

(DOUBLE SPACE PRELIMINARY DRAFT)

I OBJECT OF STUDY

1. The study of Mitsubishi-Shizuoka was made to determine the effect of the 2000-¹lb GP² bomb on a light, structural-steel type of building.

2. Intelligence on this target indicated that all production ceased after a single attack by B-29's employing the 2000-¹lb GP² bomb. A further object of the study was to learn why this single attack was able to stop all production. (^{Attacks of similar nature} ~~Similar attacks~~ ^{like} against ~~similar~~ German targets had resulted, at best, ^{only} ⁱⁿ a slow-down of production.)

II SUMMARY

1. The Mitsubishi Heavy Industries Ltd., No. 6, Main Workshop Shizuoka, Japan, hereafter referred to as Mitsubishi-Shizuoka, was an aircraft engine factory, manufacturing approximately 100 engines per month of four types, the majority of which were Type HA112. The process area was roughly L-shaped; ~~the~~ the plant area studied was 15.2 acres. The total area was not determined ^{since} ~~because~~ the entire target was not studied. The total number of major processing buildings was 37. ~~Only~~ Only the assembly shop, a one-story, light-steel-frame structure ^{having} ~~with~~ a saw-tooth roof, was studied. There were also dormitories, staff residences, and a hospital at some distance from the assembly shop.

2. Two attacks affected the area of the plant under consideration. These attacks occurred on the same day and are discussed under ~~THE~~ ^{THE} DESCRIPTION OF ATTACKS. Mitsubishi-Shizuoka was the primary target for the second of these attacks. No American intelligence is available on

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the first attack.

3.9. These attacks caused moderate damage to the ~~structure~~ ^{assembly shop}. Process equipment, raw material, and finished products had been removed and could not be surveyed. There were no ~~unexploded bombs~~ ^{unexploded bombs}.

 III GENERAL INFORMATION

1.8. The ~~Field~~ Team which inspected this target was a portion of Tokyo Area Physical Damage Team 6, ~~which~~ ^{consisted} of the following personnel:

Maj. G.P. Guill	Team Chief
Maj. R.L. Hughes	Structural Engineer
Maj. T.F. Gallagher	Ordnance
Maj. J.E. Hatcher	Chemical Engineer
Maj. H.V. Keepers	Fire Damage Analyst
Maj. E.F. Buckholdt	Ordnance
Capt. W.G. Wells	Architect
Capt. J.H. Leary	Chemical Engineer
1st Lt. T.K. Cribb	Ordnance
1st Lt. J.S. Raines	Fire Damage Analyst
1st Lt. G.F. Poehler	Structural Engineer
2nd Lt. M. Yokoyama	Interpreter
S/Sgt. R.H. Johnson	Draftsman
Pho M. 2/c J.D. Devore	Photographer
T/4 M. Shimomura	Interpreter
T/5 G. Tychsen	Interpreter
Cpl. A.L. Epler	Draftsman

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Cpl. H.L. Born

Draftsman

Pfc. N.J. Delusi

Clerk, Typist

2. The study was started on 4 November 1945 and completed on 5 November 1945. The weather was cool and clear. During this period information was also collected for PDD Report 101.

3. The bomb plot furnished by the plant was incomplete, and a new one was prepared showing those bombs which fell in the main area. Structural drawings obtained from the management were found to be accurate. The plant manager and key members of his staff were interrogated regarding plant production and employment figures. Information on structural damage was obtained ~~from~~ ^{through} personal observation.

DESCRIPTION OF THE TARGET

1. The assembly shop (the only building covered in the report) of Mitsubishi-Shizuoka (Fig 1) ^{was} located on the outskirts of the town of Shizuoka ^(Oshika, Shizuoka) approximately 120 miles south of Tokyo. The management anticipated bombings of their plant and constructed the supplementary plants listed below:

a. No. 4 Machine Shop, located in an area adjacent to the target plant, was a converted textile mill.

b. Mochimune Works, Sekibe, Shizuoka, was located in an abandoned government railroad tunnel approximately 4 miles south of Shizuoka. This plant never reached complete production because of the cold, damp, unsanitary, and generally unsatisfactory working conditions.

c. Mariko Works, Akamehaya, Mariko, Shizuoka, was located in a number of small wooden buildings in a mountain village

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approximately 4.8 miles southwest of Shizuoka.

2. ~~2~~. Table 1 indicates the size of each of these plants, ^{and} ~~with~~ ^{along} the production capacity for the combination of plants. Table 2 lists the engine types and actual production figures for the combined plants.

3. ~~3~~. The plant ~~was constantly~~ ^{ed} experiencing ^{constant} difficulty in meeting production schedule. The lack of workers, both skilled and unskilled; lack of materials; and the disruption of transportation were among the factors responsible for production failures.

4. ~~4~~. After the attack ^S ~~of 12 April 1945~~, the plant management began the removal of machinery from the assembly shop in Shizuoka. It ^{was estimated} ~~is the opinion of members of the survey~~ that the plant could have returned to production with a loss in time of approximately two weeks. The management ordered the removal of machinery because it feared destruction of machinery in subsequent attacks.

