec. tail (1)
IB: See Weapon Recommendations

SMR COAL LIQUEFACTION PLANT

Total Load in Tons (4)	Per cent of bombs dispatched expected to fall within 1000 feet of aiming point (2)			
	10%	15%	20%	30%
	F(3)	F(3)	F(3)	F(3)
100				16%
150			16%	22
200		16%	20	29
250		19	25	34
300	16%	23	29	40
350	18	26	33	45
400	20	29	37	49
450	22	32	40	
500	25	34	43	
600	29	40	49	
700	33	45		
800	37	49		
900	40			

NOTES: (1) Because the large difference in effectiveness of the various G.P. bombs against this target, this table should not be used for other than the 250-lb G.P. The 500-lb bomb is 75 per cent as efficient as the 250-lb.

(2) In the examples following this table this quantity is called the "Index of Mission Efficiency". It is a measure of bombing accuracy, and bears no relation to the size of the target.

(3) Expected fraction (per cent) of serious damage to the target. The entire target area lies within 1000 feet of the aiming point.

(4) Load is given in tons of actual (not nominal) weight of bombs.

Method of Use:

1. Determine Index of Mission Efficiency:

   (a) Estimate per cent of dispatched planes bombing primary target.
   (b) Estimate per cent of bombs over target expected to fall within 1000 feet of aiming point.
   (c) Multiply (a) by (b) and round off to the nearest percentage figure in table.

2. Read under computed Index of Mission Efficiency and opposite the total load dispatched the expected per cent of damage.

Examples Illustrating Use of Loading Tables:

1. *To find the per cent of damage for a given force:*

   Given: Planes expected to bomb primary target, 70 per cent of mission. Per cent of bombs over target expected to fall within 1000 feet of aiming

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point, 30 per cent of mission. Mission of 150 planes with a total load of 450 tons.

Solution: 70 per cent x 30 per cent equals 21 per cent; i.e., 20 per cent is Index of Mission Efficiency. Opposite 450 tons in 20 per cent column find fraction of damage equals 40 per cent.

2. *To find force required to achieve a recommended level of damage:*

Given: Recommended level of damage, 50 per cent. Same Index of Mission Efficiency (20 per cent) as in Example 1. Individual A/C load 3 tons.

Solution: In 20 per cent Mission Efficiency column take F equals 49 per cent and find loading of 600 tons, requiring a total force of 200 aircraft or 16 or 17 groups of 12 aircraft.

LEVEL OF DAMAGE

Experience has indicated that halting production completely requires a high level of serious damage (structural plus severe fire damage). Unless vital installations are destroyed by hits in a single attack, frequent re-attacks will be necessary. Recuperation from secondary and minor damage will be fairly rapid.

Fifty per cent serious damage by H.E. alone is to be sought. Fire can reasonably be expected to increase the damage achieved by primary H.E. effects to a high level. This level can be attained either in a single attack or in successive attacks at fairly short intervals.

The plant building area is small but relatively compact. It is believed that hits within it will produce a greater level of damage per hit than among modern, widely spaced installations.

CAMOUFLAGE, DECOYS AND SMOKE SCREENS

No camouflage or use of decoys apparent in photography of 19 June 1944. The use of smoke screens has not been reported.

ADDITIONAL INFORMATION

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Sheet No. 93.3-41 P6
Date 2 Feb. 1945
Page No. 1 (1 pages)

JOINT TARGET GROUP, WASHINGTON, D.C.
FUNCTIONAL IDENTIFICATION SHEET
(To be read in conjunction with Illustration No. 93.3-41 P5)

Obj. Folder 93.1-5
Obj. Area 93.3
AAF Target No. 93.3-41

Place Fushun (Manchuria)
Air Target
System Petroleum

Lat.: 41° 50'N
Long: 123° 48'E
Alt.: 280 feet

NAME OF TARGET SMR COAL LIQUEFACTION PLANT

ALL PREVIOUS SHEETS CANCELLED

Building No.	*Function of Building*
1, 1A, 1B, 2a	Not identified
2b	Six small tanks
3a-f and tankage	Separation and/or fractionation
4	Large cooling tower
4A, 5, 5A, 5B	Not identified
6 - 9	Warehouse and/or storage
10, 10A, 10B, 10C, 11 - 13	Not identified
14a, b, c	Probable hydrogenation
15a, b	Coal handling
16	Not identified
17	Boiler house
18 - 22	Not identified
23	Probable gas holder under construction
24, 25	Wet gas holders
26 - 29	Not identified
30	Wet gas holder
30A, 30B	Not identified
31, 32	Wet gas holders
33	Not identified

(Based on F/A Report No. 13, AC/AS, Intelligence, Photographic Division, dated 13 December 1944.)

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JOINT TARGET GROUP, WASHINGTON, D.C.
TARGET INFORMATION SHEET

Sheet No. 90.20-2010-TI/1
Date 10 Feb. 1945
Page No. 1 (5 pages)

Obj. Folder 90.20
Obj. Area 90.20
AAF Target No. 90.20-2010

Place Nagoya (Japan)
Air Target
System - Aircraft

Lat.: 35° 07' N
Long: 136° 54' E
Alt.: 10 feet

NAME OF TARGET **AICHI AIRCRAFT ENGINE WORKS, NAGOYA PLANT**

ALL PREVIOUS SHEETS CANCELLED

NOTE: Air Objective Folder Nagoya, 90.20, issued 6 July 1944, lists this installation as a reported new engine plant - an extension of Aichi Aircraft Works, Atsuta Plant, (TARGET 90.20-198). This new plant is now designated as Aichi Aircraft Engine Works (TARGET 90.20-2010) to distinguish it from the larger old plant (TARGET 90.20-198) reported now concentrating on torpedoes, shells, and other munitions.

SIGNIFICANCE

This plant produces the 1200 HP, 12 cylinder in-line Atsuta engine used in the Navy single-engine dive bomber Judy, and the new SE bomber Seiran. Estimated monthly production is 185 engines, a small fraction of total Japanese aero-engine output. Mines, torpedoes, and other ordnance are also reported in production here.

LOCATION

In Nagoya city, 4 miles S of Nagoya Castle and about 2 miles NNE of Nagoya Harbor piers (TARGET 90.20-251). Two branches of the Hori River join about 1600 feet to the E. From this point the river flows SW into Nagoya Harbor about 2 miles SSW of the plant. An E-W canal now terminates at the SW corner of the plant compound. The old section of this canal along the S side of the plant is partly filled in. A main NE-SW highway separates the plant from the older Aichi Works (TARGET 90.20-198) adjacent on the E.

DESCRIPTION AND LAYOUT

(Refer to Illustration No. 90.20-2010 P3, P5, and P6). The total target area extends about 1350 feet E-W and varies in width from about 600 feet on the W side to 1100 feet on the E. The area is compactly built-up. The important machine tools used in engine manufacture are contained in the large L-shaped building 3 which has a total area of 275,000 square feet. Engine assembly is also believed carried on in this building. Additional engine parts manufacture and machining facilities are immediately adjacent to the W in building 18; the foundry (building 6) is adjacent on the N. The cluster of small buildings in the NW corner of the compound is used for the manufacture of 13 mm ammunition.

No engine test cells can be identified at the plant on photography of 23 November 1944. Engine testing is presumably performed at the company's Tsukiji plant (TARGET 90.20-1828) at Nagoya Harbor which has at least 7, and possibly 12 test cells.

PRIMARY OBJECTIVES:

(Refer to Illustration No. 90.20-2010 P3, P5, and P6). The largest building (3) and building 18 housing the important machine shops, engine assembly and parts processes. Their destruction would destroy the plant's principal machine tool area.

The entire plant lies within a 1000-foot radius of building 18, the recommended aiming point for high level attack.

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TARGET INFORMATION SHEET *(Contd.)*

CONSTRUCTION & VULNERABILITY

(Refer to illustration No. 90.20-2010 P3, P5, and P6).

	Primary Objectives (Buildings 3 and 18)	Whole Target (All buildings shown on Fire Plan)
Area of buildings:	322,000 square feet.	506,600 square feet.
Construction type:	All steel framed, with short spans in 92 per cent, normal to long spans (possibly with traveling cranes) in 8 per cent.	79 per cent steel framed, with traveling cranes probably in 5 per cent. 19 per cent timber framed. 2 per cent reinforced concrete framed.
Roofs:	Practically all sawtooth roofs. All lightweight non-combustible sheet roofing.	67.5 per cent sawtooth, non-combustible. 7.5 per cent pitched, non-combustible. 23 per cent pitched, combustible. 2 per cent flat, fire-resistant.
Floors:	Generally of fire-resistant materials.	
Number of stories:	All single-story.	85 per cent single story. 15 per cent multi-story.
Number of fire divisions:	2 in 2 buildings.	19 in 21 buildings.

The Fire Susceptibility Plan indicates the vulnerability of each building and its contents. With the exception of the offices and cafeterias (buildings 1 and 2), the combustibility of the contents is slight. It is estimated that 25 per cent of the productive capacity of the plant can be destroyed by fire.

WEAPON RECOMMENDATIONS

The most effective weapons for a high level attack against this target are a combination of:

AN-M64 500-lb G.P., fuzed 0.01 sec. nose/0.01 sec. tail
(If M139 nose fuzes unavailable, the 0.1 sec. delay nose fuze should be used.)

AN-M47 70-lb incendiary.

Weight for weight, the 500-lb bomb has proved to be the most effective against the short span, relatively low buildings such as the primary objectives of this plant. The 0.01 sec. fuzing gives the best expectancy of detonating the bomb beneath the roof, thereby causing maximum damage to contents as well as to structures.

Experience has shown that where fire divisions are large and few in number and where contents are only slightly combustible, the AN-M47 is slightly better than the AN-M50 4-lb incendiary (in M17 clusters). Additional fire damage may be expected from the effects of high explosive bombs.