THE DESCRIPTION OF ATTACKS

1. ~~1~~. According to information given by the plant management, two attacks, both on 12 April 1945, affected this plant. Only the second of these attacks is covered by our intelligence.

a. The first attack ^{was} by a single B-29 ^{and} occurred at 0955 hours, 12 April. This aircraft dropped 2 bombs (Bombs 1 and 2, ^{Figure} Fig 1). It is the opinion of members of the ^{team} ~~survey~~ that Bomb 2 was a 2000-^{missile} 1b GP, while Bomb 1 may have been a 500-^{bomb which effected a low-order detonation} 1b GP or a ~~low-order~~ 2000-1b GP. There were no large fragments or TNT traces to substantiate the low-order theory, but such evidence may have been

NAME	Mitsubishi-Shizuoka	No. 4 Machine Shop	Mochimune Works	Mariko Works
LOCATION	Oshika, Shizuoka	Higashi-Wakamatsucho	Sekibe	Akamegaya, Mariko
DATE OF CONSTRUCTION OR CONVERSION	Opened 1 March 1944	Converted from Spin- ning Mill 1 May 1944	Opened 11 June 1945	Opened 17 May 1945
AREA OF PLANT (sq ft)	17,150,000 sq ft	1,179,000 sq ft	242,000 sq ft	1,730,000 sq ft
NO. OF EMPLOYEES	6,180	133	1,644	1,985
TOTAL FLOOR SPACE (sq ft)	1,670,000 sq ft	476,000 sq ft	182,300 sq ft	326,500 sq ft
<i>Percentage</i> DAMAGED	50%	3%	0%	0%
TOTAL ACTUAL PROD. SPACE (sq ft)	837,000 sq ft	259,500 sq ft	162,700 sq ft	162,000 sq ft
<i>Percentage</i> DAMAGED	86%	0%	0%	0%
Principal Prod. (All Plants) Aircraft Engines - Type HA 112, Kinsei 62, and Allied Parts.				
Capacity (All Plants) 200 Engines per month (After complete dispersal of plants).				

PDD REPORT 73
PART 2

TITLE: MITSUBISHI-SHIZUOKA

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TABLE 2
TOTAL PRODUCTION FOR 1944 AND FIRST QUARTER OF 1945

Product	1944			1945 (First Quarter)		
	No. Ordered	No. Produced	%	No. Ordered	No. Produced	%
HA 112	1283	839	65.4	1010	164	16.2
Kinsei 62	440	281	63.9	340	73	21.5
Kinsei 53	80	70	87.5			
Kinsei 54	50	30	60.0			
TOTAL	1853	1220	65.8	1350	237	17.6

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removed in the course of the considerable amount of clean-up work that had been ~~done~~ ^{accomplished}. Furthermore, it is ~~improbable~~ ^{unlikely} that the one plane dropped one 2000-lb GP and one 500-lb GP bomb. Through comparison with bombs known to have been fuzed 0.025-secnd delay, ~~fuzing was~~ ^{of the bombs dropped in this attack} ~~estimated to be 0.025 sec. delay~~ fuzing was estimated to be 0.025-secnd delay, nose and tail.

b. The second attack took place at 1155 on 12 April 1945. Ten B-29's of the 73rd Wing attacked the plant. (American intelligence shows that all planes dropped their bombs; Japanese information shows that only ~~one~~ ⁹ planes dropped their bombs.) Table 3 lists intelligence on this attack. Again there ~~are~~ ^{were} hits (Bombs 3, 4, 13, 15, 16) which appear^{ed} to be either 500-lb GP strikes or low-order 2000-lb GP strikes. The attack data, Table 3, shows that 2000-lb GP ~~bombs~~ ^{were} dropped. Again there was no direct evidence of any low-order detonations ~~or~~ ^{of} unexploded bombs. Figure 1 plots the bombs considered in the report. Table 4 summarizes^s the bomb-fall data.

~~2.~~ On 20 June 1945, aircraft employing AN-M64 500-lb GP bombs attacked and destroyed a school and training room located on the west side of the ^{plant} grounds. Information from the plant management indicated that no bombs dropped in this attack hit in the target area.

TABLE 3
RECORDED ATTACK DATA

Mission No.	Date of Attack	Type of Target	Type of Aircraft	Aircraft		Type of Bombing	Altitude	Cloud Cover	Type	Bomb Load				
				No.	Air- Borne					No.	Bombing	Fuzing Sec.	Dispatched No.	Released Tons
1/ 63	0955 12Apr 1945	A 1.3	B-29	--	1	Visual	--	--	AN-M66	NO.025 TO.025	--	--	2	2
63	1155 12Apr 1945	A 1.3	B-29	11	10	Visual	11500 18200	--	AN-M66	NO.025 TO.025	--	--	54	54
2/	20Jun 1945	A 1.3	B-29	--	--	--	--	--	AN-M64 500 lb	--	--	--	--	--

1/ This plane, reported by Japs ^{the Japanese} (no US. Intelligence), was assumed to be the first of those of Mission 63.

2/ No US. Intelligence on this attack ^{available}.

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TABLE 6
BUILDING DATA

Bldg/ No.	Occupancy	Type	Plan Area	Bldgs/ HE-V	Conts/ Fire V	Bldg/ Fire Class	Remarks
1	Assembly Shop	A 1.3	668	V4	N	N	

(Continue with text)

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II ANALYSIS OF DAMAGE

1. ~~B.~~ General.

~~1.~~ Damage to the assembly shop is described by referring to each bomb or group of bombs in sequence. A detailed description of the building precedes the analysis of damage. A discussion of damage to equipment follows the description of damage to buildings. Table 5 lists the strikes which affected the building, together with bomb data and damage estimate.

2. ~~B.~~ Structural Details

The assembly shop (Fig ~~2~~² and ~~3~~³) was a one-story, light steel-frame structure, 1,005 ~~ft~~ by 660 (ft). Clear height under trusses was 16 ft. General roof framing was of saw-tooth design, with the chords and members supporting purlins built up of angles and lace bars (Photos 1 and 2). All roof purlins were of wood. Roofing and siding were corrugated asbestos cement on wood framing. All windows, which ~~are~~^{were} continuous around the walls and the vertical area of the saw-tooth roof, were factory-type wood sash. The concrete floor slab bore directly on the ground (Table 6).

3. Bomb Damage

~~1.~~ Bombs 1, 3, 4, 5, 6 and 7 did not damage the assembly building. Table 7 lists these bombs and classifies their craters (Fig 1).

~~2.~~ Bomb 2 detonated on the ground 95 ft northwest of the assembly shop on column-line C extended, and ripped 340 sq ft of corrugated asbestos cement siding and wood framing from the northwest wall between Columns 1-b and 1-d. No damage ~~was done~~^{occurred} to structural steel members.

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c.2. Bombs 8, (Photo 3) 9, and 10 (Photos 4 and 6) were near misses of 12 ~~ft~~, 10 ~~ft~~, and 6 ~~ft~~ ^{ft}, respectively. They caused damage which was overlapped by damage ~~due to~~ ^{resulting from} Bombs 11 (Photos 4 and 6), 12 (Photos 5, 6, and 7) and 15 (Photos 8 and 9). Structural damage ascribed to these six strikes amounted to 66,500 sq ft of steel roof framing. The blast ~~destroyed~~ ^{totally damaged} 115,000 sq ft of exterior wall surface and rendered 36,000 sq ft of floor slab unserviceable. Fifteen columns were damaged in degrees ranging from slight bending to shearing of columns and overturning of column footings.

TABLE 7

Bomb No.	Point of Detonation	Class Crater	Near-Miss N.M. Dist.
16	Slightly Below Ground Level	Class B	40 ft
3	Below Ground Level	Class C	80 ft
4	Below Ground Level	Class C	80 ft
5	Slightly Below Ground Level	Class B	80 ft
6	Slightly Below Ground Level	Class B	90 ft
7	Slightly Below Ground Level	Class B	40 ft

d.23. Bombs 13 and 14 (Photos 10 and 11) damaged 51,800 sq ft of steel roof framing, 4,100 sq ft of floor slab, and 8 columns.

e.21. Bombs 16, 17, and 18 damaged 38,500 sq ft of roof framing, 8,500 sq ft of floor slab was rendered unserviceable, and 5 columns were twisted (Photos 12, 13, 14, 15, 16, 18, 19).

f.22. Bomb 19 (Photos 17, 20, and 21) damaged 35,000 sq ft of roof framing and 2,800 sq ft of floor slab. Three columns were ~~severely~~ ^{heavily} damaged.

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~~23.4. Machinery and Equipment.~~
23.4. Removal of machinery and power equipment made actual

assessment of damage to these items impossible; therefore all information on these factors was taken from Japanese records. Table 8 lists the damage to machine tools and utilities. In addition, of the complete aircraft engines on hand, 25 were ~~seriously~~ ^{heavily} damaged and 84 were slightly damaged.

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Type	Total on Hand	Destroyed
Milling Machine: (Cont'd) Miscellaneous	30	6
Grinding Machine: Universal	30	8
Internal	62	6
Surface	30	3
External	67	14
Gear	34	1
Thread	2	1
Miscellaneous	52	2
Gear Cutting Machine	79	11
Shaper	2	0
Metal Saw	5	0
Broaching Machine	3	0
Other Miscellaneous Machines	38	3
Hydraulic Press (under 100 tons)	4	1
Machine Press	4	0
Heating Furnace	45	3
Transformer: Special high-tension (3,500 KVA)	3	0
High Tension (200 ^{lc} KVA)	20	0
" " (100 KVA)	9	7
" " (75 KVA)	2	0
" " (50 KVA)	57	17
" " (30 KVA)	6	2
" " (10 KVA)	6	2

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Type	Total on Hand	Destroyed
High-Tension (5 ^{le} KVA)	25	10
Special (60 KVA)	1	0
" (40 KVA)	1	0
" (3 KVA)	1	0
Electric Heating Furnace (150 KW)	12	1
" (130 KW)	4	4
" (under 70 KW)	42	14
Electric Welder	3	1

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TABLE 8		
DAMAGE TO MACHINE TOOLS AND UTILITIES		
Type	Total on Hand	Destroyed
Lathe: Engine (under 4 ft)	220	1
Engine (5 - 8 ft)	220	16
Engine (over 10 ft)	4	0
Bench	4	0
Gap	16	2
Face	22	1
Turret	247	29
Vertical Turret	6	0
Automatic	52	5
Drill: Radial	59	10
Bench	7	0
Upright	98	17
Multiple Spindle	6	0
Miscellaneous	16	1
Boring Machine : Ordinary	3	0
Vertical	3	1
Minute	10	1
Miscellaneous	42	8
Milling Machine : Horizontal	31	4
Vertical	104	25
Universal	5	0
Thread	27	2

the first.

5. These attacks caused moderate damage to the structure. Process equipment, raw material, and finished products had been removed and could not be surveyed. There were no UXB's.


GENERAL INFORMATION

6. The Field Team which inspected this target was a portion of Tokyo Area Physical Damage Team 6, which consisted of the following personnel:

Maj. G.P. Guill	Team Chief
Maj. R.L. Hughes	Structural Engineer
Maj. T.F. Gallagher	Ordnance
Maj. J.E. Hatcher	Chemical Engineer
Maj. H.V. Keepers	Fire Damage Analyst
Maj. E.F. Buckholdt	Ordnance
Capt. W.G. Wells	Architect
Capt. J.H. Leary	Chemical Engineer
1st Lt. T.K. Cribb	Ordnance
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S/Sgt. R.H. Johnson	Draftsman
Pho. M. 2/c J.D. Devore	Photographer
T/4 M. Shimomura	Interpreter
T/5 G. Tychsen	Interpreter
Cpl. A.L. Epler	Draftsman

TABLE 1
GENERAL INFORMATION CONCERNING MITSUBISHI HEAVY IND. LTD., NO. 6 WORKS

NAME	Mitsubishi-Shizuoka	No. 4 Machine Shop	Mochimune Works	Mariko Works
LOCATION	Oshika, Shizuoka	Higashi-Wakamatsucho	Sekibe	Akamegaya, Mariko
DATE OF CONSTRUCTION OR CONVERSION	Opened 1 March 1944	Converted from Spin- ning Mill 1 May 1944	Opened 11 June 1945	Opened 17 May 1945
AREA OF PLANT	17,150,000 sq ft	1,179,000 sq ft	242,000 sq ft	1,780,000 sq ft
NO. OF EMPLOYEES	6,180	133	1,644	1,985
TOTAL FLOOR SPACE	1,670,000 sq ft	476,000 sq ft	182,300 sq ft	326,500 sq ft
% DAMAGES	50%	3%	0%	0%
TOTAL ACTUAL PROD. SPACE	837,000 sq ft	259,500 sq ft	162,700 sq ft	162,000 sq ft
% DAMAGED	86%	0%	0%	0%
Principal Prod. (All Plants) Aircraft Engines - Type HA 112, Kinsei 62, and Allied Parts.				
Capacity (All Plants) 200 Engines per month (After complete dispersal of plants).				