The following Loading Table shows the per cent of serious damage to the target which can be expected for different weights of attack and different accuracies of bombing. Accuracy is measured by the per cent of bombs dispatched expected to fall within 1000 feet of the aiming point. (Reference should be made to Joint Target Group Memorandum No. 3, "Explanation of Weapon Recommendations and Loading Tables Given in Target Information Sheets", dated 27 December 1944.)

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TARGET INFORMATION SHEET *(Contd.)*

Table I

LOADING TABLE - MOST EFFECTIVE WEAPONS (1)

HE: AN-M64 500-lb G.P., fuzed 0.01 sec. nose/ 0.01 sec. tail (0.1 sec. nose if M139 nose fuzes unavailable)

IB: AN-M47 70-lb.

AICHI AIRCRAFT ENGINE WORKS, NAGOYA PLANT

Total Load In Tons (4)	Per cent of bombs dispatched expected to fall within 1000 feet of the aiming point (2)											
	10%			15%			20%			30%		
	HE	IB	F(3)	HE	IB	F(3)	HE	IB	F(3)	HE	IB	F(3)
	Tons (4)			Tons (4)			Tons (4)			Tons (4)		
75										15	60	15%
100							20	80	13%	35	65	18
150				25	125	15%	50	100	18	85	65	23
200	35	165	13%	70	130	18	100	100	21	135	65	28
300	110	190	17	170	130	23	200	100	27	235	65	36
400	210	190	21	270	130	27	300	100	33	335	65	44
500	310	190	24	370	130	32	400	100	38	435	65	51
600	410	190	27	470	130	36	500	100	44	535	65	58
700	510	190	30	570	130	39	600	100	49	635	65	64
800	610	190	33	670	130	44	700	100	54	735	65	68
900	710	190	36	770	130	48	800	100	58	835	65	72
1000	810	190	38	870	130	51	900	100	62	935	65	76
1100	910	190	41	970	130	55	1000	100	65	1035	65	80
1200	1010	190	44	1070	130	58	1100	100	68	1135	65	83
1300	1110	190	46	1170	130	61	1200	100	71	1235	65	

NOTES: (1) Because of the small difference in effectiveness of the various G.P. bombs, there will be only a small error if this table is used for the 1000 and 2000-lb G.P.'s. (The 1000 and 2000-lb bombs are 95 per cent as effective against this target as the 500-lb G.P.) Also, there will be only a negligible error if this table is used for the AN-M50 4-lb incendiary as the difference in effectiveness between the AN-M50 and AN-M47 is less than 5 per cent.

(2) In the examples following this table, this quantity is called the "Index of Mission Efficiency". It is a measure of bombing accuracy, and bears no relation to the size of the target.

(3) Expected fraction (per cent) of serious damage to the target.

(4) Load is given in tons of actual (not nominal) weight of bombs.

Method of Use:

1. Determine Index of Mission Efficiency:

   (a) Estimate per cent of dispatched planes bombing primary target.
   (b) Estimate per cent of bombs over target expected to fall within 1000 feet of aiming point.
   (c) Multiply (a) by (b) and round off to nearest percentage figure in table.

2. Read under computed Index of Mission Efficiency and opposite the total load dispatched the recommended high explosive-incendiary loading and the expected per cent of damage.

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Examples Illustrating Use of Loading Table:

1. *To find the best HE-IB combination and resulting per cent of damage for a given force:*

Given: Planes expected to bomb primary target, 70 per cent of mission. Percent of bombs over target expected to fall within 1000 feet of aiming point, 30 per cent. Mission of 100 planes with total load of 300 tons.

Solution: 70 per cent x 30 per cent equals 21 per cent; i.e., 20 per cent is Index of Mission Efficiency. Opposite 300 tons in 20 per cent column find loading:

HE 200 tons equals 67 plane loads at 3 tons per plane.
IB 100 tons equals 33 plane loads at 3 tons per plane.
Fraction of damage: 27 per cent.
Hence, for optimum loading 67 planes will carry HE and 33 planes IB, but if groups of 12 are to carry only one kind of bomb per group, this may be revised to 5 groups of HE and 3 groups of IB.

2. *To find force required to achieve recommended level of damage:*

Given: Recommended level of damage, 50 per cent. Same Index of Mission Efficiency as in Example 1. Individual A/C bomb load 3 tons.

Solution: In 20 per cent Mission Efficiency column take:
F equals 49 per cent and find loading:

	HE 600 tons
	IB 100 tons
Total	700 tons

requiring a total force of 233 A/C or 20 groups of 12 A/C.

The Loading Table has been prepared from an analysis of the target before attack. If the important buildings of the target have suffered only slight damage in an early attack, it will still be suitable for determining the best loading, but after substantial damage to the important buildings has resulted, a new analysis of the target should be made and a new Loading Table prepared.

If the target has suffered substantial damage in earlier attacks, and no new Loading Table is available, the following general rules can be applied:

a. If previous attacks have destroyed most of the important combustible buildings (or buildings with highly combustible contents) on the site, as shown in the Fire Susceptibility Plan (Illustration No. 90.20-2010 P5), loads carried on subsequent attacks should consist wholly of the recommended HE weapon.

b. If the proportion of combustible buildings remaining is about the same as before attack (e.g., because the bomb pattern has covered only part of the site), the original Loading Table may again be used to calculate the best mixture of He and IB for a subsequent attack.

c. If it has not been possible to assess damage in the earlier attack, the Loading Table should be used to determine the cumulative load. For example, if 300 tons have previously been dispatched, and 200 tons are to be sent in a second attack, and the Index of Mission Efficiency is 20 per cent, the Loading Table shows the cumulative load (500 tons) should be divided into 400 tons HE and 100 tons IB. If 200 tons HE and 100 tons IB were sent in the first attack, 300 tons HE and no IB should be dispatched in the second attack.

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TARGET INFORMATION SHEET *(Contd.)*

LEVEL OF DAMAGE

Serious damage (structural plus severe fire damage) of the following approximate levels will result in the net production loss shown below:

Fraction of Damage	Months of Net Production Loss
25 per cent	1 to 3 months
50 per cent	3 to 5 months
70 per cent	5 to 8 months

Damage of approximately 70 per cent to the vital machine shops would destroy a major portion of the machine tools and completely halt production for at least four months. Net production loss would be between 5 and 8 months's of the pre-attack output rate. In the aero-engine industry, experience indicates diminishing returns do not take effect until levels of damage exceeding 70 per cent are reached.

At lesser levels, net production loss will vary depending upon whether bombs strike essential processes in key production lines, such as those making cylinder heads, crankshafts, gears, etc. Also, there is more chance for removal of undamaged or salvageable equipment to nearby plants or for utilization of undamaged facilities within the plant more fully, thus curtailing production loss. Damage of less than 25 per cent will probably be repaired rather quickly, and unless vital processes are hit, loss should be relatively unimportant.

The total tonnage which must be dispatched to cause these levels of damage may be estimated from the Loading Table as explained and illustrated under "Method of Use" of the Table.

CAMOUFLAGE, DECOYS AND SMOKE SCREENS

Photography of 23 November 1944 shows some disruptive roof painting. There is no evidence of decoy buildings and no smoke screens have been reported.

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Sheet No. 90.20-2010-P 6
Date 10 Feb. 1945
Page No. 1 (1 pages)

JOINT TARGET GROUP, WASHINGTON, D.C.
FUNCTIONAL IDENTIFICATION SHEET

(To be read in conjunction with Illustration No. 90.20-2010 P5)

Obj. Folder 90.20
Obj. Area 90.20
AAF Target No. 90.20-2010

Place Nagoya, (Japan)
Air Target
System - Aircraft

Lat.: 35° 07' N
Long: 136° 54' E
Alt.: 10 feet

NAME OF TARGET AICHI AIRCRAFT ENGINE WORKS, NAGOYA PLANT

ALL PREVIOUS SHEETS CANCELLED

Building No.	Function of Building
1	Offices and cafeterias.
2	Offices.
3	Engine parts manufacture and assembly.
4	Probable foundry or parts manufacture.
5	Probable parts manufacture.
6	Foundry and storage.
7	Storage.
8, 9	Unidentified.
10 - 15	Probable storage.
16, 17	Possible location of reported 13 mm ammunition manufacture.
18	Engine parts manufacture.
19, 20	Unidentified.
21	Boiler house.

(Based on F/A Report No. 10, AC/AS, Intelligence, Photographic Division, dated 13 December 1944.)

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JOINT TARGET GROUP, WASHINGTON, D.C.
TARGET INFORMATION SHEET

Sheet No.93.3-45-TI
Date 30 Dec. 1944
Page No. 1 (6 pages)

Obj. Folder 93.1-5
Obj. Area 93.3
AAF Target No. 93.3-45

Place Mukden
Category Aircraft

Lat.: 41°52'N
Long: 123°26'E
Alt.: 106 feet

NAME OF TARGET MANCHURIA AIRPLANE MFG. CO., PLANT NO. 2

ALL PREVIOUS SHEETS CANCELLED

SIGNIFICANCE

This plant is not believed to be producing either combat aircraft or engines. It is of little significance to the Japanese aircraft industry. The layout and construction of buildings suggests that the facilities here are devoted to repair and overhaul of aircraft, and possibly to some experimental work.

LOCATION:

On the W side of the N Mukden airfield. It is immediately N of the Peiling Tombs and about 4.5 miles N of the old walled city of Mukden. It is bounded on the E by the airfield and on the W by a main roadway running N from Mukden.

DESCRIPTION AND LAYOUT

(Refer to Illustration No. 93.3-45 P5). The target area is roughly triangular, extending 5200 feet N-S and 2600 feet at the widest E-W point. The plant is divided into two well separated groups of buildings, and has been broken down into Target A and Target B. Target A contains the fabrication and repair facilities, as well as the administration section and workers' huts. Target B consists of flight and testing hangars and related buildings. Buildings 13 and 3, hangar-type construction, are the largest units, having plan areas of 78,600 and 64,000 square feet. Construction is continuing at the site.

CONSTRUCTION & VULNERABILITY

(Refer to Illustration No. 93.3-45 P5).

General: Buildings 3, 12, 13, 22-26 (Hangar-type construction) have steel trusses supported on masonry or reinforced concrete walls. Roofing is probably corrugated iron. Buildings 4 and 11 probably have steel trusses supporting saw-tooth roofs with masonry external walls. Section B of building 11 probably has a combustible roof supported by wood trusses. Building 6 has a wood trussed roof, supported upon masonry bearing walls. Remainder of the buildings are of wood frame construction.

Floors: Floors are concrete or compacted earth.

Number of Stories: Approximately 85 per cent of the entire target is composed of single story buildings.

Number of Fire Divisions: Target A: 27 fire divisions in 17 buildings.
Target B: 8 fire divisions in 7 buildings.

(Buildings 20, 21, 29, 30, 31, 32, 34 are not considered in the fire analysis as they are workers' huts, living quarters, and probably a school).

The Fire Susceptibility Plan shows the vulnerability to fire of each building and its contents. Contents are of low to moderate combustibility. It is estimated that 40 per cent of Target A and 50 per cent of Target B can be destroyed by fire. The target is a good choice for combined high explosive-incendiary attack.

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PRIMARY OBJECTIVES

(Refer to Illustration No. 93.3-45 P5). Target A: Buildings 3, 4, 10, 11, 12, 13, and 18, housing the fabrication and repair facilities. All buildings in this group fall well within a circle of 1000-foot radius centering on building 12. The aiming point for Target A should be building 12.

Target B: The service and repair hangars, buildings 23, 24, 25, 26. Building 24 should be the aiming point. (Selection of aiming points is for a high level attack.)

WEAPON RECOMMENDATIONS

The most effective weapons for high level attack against Targets A and B are the AN-M50 4-lb incendiary bomb (in M17 clusters) and the AN-M65 1000-lb G.P. Maximum damage to structures and contents will result if the high explosive bombs are fuzed 0.1 sec. nose and 0.01 sec. tail.

The AN-M50 I.B. is slightly more effective against this target than the AN-M47 because of the wide dispersal of combustible material in the primary objectives, which require multiple hits for a high level of damage. This same factor makes the use of the AN-M76 500-lb incendiary unprofitable. Because buildings are fairly well spaced, each fire division must be ignited. This, plus the presence of fire walls, tends to prevent fire spread.

The 1000-lb G. P. is selected as the best high explosive weapon because it is equal in effectiveness to the AN-M66 2000-lb G.P. on the buildings in Target A, and 15 per cent more effective than the 2000-lb bomb on Target B structures. The AN-M64 500-lb G.P. is only 86 per cent as effective against buildings in Target A as the 1000-lb bomb, and only 77 per cent as effective against Target B structures. Considerable damage to contents as well as structures will result with the 1000-lb bomb exploding 6 to 10 feet beneath the roof due to 0.01 sec. tail fuzing.

The following loading tables show, for different choices of weapons, the best combinations of H.E. and I.B. for different weights of attack and for different assumptions regarding the number of bombs dispatched falling within 1000 feet of the aiming point to obtain maximum damage for a given weight of bombs. They also show the fraction of structural damage to the buildings in Targets A and B which can be expected for each weight of attack and assumption of bombs dispatched falling within 1000 feet of aiming point.

Table I is computed for the best combination of weapons, namely, 2000-lb G.P. and AN-M50 incendiary. If conditions of supply or other factors indicate choice of weapons other than those recommended in Table I, the reduced effectiveness of the alternate weapons is shown in Table II, which is made up for the 1000-lb G.P. and the AN-M47 incendiary.

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Table I

LOADING TABLE - MOST EFFECTIVE WEAPONS

H.E. : AN-M65 1000-lb G.P. (1)
I.B. : AN-M50 4-lb.

Manchuria Airplane Manufacturing Co., Plant No. 2

----Target A-----

Total Load in Tons (4)	Per cent of bombs dispatched expected to fall within 1000 feet of aiming point (2)											
	10%			15%			20%			30%		
	H.E. Tons (4)	I.B. Tons (4)	F(3)	H.E. Tons (4)	I.B. Tons (4)	F(3)	H.E. Tons (4)	I.B. Tons (4)	F(3)	H.E. Tons (4)	I.B. Tons (4)	F(3)
50	35	15	.08	25	25	.14	20	30	.18	15	35	.25
75	35	40	.14	25	50	.20	20	55	.25	15	60	.31
100	35	65	.18	25	75	.25	20	80	.29	25	75	.35
125	35	90	.22	25	100	.28	20	.05	.33	50	75	.38
150	35	115	.25	25	125	.31	40	110	.35	75	75	.42
175	35	140	.27	25	150	.33	65	110	.37	100	75	.45
200	35	165	.29	50	150	.35	90	110	.40	125	75	.48
250	35	215	.33	100	150	.39	140	110	.44	175	75	.53
300	80	220	.35	150	150	.42	190	110	.48	225	75	.58
400	180	220	.40	250	150	.48	290	110	.54	325	75	.66
500	280	220	.44	350	150	.53	390	110	.61	425	75	.72

-----Target B-----

Total Load in Tons (4)	Per cent of bombs dispatched expected to fall within 1000 feet of aiming point (2)											
	10%			15%			20%			30%		
	H.E. Tons (4)	I.B. Tons (4)	F(3)	H.E. Tons (4)	I.B. Tons (4)	F(3)	H.E. Tons (4)	I.B. Tons (4)	F(3)	H.E. Tons (4)	I.B. Tons (4)	F(3)
50	35	15	.16	25	25	.25	20	30	.30	15	35	.37
75	35	40	.25	25	50	.33	20	55	.37	15	60	.42
100	35	65	.30	25	75	.37	20	80	.41	30	70	.46
125	35	90	.34	25	100	.40	25	100	.45	55	70	.51
150	35	115	.37	25	125	.41	50	100	.47	80	70	.55
175	35	140	.39	40	135	.44	75	100	.49	105	70	.58
200	35	165	.41	65	135	.46	100	100	.52	130	70	.61
250	50	200	.45	115	135	.51	150	100	.57	180	70	.67
300	100	200	.46	165	135	.54	200	100	.61	230	70	.72
400	200	200	.52	265	135	.61	300	100	.69	330	70	.80
500	300	200	.57	365	135	.67	400	100	.75	430	70	.86

NOTES:
(1) The table for Target A also is valid for the 2000-lb G.P. Because of the difference in effectiveness, there will be a small error if the table for Target B is used for the 2000-lb G.P.
(2) In the examples following this table this quantity is called the "Index of Mission Efficiency".
(3) Expected fraction (per cent) of structural damage to buildings within Targets A and B.
(4) Load is given in tons of actual (not nominal) weight of bombs.

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Table II

LOADING TABLE - ALTERNATE WEAPONS

H.E.: AN M65 1000-lb G. P.(1)
I.B.: AN M47 70-lb I.B.

Manchuria Airplane Manufacturing Company, Plant No. 2

-----Target A-----

Total Load in Tons (4)	Per cent of bombs dispatched expected to fall within 1000 feet of aiming point (2)											
	10%			15%			20%			30%		
	H.E. Tons (4)	I.B. Tons (4)	F(3)	H.E. Tons (4)	I.B. Tons (4)	F(3)	H.E. Tons (4)	I.B. Tons (4)	F(3)	H.E. Tons (4)	I.B. Tons (4)	F(3)
50	35	15	.06	25	25	.12	20	30	.16	15	35	.22
75	35	40	.12	25	50	.17	20	55	.22	15	60	.29
100	35	65	.16	25	75	.22	20	80	.28	15	85	.34
125	35	90	.19	25	100	.26	20	105	.31	15	105	.37
150	35	115	.22	25	125	.29	20	130	.34	45	105	.41
175	35	140	.25	25	150	.32	20	155	.36	70	105	.44
200	35	165	.28	25	175	.34	45	155	.38	95	105	.47
250	35	215	.31	45	205	.37	95	155	.43	145	105	.52
300	35	265	.34	95	205	.41	145	155	.47	195	105	.57
400	95	305	.38	195	205	.47	245	155	.54	295	105	.65
500	195	305	.43	295	205	.52	345	155	.60	395	105	.72

-----Target B-----

Total Load in Tons (4)	Per cent of bombs dispatched expected to fall within 1000 feet of aiming point (2)											
	10%			15%			20%			30%		
	H.E. Tons (4)	I.B. Tons (4)	F(3)	H.E. Tons (4)	I.B. Tons (4)	F(3)	H.E. Tons (4)	I.B. Tons (4)	F(3)	H.E. Tons (4)	I.B. Tons (4)	F(3)
50	35	15	.08	25	25	.16	25	25	.21	25	25	.29
75	35	40	.16	25	50	.23	25	50	.29	25	50	.38
100	35	65	.21	25	75	.29	25	75	.36	25	75	.44
125	35	90	.26	25	100	.35	25	100	.41	40	85	.48
150	35	115	.29	25	125	.38	25	125	.44	65	85	.52
175	35	140	.33	25	150	.42	45	130	.47	90	85	.57
200	35	165	.36	35	165	.44	70	130	.50	115	85	.59
250	35	215	.41	80	170	.48	120	130	.55	165	85	.65
300	45	255	.44	130	170	.52	170	130	.59	215	85	.70
400	145	255	.50	230	170	.59	270	130	.67	315	85	.79
500	245	255	.55	330	170	.65	370	130	.74	415	85	.85

NOTES:
(1) The table for Target A also is valid for the 2000-lb G.P. Because of the difference in effectiveness, there will be a small error if the table for Target B is used for the 2000-lb G.P.
(2) In the examples following this table this quantity is called the "Index of Mission Efficiency".
(3) Expected fraction (per cent) of structural damage to buildings within Targets A and B.
(4) Load is given in tons of actual (not nominal) weight of bombs.