MITSUBISHI-SHIZUOKA


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TABLE 2
 TOTAL PRODUCTION FOR 1944 AND FIRST QUARTER OF 1945

Product	1944			1945 (First Quarter)		
	No. Ordered	No. Produced	%	No. Ordered	No. Produced	%
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TOTAL	1853	1220	65.8	1350	237	17.6

MITSUBISHI-SHIZUOKA

TABLE 3
RECORDED ATTACK DATA

Mission No.	Date of Attack	Type of Target	Aircraft		Type of Bombing	Altitude	Cloud Cover	Bomb Type	Bomb Load				
			Type	No. Air-Borne					No. Bombing	Fuzing Sec.	Dispatched No.	Released Tons	Released No.
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2/	20Jun 1945	A 1.3	B-29	--	--	--	--	AN-M64 500 lb	--	--	--	--	--

8

1/ This plane, reported by Japs, no US. Intelligence, was assumed to be the first of those of Mission 63.

2/ No US. Intelligence on this attack *x available.*

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MITSUBISHI-SHIZUOKA

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TARGET NAME
 MITSUBISHI-SHIZUOKA WORKS

TABLE 4
 BOMB FALL SUMMARY HE WEAPONS

TARGET AREA 15.2 acres

Date of Attack	Size of Bomb	Functioning Bombs			Malfunctions		Total Number Bombs Released	Total Tons Released	Bomb Density on Target Area			
		D.H.	N.M.	M.	UXB	L.O.			No. Bombs	No. Tons	Bombs /Acre	Tons /Acre
12Apr45	2000 lb	9	4	18	0	0	55	55	13*	13*	0.855*	0.855*

MITSUBISHI-SHIZUOKA

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D.H. - Direct Hit

UXB - Unexploded Bomb

N.M. - Near Miss

L.O. - Low Order Detonation

M. - Miss

1 Ton = 2000 Pounds

*Includes only those bombs which damaged main machine shop.

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TABLE 6
BUILDING DATA

Bldg. No.	Occupancy	Type	Plan Area	Bldgs. HE-V	Conts. Fire V	Bldg. Fire Class	Remarks
1	Assembly Shop	A 1.3	658 658	V4	N	N	

ANALYSIS OF DAMAGE

15. General.

a. Damage to the assembly shop is described by referring to each bomb or group of bombs in sequence. A detailed description of the building precedes the analysis of damage. A discussion of damage to equipment follows the description of damage to buildings. Table 5 lists the strikes which affected the building together with bomb data and damage estimate.

16. The assembly shop (Figs ~~1~~² and ~~2~~³) was a one-story, light steel frame structure, 1,005 ft by 660 ft. Clear height under trusses was 16 ft. General roof framing was of saw-tooth design, with the chords and members supporting purlins built up of angles and lace bars (Photos 1 and 2). All roof purlins were of wood. Roofing and siding were corrugated asbestos cement on wood framing. All windows, which ~~are~~^{were} continuous around the walls and the vertical area of the saw-tooth roof, were factory type wood sash. The concrete floor slab bore directly on the ground (Table 6).

17. Bombs 1, 3, 4, 5, 6 and 7 did not damage the assembly building. Table 7 lists these bombs and classifies their craters (Fig 1).

18. Bomb 2 detonated on the ground 95 ft northwest of the assembly shop on column line C extended, and ripped 340 sq ft of corrugated asbestos cement siding and wood framing from the northwest wall between Columns 1-b and 1-d. No damage was done to structural steel members.

23. Removal of machinery and power equipment made actual assessment of damage to these items impossible, therefore, all information on these factors was taken from Japanese records. Table 8 lists the damage to machine tools and utilities. In addition, of the complete aircraft engines on hand, 25 were seriously damaged and 84 were slightly damaged.

TABLE 8

DAMAGE TO MACHINE TOOLS AND UTILITIES

Type	Total on Hand	Destroyed
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Engine (5 - 8 ft)	220	16
Engine (over 10 ft)	4	0
Bench	4	0
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(130 KW)	4	4
(under 70 KW)	42	14
Electric Welder	3	1

Damage To Columns & Footing - 7 P

- 1A - Broken L^s, out of plumb
- 1F - Footing ripped up, about 4' out of plumb
- 1G - Ripped loose from footing, footing cracked
- 1H - Top of column bent in 10', bent 10' inside bldg.
- 1K - Bent twice in 90° angles.
- 1L - Disconnected from footing, bent at bottom part of truss, 10' out of plumb, towards southwest.

- 2L - Ripped loose from footing and twisted
- 2K - Column broken off 7' off floor, footing broken, steel bearing plate
- 2J - Broken off 9' off floor, footing sheared at heavy plate
- 2G - Bent at 7' x 10' above floor, footing sheared at heavy plate
- 2F - Column sheared off 10" above floor
- 2E - Several breaks in L^s, bent at bottom corner of truss.

3F - Missing

- 3G - Missing
- 3I - Footing cracked, angle broken, lace bars bent
- 3J - Column and footing missing
- 3K - " " " "
- 3L - Column tipped over.