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Method of Use:

1. Determine index of mission efficiency:
   (a) Estimate per cent of dispatched planes bombing primary target.
   (b) Estimate per cent of bombs over target expected to fall within 1000 feet of aiming point.
   (c) Multiply (a) by (b) and round off to nearest percentage figure in table.

2. Read under computed index of mission efficiency and opposite the total load dispatched the recommended H.E. - I.B. loading and the expected fraction of damage.

Examples Illustrating Use of Loading Table: (based on Table I- Target A)

1. To find best H.E. - I.B. combination and resulting per cent of damage for a given force:

   Given: Planes expected to bomb primary target, 70% of mission.
   Per cent of bombs over target expected to fall within 1000 feet of aiming point, 30%.
   Mission of 100 planes with total load 300 tons.

   Solution: 70% x 30% = 21%; i.e., 20% is index of mission efficiency.
   Opposite 300 tons in 20% column find loading:
   H.E. 190 tons -- 63 plane loads at 3 tons per plane.
   I.B. 110 tons -- 37 plane loads at 3 tons per plane.
   F= 48%

   Hence, for optimum loading, 63 planes will carry H.E. and 37 planes I.B., but if groups of 12 are to carry only one kind of bomb per group, this may be revised to 5 groups with H.E.'s and 3 groups with I.B.'s.

2. To find force required to achieve a recommended level of damage:

   Given: Recommended level of damage, 40%.
   Same index of mission efficiency as in example 1.
   Individual A/C bomb load, 4 tons.

   Solution: In 20% index of mission efficiency column, take:
   F = 40% and find loading H.E. 90 tons
   I.B. 110 tons
   Total 200 tons
   requiring a total force of 50 aircraft or 4 groups of 12 aircraft.

LEVEL OF DAMAGE

Loss due to less than 15 per cent structural damage probably can be repaired rather quickly. It is not likely that much critical equipment would be hit at this level, and repairs would be confined to the walls and roof. While replacement time depends to a considerable degree on whether the scattered bombs hit some especially important spot, loss caused by destruction of material and aircraft in process and repair is not likely to result in more than 10 to 14 days output.

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Experience indicates that damage of 30 to 40 per cent is much more serious, as a high percentage of the material in process and repair would be destroyed. It would be more economical to move the plant to new buildings than to attempt to repair the buildings damaged 30 to 40 per cent. The loss in airframe fabrication and repair probably would be two to three months, spread over four or five months. Damage greater than 40 per cent is not profitable because of increased force requirements necessary against this small plant.

CAMOUFLAGE, DECOYS AND SMOKE SCREENS

Photography of 19 June 1944 shows no attempt at camouflage or decoys. Use of smoke screens has not been reported.

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TARGET NO. 93.3–45

APPROX. COORDINATES 41° 51' N 123° 26' E

PHOTOGRAPHED 19 JUNE 1944

MANCHURIA AIRPLANE MFG. CO., PLANT 2
MUKDEN, MANCHURIA

ILLUSTRATION NO. 93.3–45 P I

11 SEPTEMBER 1944

CONFIDENTIAL

0 2000 4000 6000 FEET
0 ½ 1 MILE
1:32 000 APPROX.

TYPE A

AC/AS. INTELLIGENCE

CONFIDENTIAL

TARGET NO. 93.3-45

APPROX. COORDINATES 41° 51' N 123° 26' E

PHOTOGRAPHED 19 JUNE 1944.

MANCHURIA AIRPLANE MFG. CO., PLANT 2
MUKDEN, MANCHURIA

ILLUSTRATION NO. 93.3-45 P2

11 SEPTEMBER 1944

CONFIDENTIAL

0 2000 4000 6000 FEET
0 ½ 1 MILE
1:32 000 APPROX.

CONFIDENTIAL

AC/AS, INTELLIGENCE

TYPE B

TARGET NO. 93.3-45

MANCHURIA AIRPLANE MFG. CO., PLANT 2
MUKDEN, MANCHURIA.

ILLUSTRATION NO. 93.3-45 P3

11 SEPTEMBER 1944

CONFIDENTIAL

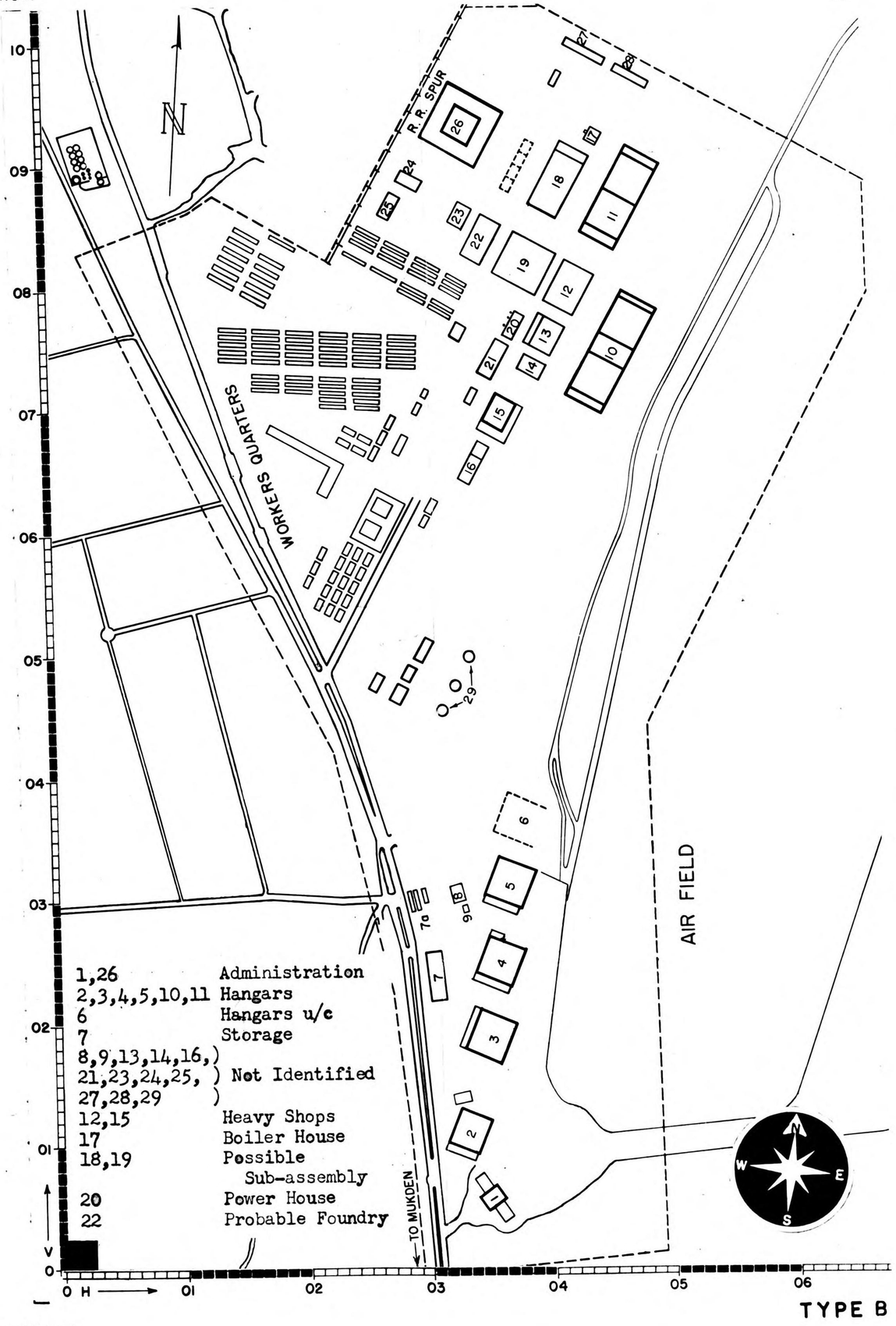
APPROX. COORDINATES 41° 51' N 123° 26' E

PHOTOGRAPHED 19 JUNE 1944

0 500 1000 1500 2000 2500 3000 FEET

0 1/4 1/2 MILE

1:6000 APPROX.



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Sheet No. 93.3-177TI/1
Date 16 Dec. 1944
Page No. 1 (7 pages)

JOINT TARGET GROUP, WASHINGTON, D.C.
TARGET INFORMATION SHEET

Obj. Folder 93.1-5
Obj. Area 93.3
AAF Target No. 93.3-177

Place **Mukden (Manchuria)**
Category **Aircraft**

Lat.: 41°48' N
Long: 123°30' E
Alt.: 160'

NAME OF TARGET **MANCHURIA AIRPLANE MFG. CO., PLANT #1**
(Manshu Hikoki Seizo KK)

ALL PREVIOUS SHEETS CANCELLED

SIGNIFICANCE:

The plant is probably now being used for the production of advanced single engine trainers. Study of aerial cover indicates that it is the only plant in Mukden engaged in aircraft fabrication. Target No. 93.3-45 (Manchuria Airplane Manufacturing Co., Plant No. 2), located on the W side of the N Mukden Airfield (41°52' N, 123°26' E) consists mainly of hangar type structures and is believed to be a repair and modification center.

Despite the frequent references to the importance of Manchuria as a producer of aircraft, the only aircraft and aero-engine nameplates recovered to date show that the obsolete fighter Nate and its engine (type 97650) were made at this plant in November, 1942. One intelligence source states that the Tachikawa firm set up a plant for the production of single engined trainers at Mukden in 1939, and it is not improbable that this is the present product. It is unlikely that either operational aircraft or engines are made here.

Output figures are not available. The size of the plant believed devoted to airframe (over 600,000 sq. ft.) and the large number of aircraft seen in and adjacent to the factory grounds suggest an output of at least 200 planes per month. While the existence of test beds in the extreme northern portion of the plant suggests engine production, there is no knowledge at present of the location or quantity of engine output by this company.

LOCATION:

This plant is part of a target complex which includes the Mukden Arsenal (Target No. 93.3-46) and its subsidiary Manchuria Machine Tool Co. (Target No. 93.3-164) and Manchuria Iron Works (Target No. 93.3-166). It is situated in the eastern suburbs of Mukden approximately 2½ miles E of the old walled city. The Hun River flowing generally NE-SW lies to the S and E with its nearest point about 4,500 feet SE. A RR spur runs W through the target and the adjacent Mukden Arsenal, and then NW to the Mukden-Kirin line. The compound is bounded on the W by the Mukden Arsenal, on the NE by a tributary of the Hun River, and on the S by the Old East Mukden Airfield. The Airfield is used for testing and flying off completed planes. The target area is adjacent to open country on the S and N and a sparsely built-up area on the E.

DESCRIPTION AND LAYOUT:

(Identity numbers quoted in this section refer to Illustration No. 93.3-177/P5, Fire Susceptibility Plan.) The plant occupies a triangular area 2,500 x 2,000 feet totalling 5,590,000 sq. ft. The major producing facilities occupy a compact square 1,200 feet on a side 45% built up, containing Buildings 5a and b, 12, 16, 19-21, and 30. This area contains the sub and final assembly facilities and possibly most of the metal processing and bench work as well. A minor producing area centers around Buildings 22 and 25 and those lying N of the railroad (Buildings 40-57). This area is probably used for basic airframe machining and stores if the plant makes only airframes and is functionally related to assembly in Building 6; or for engine compon-

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ent manufacture, if engines are made. It is not considered of primary importance even if the plant is engaged in engine manufacture since it is probable that a high percentage of engine components is produced in the arsenal itself.

The southwestern portion of the plant (Buildings 6 and 7) is presumably devoted to assembly and/or repair and/or experimental work.

Further details of building identifications are given in the attached functional analysis, Sheet No. 93.3-177/P6, which is keyed to the fire plan.

CONSTRUCTION AND VULNERABILITY:

(Identity numbers refer to Illustration No. 93.3-177/P5, Fire Plan.)

Walls: The majority of the buildings are steel framed; some smaller buildings are timber framed. Wall panels may be either masonry or corrugated iron.

Roofs: The bulk of the roofs are non-combustible, probably of corrugated iron or asbestos.

Floors: Concrete floors probably used in most buildings, particularly the hangar-like structures. Floors in multi-story units are reinforced concrete.

Number of Stories: 91% of the whole target and 96% of primary objectives consist of single story buildings.

Number of Fire Divisions: 63 in 57 buildings.

The Fire Plan shows the vulnerability to fire of each building and its contents. Contents are of low to moderate combustibility. It is estimated that 46% of the whole target and 38% of the primary objectives can be destroyed by fire. The target is therefore a reasonably good choice for combined HE -IB attack.

PRIMARY OBJECTIVES:

(Identity numbers refer to Illustration No. 93.3-177/P5, Fire Plan.) Whether or not engine parts are made at this plant, the primary objectives are the principal buildings associated with airframe production (machine shops, detail, sub-assembly and assembly). These are numbered as 5a and b, 12, 16, 19, 20a and b, 21 and 30.

These buildings are all within the 1,200-foot square mentioned in Section 4 above. All buildings within this area fall within a circle of 1,000 foot radius centering on Building 20. A large proportion of all airframe or engine machining buildings lie in this circle.

The selection of a single aiming point on Building 20 is therefore recommended for high level attack.

WEAPON RECOMMENDATIONS:

The most effective weapons for high level attack against the primary objectives in this target are the AN-M50 4 lb. incendiary in (M17 clusters) and the 2000 G.P. (AN-M66). Maximum damage to structures and contents will result if the HE bombs are fuzed 0.1 sec. nose and 0.01 sec. tail.

The AN-M50 IB (in M17 clusters) is much more effective than the AN-M47 against this target because of the wide dispersal of combustible material in the primary objectives, which requires multiple hits

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for a high level of damage. This same factor makes the use of the AN-M76 500 lb. incendiary very unprofitable. It is necessary to ignite each fire division, because the buildings are fairly well spaced and this, plus the presence of fire walls, tends to prevent fire spread.

The 2000 lb. G.P. is more effective than smaller G.P. bombs because it gives the best expectancy of causing spreading collapse to the long spanned and high roofed assembly buildings, particularly when it explodes 6 to 10 feet beneath the roof as a result of 0.01 sec. tail fuzing. The building area destroyed by a ton of either of the 500 lb. G.P. or the 1000 lb. G.P. is estimated to be about 90% of that destroyed by the 2000 lb. G.P.

The following loading tables show, for different choices of weapons, the best combinations of HE and IB for different weights of attack and for different assumptions regarding the number of bombs dispatched falling within 1,000 feet of the aiming point to obtain maximum damage for a given weight of bombs. They also show the fraction of structural damage to primary objectives which can be expected for each weight of attack and assumption of bombs dispatched falling within 1,000 feet of aiming point.

Table I is computed for the best combination of weapons, namely 2000 lb. G.P. and AN-M50 incendiary. If conditions of supply or other factors indicate choice of weapons other than those recommended in table I, the reduced effectiveness of the alternate weapons is shown in table II, which is made up for the 2000 lb. G.P. and the AN-M47 incendiary.

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Table I

LOADING TABLE - MOST EFFECTIVE WEAPONS

HE:AN-M66, 2000 lb. G.P. (1)
IB:AN-M50, 4 lb.

Manchuria Airplane Manufacturing Company, Plant No. 1

Total Load in Tons (4)	Percent of bombs dispatched expected to fall within 1,000 ft. of aiming point (2)							
	10%		15%		20%		30%	
	HE - IB Tons (4)	F(3)	HE - IB Tons (4)	F(3)	HE - IB Tons (4)	F(3)	HE - IB Tons (4)	F(3)
50					20-30	19%	15-35	27%
75	35-40	16%	25-50	22%	20-55	28	15-60	34
100	35-65	20	25-75	28	20-80	32	25-75	37
125	35-90	24	25-100	31	20-105	35	50-75	40
150	35-115	28	25-125	34	40-110	37	75-75	43
175	35-140	30	25-150	36	65-110	39	100-75	46
200	35-165	32	50-150	37	90-110	41	125-75	48
250	35-215	35	100-150	40	140-110	45	175-75	53
300	80-220	37	150-150	43	190-110	48	225-75	57
400	180-220	41	250-150	48	290-110	54	325-75	64
500	280-220	45	350-150	53	390-110	60	425-75	70

Notes: - (1) Because of the small difference in effectiveness of the various G.P. bombs, there will be only a small error if this table is used for the 1000 and 500 lb. G.P. bombs.

(2) In the examples following this table this quantity is called the "Index of Mission Efficiency".

(3) Expected fraction (percent) of structural damage to vital parts in target.

(4) Load is given in tons of actual (not nominal) weight of bombs.

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Table II

LOADING TABLE - ALTERNATE WEAPONS

HE:AN-M66, 2000 lb. G.P. (1)
IB:AN-M47, 70 lb.

Manchuria Airplane Manufacturing Company, Plant No. 1								
Total Load in Tons (4)	Percent of bombs dispatched expected to fall within 1,000 ft. of aiming point (2)							
	10%		15%		20%		30%	
	HE - IB Tons (4)	F(3)	HE - IB Tons (4)	F(3)	HE - IB Tons (4)	F(3)	HE - IB Tons (4)	F(3)
50					20-30	9%	15-35	13%
75	35-40	7%	25-50	10%	20-55	13%	15-60	19
100	35-65	10	25-75	13	20-80	17	15-85	24
125	35-90	12	25-100	16	20-105	21	35-90	28
150	35-115	13	25-125	19	20-130	24	60-90	31
175	35-140	15	25-150	21	45-130	26	85-90	34
200	35-165	17	25-175	24	70-130	29	110-90	37
250	35-215	22	75-175	28	120-130	33	140-90	43
300	45-255	24	125-175	31	170-130	37	210-90	48
400	145-255	29	225-175	37	270-130	45	310-90	58
500	245-255	33	325-175	42	370-130	53	410-90	66

Notes: - (1) Because of the small difference in effectiveness of the various G.P. bombs, there will be only a small error if this table is used for the 1000 and 500 lb. G. P. bombs.

(2) In the examples following this table this quantity is called the "Index of Mission Efficiency".

(3) Expected fraction (percent) of structural damage to vital parts in target.

(4) Load is given in tons of actual (not nominal) weight of bombs.

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Method of Use:

1. Determine index of mission efficiency:
   (a) Estimate percent of dispatched planes bombing primary target.
   (b) Estimate percent of bombs over target expected to fall within 1,000 feet of aiming point.
   (c) Multiply (a) by (b) and round off to nearest percentage figure in table.
2. Read under computed index of mission efficiency and opposite the total load dispatched the recommended HE - IB loading and the expected percent of damage.

Examples Illustrating Use of Loading Table: (Based on Table I)

1. To find best HE - IB combination and resulting percent of damage for a given force:

   Given: Planes expected to bomb primary target, 70% of mission.
   Percent of bombs over target expected to fall within 1,000 feet of aiming point, 30%.
   Mission of 100 planes with total load 300 tons.

   Solution: 70% x 30% = 21%; i.e., 20% is index of mission efficiency.
   Opposite 300 tons in 20% column find loading:
   HE 190 tons = 63 plane loads at 3 tons per plane.
   IB 110 tons = 37 plane loads at 3 tons per plane.
   F 48%
   Hence, for optimum loading 63 planes will carry HE and 37 planes IB, but if groups of 12 are to carry only one kind of bomb per group, this may be revised to 5 groups with HE's and 3 groups with IB's.

2. To find force required to achieve a recommended level of damage.

   Given: Recommended level of damage, 40%. Same index of mission efficiency as in example 1.
   Individual A/C bomb load, 4 tons.