4L - Missing

- 4H - " "
- 4J - Numerous hits in column members, footing badly disintegrated

5J - Same as 4J

- 5L - Angles & lace bars badly bent, footing badly disintegrated

(over)

9 F - Footing heaved

10 E } Column footing heaved
10 F }

11 E - Column footing heaved
11 F - Column bent and twisted

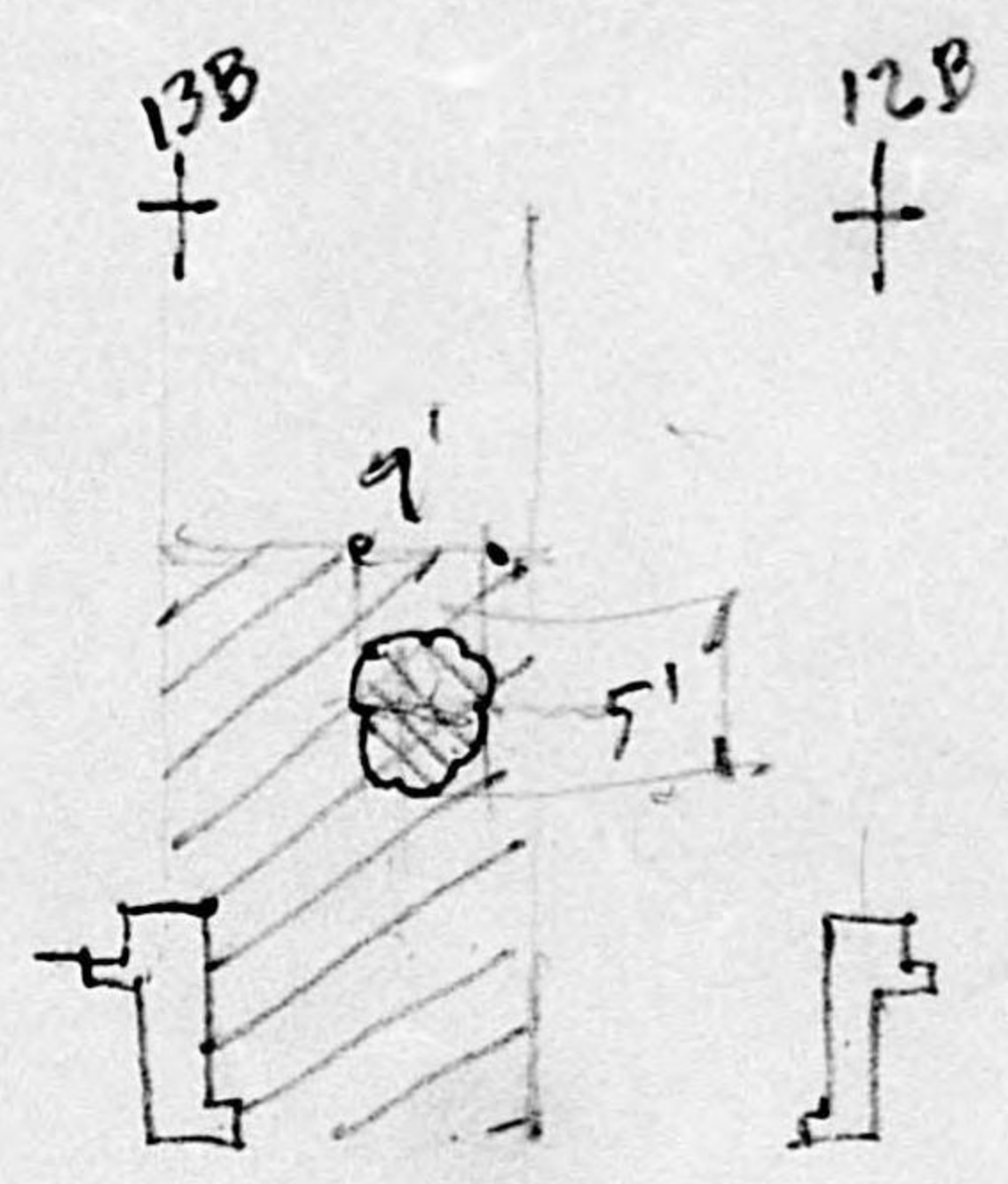
12 I - Column footing turned up

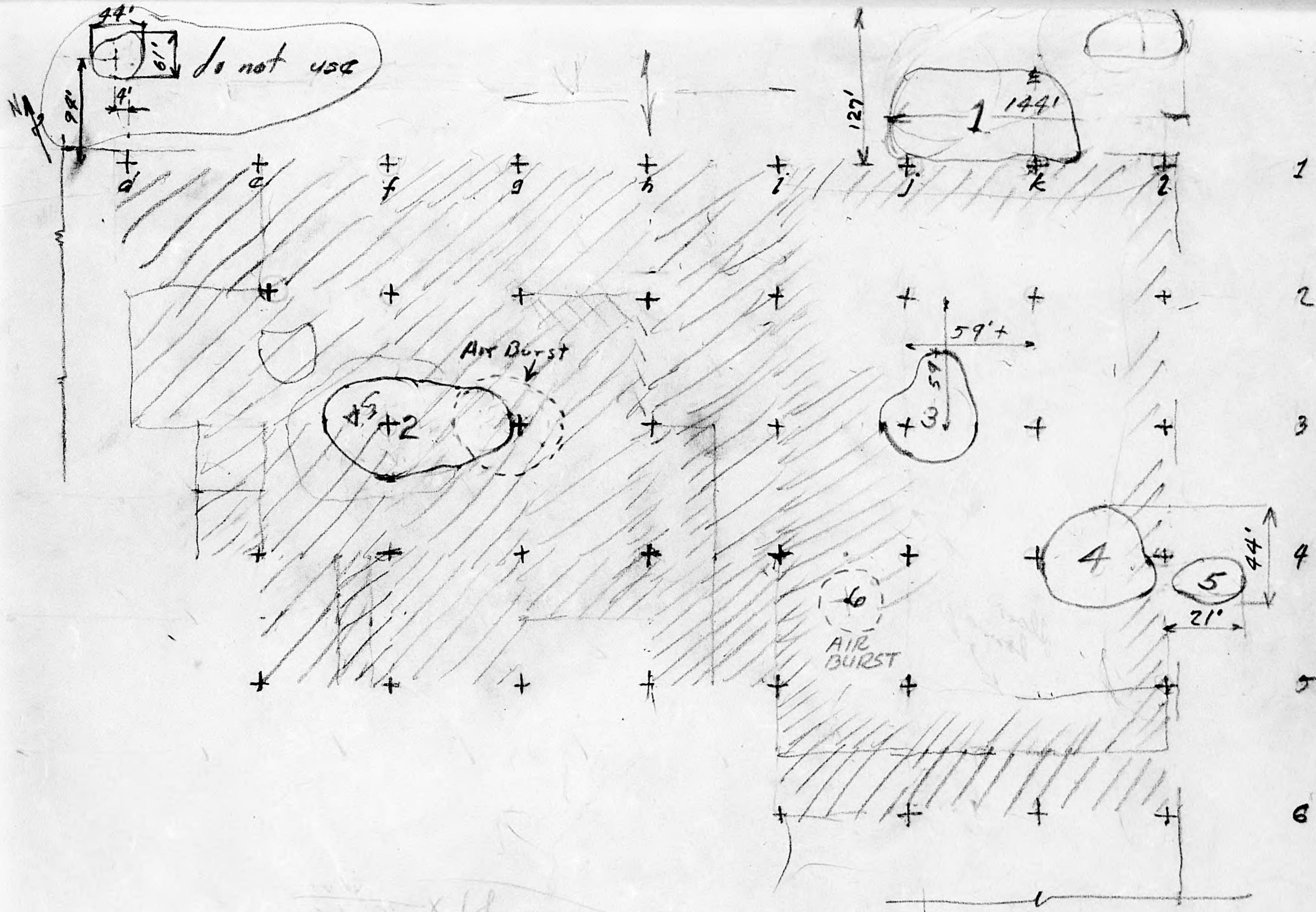
12 J - Column pushed down

13 I - Column sheared off.

3/col.

(over)

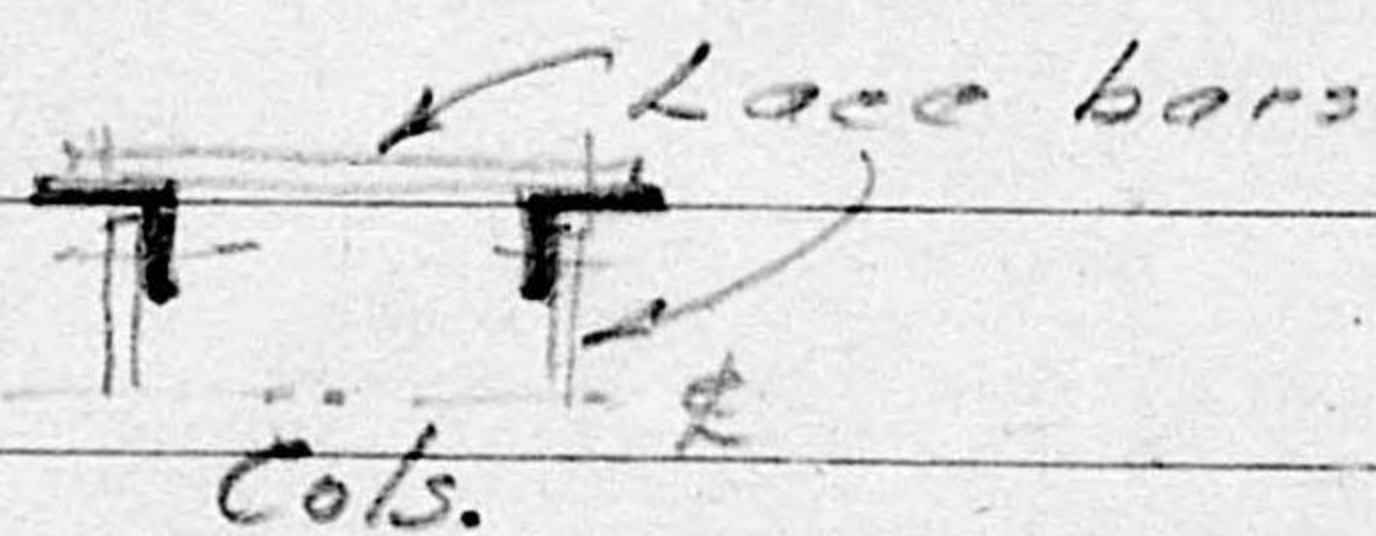
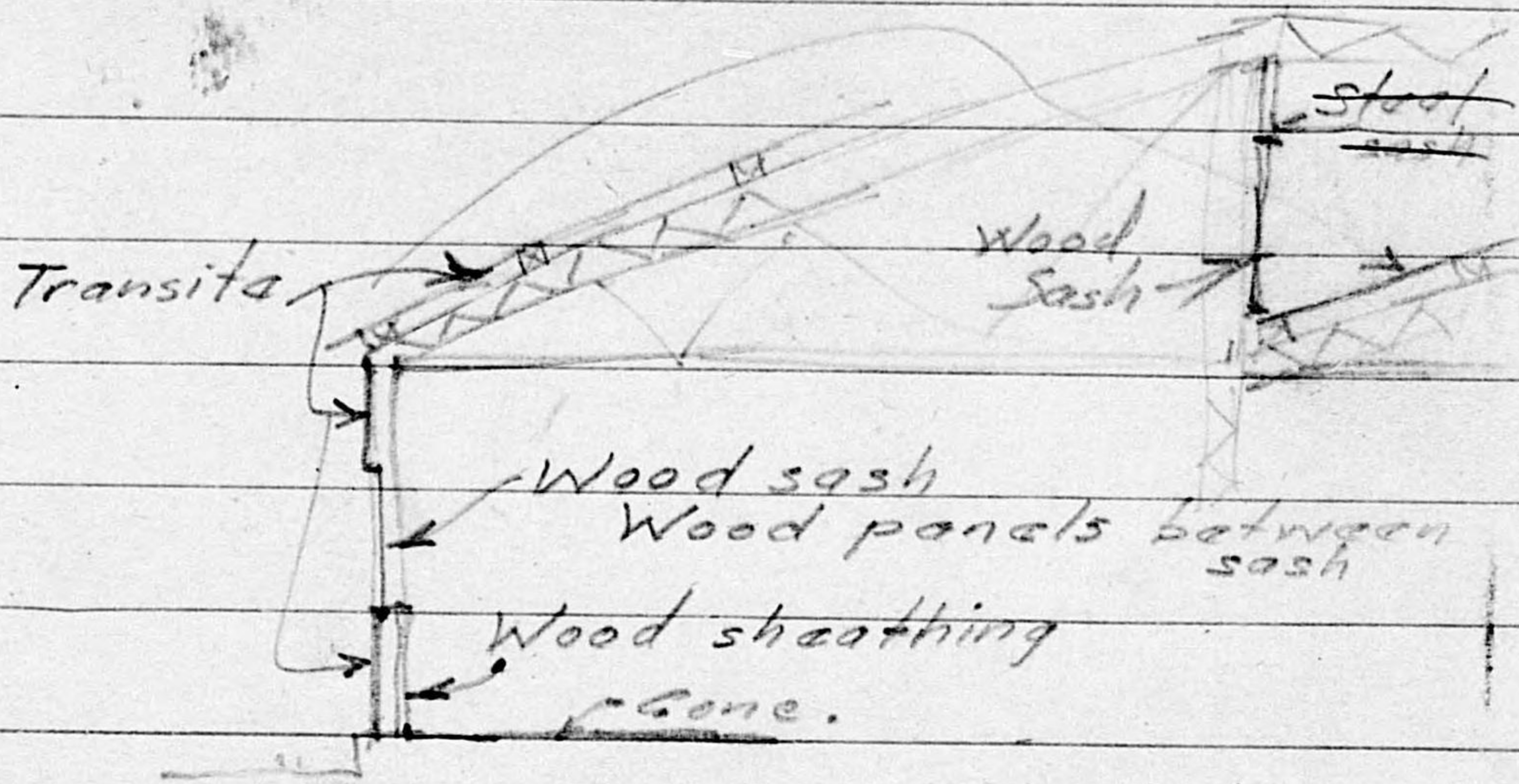