   Solution: In 20% of mission efficiency column take:
   F = 41% and find loading HE 90 tons
   IB 110 tons
   Total 200 tons
   requiring a total force of 50 A/C or 4 groups of 12 A/C.

LEVEL OF DAMAGE:

Any damage amounting to less than 15% structural damage to either the airframe or engine section of the plant will probably be repaired rather quickly. If the damage is in the airframe assembly section, it is not likely that much critical equipment will be hit and the only repairs necessary will be to walls and roof. This degree of damage in the engine section is likely to injure some tools, but increased use of similar equipment already in the plant and other temporary expedients are likely to put the plant back in full operation in a relatively short time. While repair time depends to a considerable degree on whether the scattered bombs hit some especially important spot, loss caused by destruction of material in process and by decrease in production of either airframes or engines is not likely to be more than 10 days to two weeks output.

Damage of 30 to 40% is much more serious. While there is no experience upon which to base Japanese reaction to this degree of damage,

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European experience indicates that at this level a high percentage of material in production is destroyed and it is more economical to move the plant to new buildings than to attempt to repair the damaged buildings. Loss in airframes should be on the order of two to three months production, spread over four or five months; loss of engine production in this small plant should amount to about four months output spread over six or seven months. In this small plant higher damage than 40% is not likely to yield appreciably greater results.

CAMOUFLAGE: Roofs of several buildings have disruptive painting, but many of the buildings show no attempt at camouflage.

ADDITIONAL INFORMATION: This sheet cancels previous sheet 93.3-177TI, dated 28 August 1944.

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JOINT TARGET GROUP, WASHINGTON, D. C.

ECONOMIC DAMAGE ASSESSMENT

CONFIDENTIAL

Sheet No. 93.3–177–DA
Date 17 February 1945
Page No. 1

Obj. Folder 93.1–5
Obj. Area 93.3
AAF Target No. 93.3–177
Air Target System—Aircraft

MANCHURIA AIRPLANE MFG. CO., PLANT NO. 1

(Manshu Hikoki Seizo KK)

MUKDEN . . . . . MANCHURIA

Lat.: 41°48′N
Long.: 123°30′E
Alt.: 160′

ALL PREVIOUS SHEETS CANCELLED

PARTICULARS OF ATTACK

On 7 December 1944, this plant was attacked by 80 B–29's of the XX Bomber Command; 259 tons of explosives (184 tons of 500-pound G. P. and 75 tons of 500-pound I. B. bombs) were dropped from heights ranging between 19,300 and 23,800 feet. The plant was reattacked on 21 December by 19 B–29's. On this raid, 83 tons of bombs (41 tons of 500-pound G. P.'s and 42 tons of 500-pound I. B.'s) were dropped from roughly the same altitudes as were used during the first attack.

PREVIOUS REPORTS

None.

SUMMARY OF CONCLUSIONS

1. Damage to the part of the plant producing airframes was nearly entirely confined to final assembly which received about 40 percent superficial damage.
2. This is estimated to have caused about 2 weeks' loss in output of trainers, divided equally between loss in process and replacement time.
3. Other damage to post assembly and possibly repair functions, while severe, will scarcely be reflected in an appreciable loss of aircraft.
4. Little or no repair clearance is observed nearly 3 weeks after the attacks, suggesting dispersal of the damaged functions.

PHYSICAL DAMAGE

Of the plant's 1,269,000 square feet, 80,000 square feet or 6 percent of the total area suffered structural damage while 65,000 square feet or 5 percent of the total area received superficial damage from the first attack. The second attack did not add to this damage. The superficial damage was nearly entirely concentrated on the known productive parts of this factory (principally final assembly) while the structural damage was confined to post assembly functions and to unidentified buildings. This damage is summarized in the attached schedule.

Building No. 1, believed engaged in propeller mounting, was about 40 percent structurally damaged and a nearby hangar (Building No. 4) was slightly damaged. Post raid cover was obtained 6 days after the attack and it is difficult to estimate the number of planes destroyed in or around these buildings. At the outside, this should only amount to a few days' output.

Building No. 7, unidentified, was destroyed. It is believed that this building might have been engaged in repair work. At the most this damage might result in 1 month's loss of planes and components—type unknown—under repair, but the small size of this building suggests that this function was relatively unimportant.

ECONOMIC ASSESSMENT

As the productive portion of this plant received only superficial damage to its final assembly building (40 percent of this function being damaged) the net loss to trainer aircraft under construction is light. It is believed that this loss will not exceed 1 week's output. An additional week's output will probably be lost while this production is set up elsewhere—possibly at the No. 2 plant in northern Mukden (Target 93.3–45). The damage to the rest of the productive part of this plant was negligible and can be disregarded.

REPAIR ACTIVITY

There is evidence of some clearance to Building No. 7 noted on the cover of 25 December 1944, taken 18 days after the first attack. Lack of repair to Building No. 5a strongly suggests that final assembly functions will be dispersed.

Study of the strike and post attack cover shows that a large portion of Building No. 5b (subassembly) had been removed between the time of the first cover of this plant and the time of the first attack. Presumably a fire not caused by air attack caused the damage which necessitated abandoning this part of the plant. Building No. 30, once believed to be an incoming storage building, has had north light roofing substituted for its previous flat roof. It is thus possible that this building now houses the subassembly function once carried out in the destroyed portion of Building No. 5a.

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TARGET NO. 933-177

MANCHURIA AIRPLANE MFG. CO., PLANT 1
MUKDEN, MANCHURIA

ILLUSTRATION NO. 933-177 P1

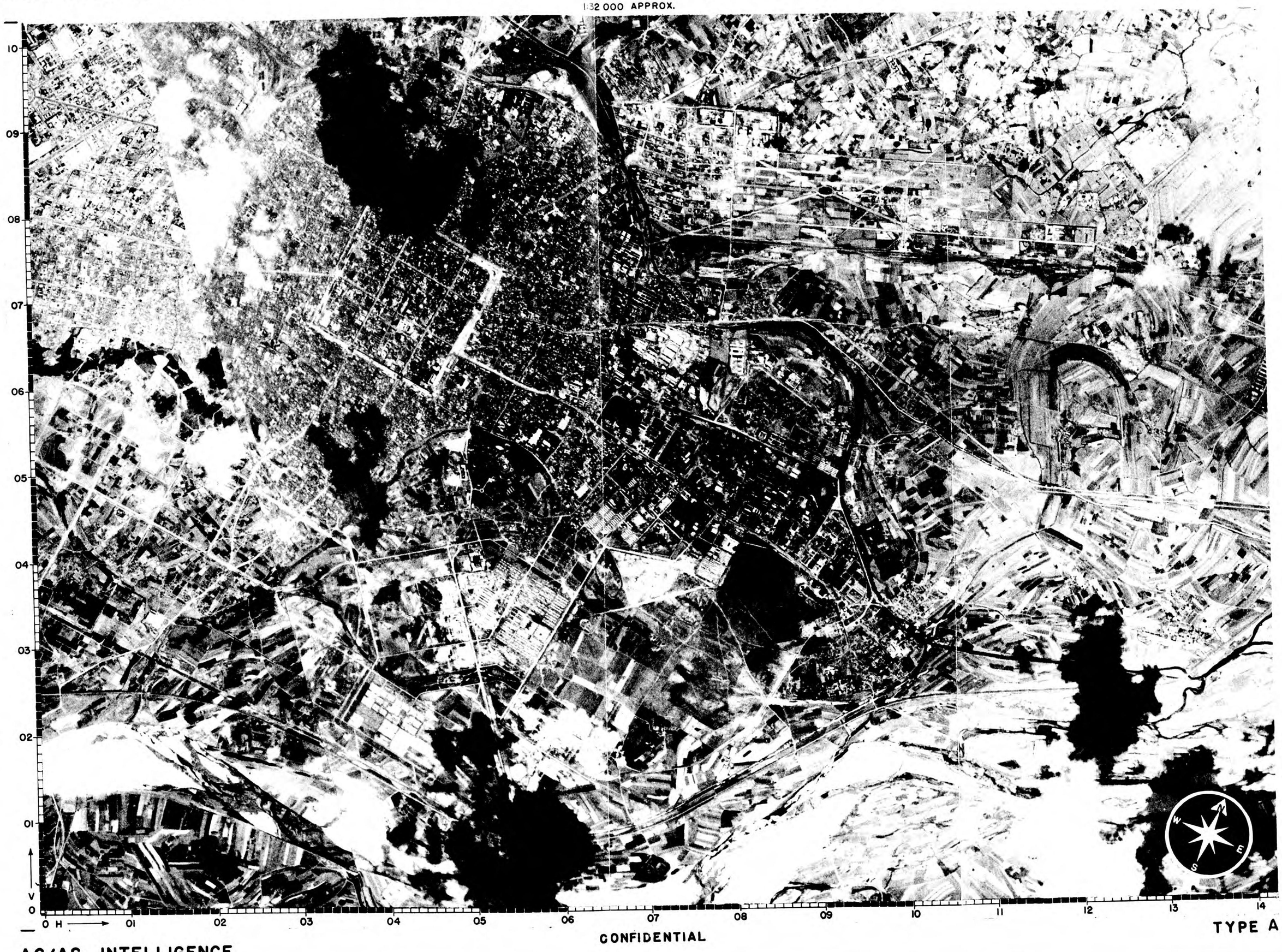
28 AUGUST 1944

APPROX. COORDINATES 41°-48' N 123° 30' E

PHOTOGRAPHED 19 JUNE 1944.

CONFIDENTIAL

0 2000 4000 6000 FEET
0 1/2 1 MILE
1:32 000 APPROX.



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TYPE A

AC/AS, INTELLIGENCE

TARGET NO. 93.3-177

MANCHURIA AIRPLANE MFG. CO., PLANT 1
MUKDEN, MANCHURIA

ILLUSTRATION NO. 93.3-177 P2

APPROX. COORDINATES 41° 48' N 123° 30' E

PHOTOGRAPHED 19 JUNE 1944

28 AUGUST 1944

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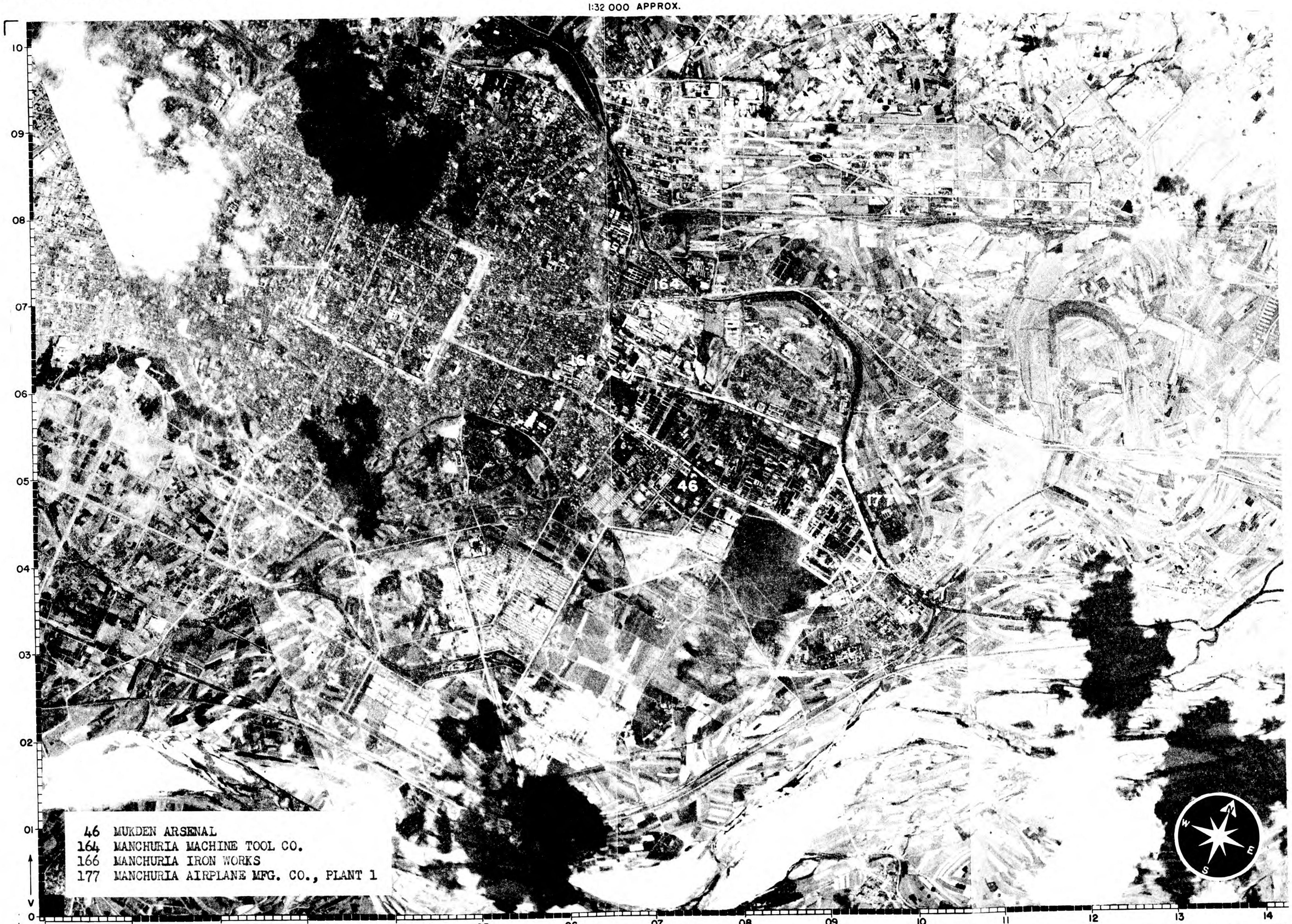

46 MUKDEN ARSENAL
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166 MANCHURIA IRON WORKS
177 MANCHURIA AIRPLANE MFG. CO., PLANT 1

CONFIDENTIAL

TYPE A

AC/AS, INTELLIGENCE

TARGET NO. 93.3-177

MANCHURIA AIRPLANE MFG. CO., PLANT 1
MUKDEN, MANCHURIA

ILLUSTRATION NO. 93.3-177 P3

28 AUGUST 1944

CONFIDENTIAL

APPROX. COORDINATES 41° 48' N 123° 30' E

PHOTOGRAPHED 19 JUNE 1944

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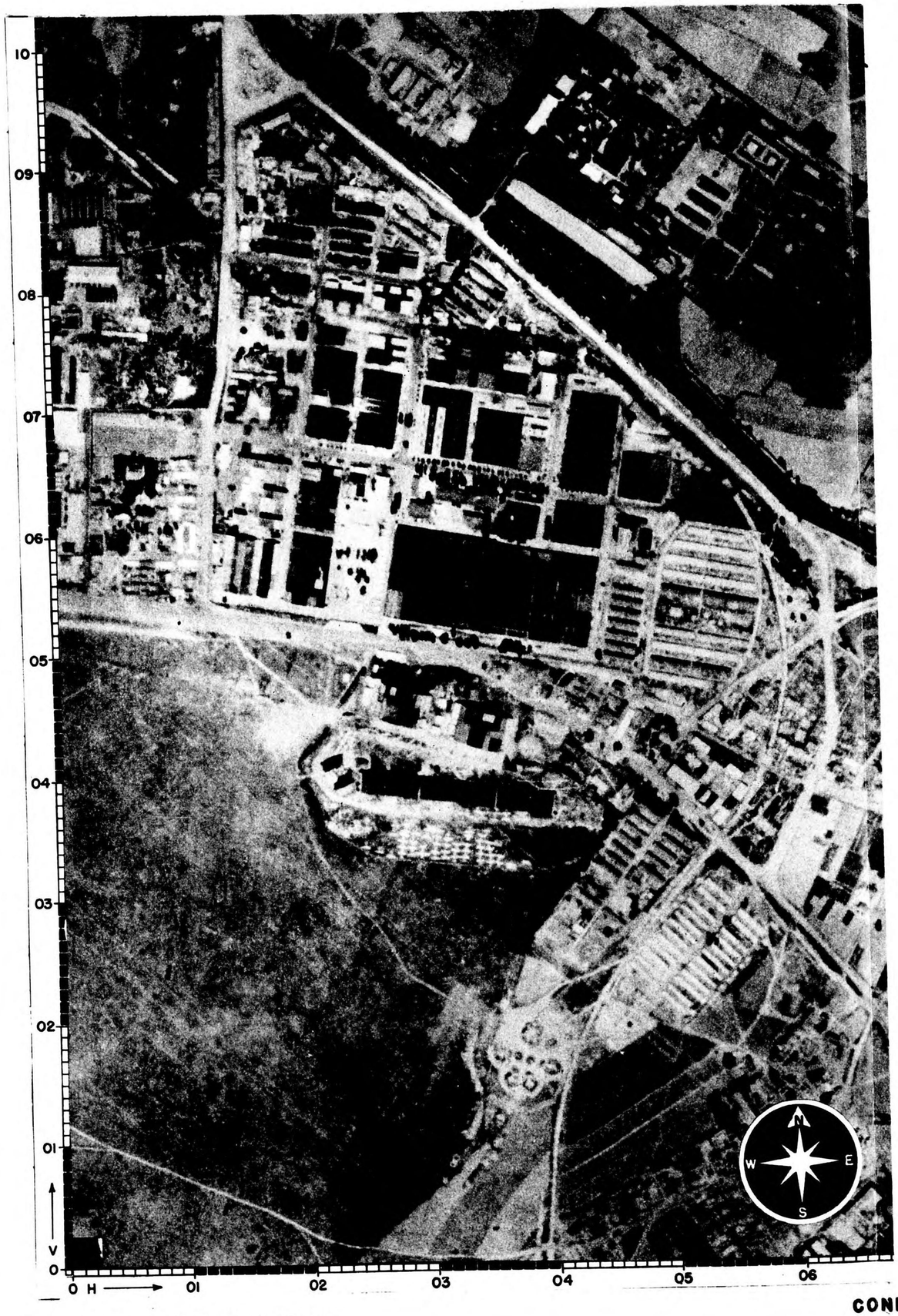