Hattori

SAX

Mayuzumi



Fundamental Investigation of the Works

The Mitsubishi Heavy Industries Limited,

No. 6 Works

Oct. 25 1945

No. 1

General Description of the Works

Name of the Works	The Mitsubishi Heavy Industries Ltd. No. 6 Works, Main Workshop	No. 4 Machine Shop	Machimune Works	Mariko Works
Location	Oshika, Shizuoka	Higashi-wakamatsucho Yoncho-me, Shizuoka	Sekibe, Shizuoka	Akamegaya, Mariko, Shizuoka
The Date of Construction or Conversion	Opened March 1, 1944	Converted from spinning works May 1, 1944	Opened June 11, 1945	Opened May 17, 1945

Main Products	Capacity	Name of the Works	Area of the Site	Building (Total Floor Space)	Number of Employees	Degree of Damages by Bombing	Rate of Utilization of Works for mfg. of Engine
Aero-engine Type "Ha 112" "Kinsei 62" & their parts	Output per month 200 engines (After completing of dispersion of the works)	Main workshop	1,491.548 m ²	150,528 m ² (778,600 ft ²)	6,180	50% (86%)	100%
		No. 4 Machine shop	109.315	44,242 (24,101)	133	3 (0)	100
		Machimune works	22.486	16,927 (15,101)	1,664	0 (0)	100
		Mariko works	165.289	30,384 (15,060)	1,985	0 (0)	100
		Total	1,788.638	242,081 (132,122)	9,962		

- Remarks (1) The figure in brackets in column of "Building" shows the area of producing workshop viz. excluding indirect producing building, eg. warehouse, business office etc.
- (2) Number of employees of main works includes employees of the temporary dispersed works near Shizuoka City
- (3) This figure shows state on Aug. 15, 1945.

No. 2

Output of Engines in the Past

year	Main Products	Numbers of Engine Ordered (A)	Numbers of Engine Produced (B)	Rate $\frac{(B)}{(A)}$
1944	Type "Ha 112"	1,283	839	65.4
	"Kinsei 62"	440	281	63.9
	" " 53"	80	70	87.5
	" " 54"	50	30	60.0
	Total	1,853	1,220	65.8
1945 (the first quarter)	"Ha 112"	1,010	164	16.2
	"Kinsei 62"	340	73	21.5
	Total	1,350	237	17.6

No. 3 (1)

Machines and Equipments

	Name	Size	Total (Includes destroyed one)	Machines Capable to use		
Large Class Machine tool	Middle Class Lathe	Small Class Engine lathe	under 4 feet	220	219	1
		"	5~8 feet	220	204	16
		"	over 10 feet	4	4	
		Bench lathe		4	4	
		Gap lathe		16	14	2
		Face lathe		22	21	1
		Turret lathe		247	218	29
		Vertical turret lathe		6	6	
		Automatic lathe		52	47	5
		Miscellaneous lathe		0	0	
Drilling machine	Radial drill		59	49	10	
	Bench drill		7	7		
	Upright drill		98	81	17	
	Multiple spindle drill		6	6		
	Miscellaneous drill		16	15	1	
Boring machine	Ordinary boring machine		3	3		
	Vertical " "		3	2	1	
	Minute " "		10	9	1	
	Miscellaneous " "		42	34	8	
Milling machine	Horizontal milling machine		31	27	4	
	Vertical " "		104	79	25	
	Universal " "		5	5		
	Thread " "		27	25	2	
	Miscellaneous " "		30	24	6	

No. 3 (2)