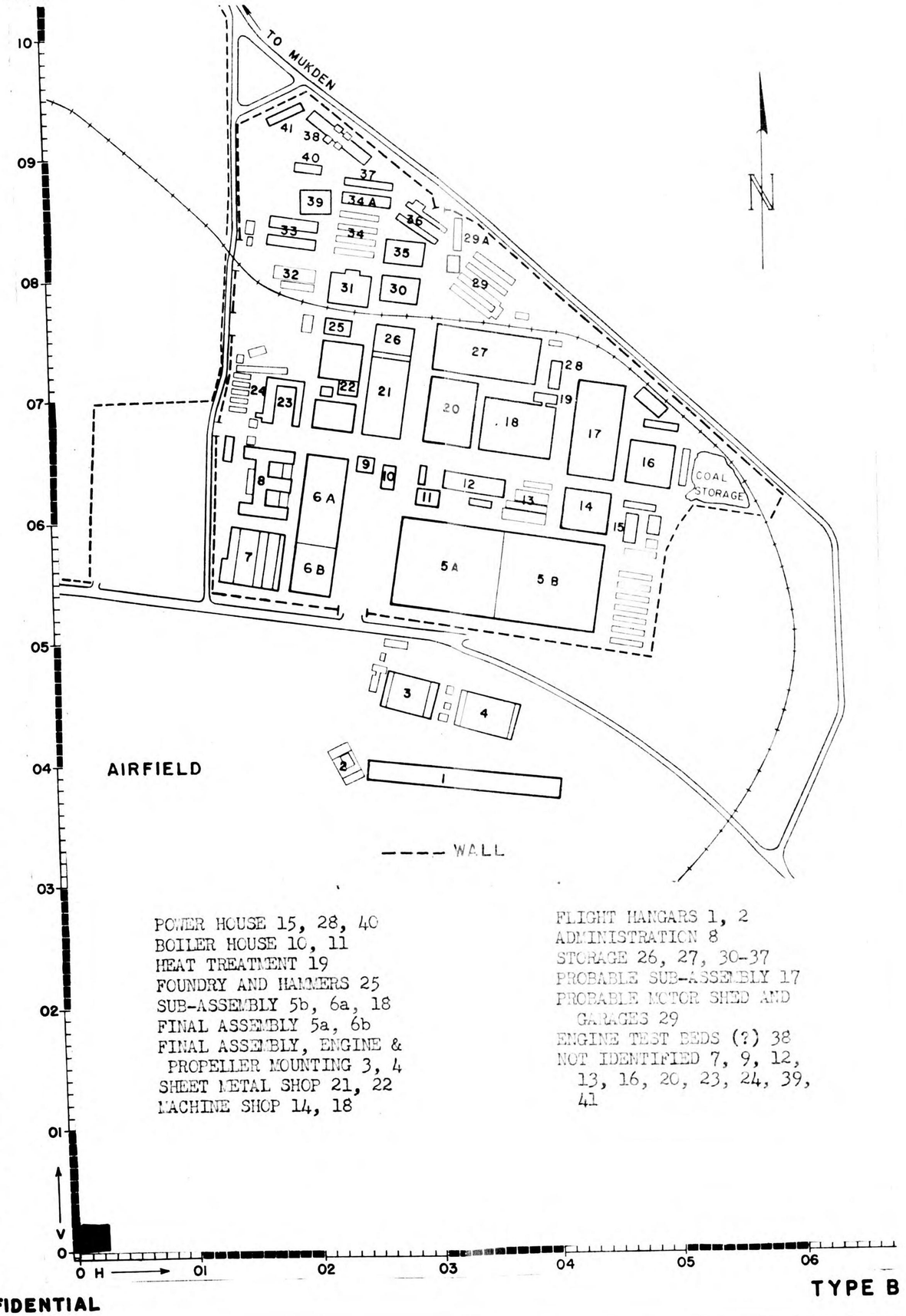

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TYPE B

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AC/AS, INTELLIGENCE

JOINT TARGET GROUP-WASHINGTON, D. C.

TARGET NO. 93.3-177

APPROX. COORDINATES 41°48′ NORTH
123°30′ EAST

PHOTOGRAPHED 19 JUNE 1944

MANCHURIA AIRPLANE MFG CO
PLANT NO. 1
MUKDEN, MANCHURIA

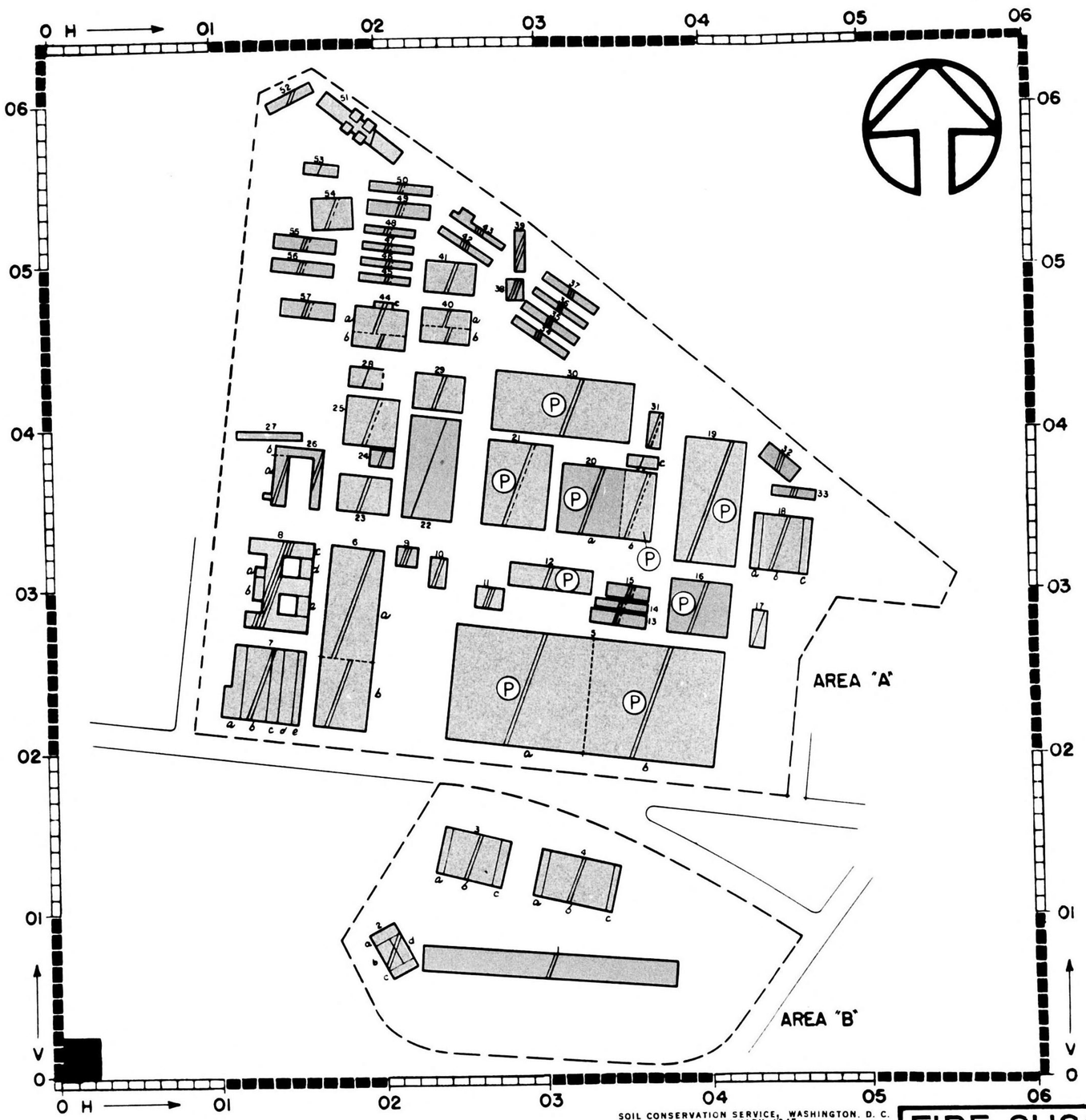
ILLUSTRATION NO. 93.3-177-P5

ISSUED 11 DECEMBER 1944

CONFIDENTIAL

SCALE 1:6000

500 0 500 1000 Feet



SOIL CONSERVATION SERVICE, WASHINGTON, D. C.
JANUARY 1945

FIRE SUSCEPTIBILITY PLAN

PRIMARY BUILDINGS	P	FIRE WALL, CERTAIN	
SECONDARY BUILDINGS	S	FIRE WALL, PROBABLE	
BUILDINGS		**CONTENTS**	
COMBUSTIBLE		NON-COMBUSTIBLE	
NON-COMBUSTIBLE		SLIGHTLY COMBUSTIBLE	
FIRE RESISTANT		MODERATELY COMBUSTIBLE	
COMBINATION I.E. COMBUSTIBLE ROOF RESISTANT FLOORS		HIGHLY COMBUSTIBLE	
		EXTREMELY COMBUSTIBLE	
WATER TANK	W	INTERMEDIATE VALUES	

AREAS IN ACRES	PRIMARY BUILDINGS	ALL BUILDINGS SHOWN
PLAN AREA	13.7	29.2
TOTAL FLOOR AREA	14.1	30.9
SITE AREA	128.0	

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JOINT TARGET GROUP, WASHINGTON, D.C.
FUNCTIONAL IDENTIFICATION SHEET

Sheet No. 93.3-177-P6
Date 16 Dec. 1944
Page No. 1 (1 pages)

Obj. Folder 93.1-5
Obj. Area 93.3
AAF Target No. 93.3-177

Place MUKDEN (Manchuria)
Category Aircraft

Lat.: 41°48' N
Long: 123°30' E
Alt.: 160'

NAME OF TARGET MANCHURIA AIRPLANE MFG. CO,, PLANT NO. 1
(Manshu Hikoki Seizo KK)

ALL PREVIOUS SHEETS CANCELLED

F U N C T I O N A L I D E N T I F I C A T I O N

(to be read in conjunction with Illustration 93.33-177/P5, Fire Plan)

Bldg. No.	Function of Building
1.	Flight hangar
2.	Hangars-control tower
3-4.	Hangars-post assembly and propeller mount-/ing
5a.	Final assembly
5b.	Sub-assembly
6a.	Sub-assembly
6b.	Final assembly
7.	Possible experimental and repair
8.	Administration
9.	Unidentified
10.	Boilerhouse
11.	Boilerhouse
12-15.	Unidentified
16.	Sub-assembly
17.	Power house
18.	Hangar type — possible sub-assembly
19.	Sub-assembly
20.	Metal shaping and detail and heat treating
21.	Metal fabrication
22.	Metal shaping, possible detail
23.	Sub-assembly
24-25.	Metal fabrication
26-27.	Unidentified
28.	Die foundry and hammers
29.	Storage
30.	torage and possible metal shaping
31.	Power house
32-33.	Unidentified
34-39.	Motor sheds and garages
40-44.	Storage
45-50.	Probable storage
51.	Engine test cells
52.	Unidentified
53.	Power house
54.	Unidentified
55-56.	Storage
57.	Unidentified
Area "A"	Main Plant Area
Area "B"	Post Assembly Area

(Based on Functional Analysis Report No. F/A-9 dated 11 Dec. 1944)

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