Large class	Middle class	Small class	Size	Total (Excludes destroyed one)	Machines Capable to use	
	Grinding machine	Universal grinding machine		30	22	8
		Internal " "		62	56	6
		Surface " "		30	27	3
		External " "		67	53	14
		Gear " "		34	33	1
		Thread " "		2	1	1
		Miscellaneous " "		52	50	2
	Gear cutting machine			79	68	11
	Planer			0	0	
	Shaper			2	2	
	Metal saw			5	5	
	Broaching machine			3	3	
	Miscellaneous			38	35	3
	Total			1,636	1,458	
<p>The figure in this table does not include 57 machines borrowed from the Army and Navy.</p>						
Industrial machine	Forging machine	Hydraulic press	under 100 tons	4	3	1
		Machine press		4	4	exclude small arbor press
<p>There are no presses as forging machine, but we have presses for assembly.</p>						

No. 3 (3)

		Name	Size	Total (Includes destroyed one)	Machines Capable to use		
Large class	Middle class	Small class					
	Metallurgic machine	Heating furnace		45	42	3	
	Chemical machine	Storage tank		15	15		
		Miscellaneous chemical machine		16	13	3	
	Machine for general use	Loading machine		20	19	1	
		Steam boiler		3	3		
		Air compressor and blower		11	11		
		Hydraulic machine		3	3		
		Separating machine		7	7		
		Miscellaneous machine		28	24	4	
Electric equipment	Transformer	A. Special high tension	22KV/3.3KV 3.500 KVA	3	3		
		B. High tension	3.3KV/220V 700 KVA	20	20		
		"	" 100 KVA	9	2	7	
		"	" 75 "	2	2		
		"	" 50 "	57	40	17	
		"	" 30 "	6	4	2	
		"	" 10 "	6	4	2	
		"	" 5 "	25	15	10	
		"	c. Special transformer	22KV/110V 220 VA	4	4	
		"	"	60 KVA	1	1	
		"	"	40 "	1	1	
		" 3 "	1	1			
	Static electric condenser		9	9			
	Electric heating furnace		12	11	1		

No. 3 (4)

Name		Size	Total (Includes destroyed one)	Machines Capable to use	
Large class	Middle class				
	Electric heating furnace	130 KW	4	0	4
	"	under 70 KW	42	28	14
	Electric welder		3	2	1
	Converter		26	26	
Fine measuring machine			32	32	

No. 4 (1)

Engines in Stock

Name	Type	Quantity
Aero-engine	Ha 112	45
"	" 102	5
"	Kinsei 62	21
Total		71

Parts under Manufacturing

No. 4 (2)

Self-made parts	Name of Parts	Amount	Quantity changed into numbers of complete engine
	Crank shaft	399.441 ^{yen}	115
	Cam	357.732	2.133
	Master rod	461.493	543
	Reduction gear hub	454.139	1.194
	Reduction gear pinion cage	266.440	1.358
	Propeller shaft	547.926	1.257
	Cylinder barrel	808.970	339
	Reduction driving gear	440.214	2.529
	Fixing hub for reduction driving gear	94.598	580
	Crank case	140.630	107
	Cam case	656.937	1.469
	Supercharger housing front	880.442	1.974
	Supercharger housing rear	184.824	303
	Rear section cover	352.440	1.026
	Reduction gear case	130.364	545
	Impeller	68.599	208
	Piston	737.774	1.323
	Tappet	89.672	387
	Reckon arm of valve (suction)	35.275	283
	" " (exhaust)	35.365	354
	Articulated connecting rod pin	43.693	509
	Impeller shaft	153.666	1.158
	Shock absorber gear	55.249	539
	Accessories driving shaft	114.240	408
	Planetary gear	213.483	676

No. 4 (13)

Parts under Manufacturing

	Name of Parts	Amount	Quantity changed into number of complete engine
Self-made Parts	Intermediate driving shaft (no. 1)	47,900 ^{yen}	479
	" " " (no. 2)	89,358	775
	Gear for supercharger (no. 1)	118,203	604
	" " (no. 2)	65,913	529
	Fixed gear	43,461	358
	Other parts	9,529,540	
	Total	17,617,951 17,617,951	

Assuming the price of a total self-made parts necessary for an engine^s about ¥17,000, the total sum of money above showed corresponds about 1,000 engines.

Purchased parts	Carburettor	440,640	324
	Magneto, 14 AF ₂	680,000	1,000
	Electric starter, PCFHG	1,500,000	1,500
	Inertia starter, No. 1 type	45,000	100
	" " No. 4, No. 2	1,541,030	2,023
	Magneto, 14 AF ₂ 14 poles, No. 2 type	173,665	454
	Fuel jet pump	2,192,400	1,105
	" " valve	329,000	940
	other small parts	10,345,690	
		Total	17,247,425
	Grand total	34,865,376 34,865,376	

No. 5 (1)

Materials in Stock

This figure shows state on Aug. 15 1945
(unit ton)

Large class		For use of direct production	For use of indirect production	Small class		Small class		Small class		Remarks		
				Name	quantity	Name	quantity	Name	quantity			
Ordinary steel	Extruded steel		224.5	bar	73.0	plate	88.5	tube	56.0	wire 7.0	wire includes the worked up from wire	
	Ingot steel			others								
Special steel	Carbon steel	36.1		bar	27.9	plate	7.1	tube	1.1	wire		
	Tough steel	25.4		ingot		billet						
	Heat proof steel				bar	25.4	plate		tube		wire	
					ingot		billet					
	Tool steel			30.0	bar	30.0	plate		tube		wire	
					ingot		billet					
	Steel for dies				bar		plate		tube		wire	
					ingot		billet					
	Stainless steel		1.4		bar	0.4	plate	0.7	tube	0.3	wire	
					ingot		billet					
others		42.5		bar	42.5	plate		tube		wire		
Scrap	Ordinary steel	3.7		shaving waste	0.6	misc-made parts	2.1			bombed 1.0	{ machine tool 6 iron tube 12 carb material for construction 34 others 1	
	Special steel	1.8		"	1.5	"	0.1			" 0.2		
	Pig iron		56.0							" 56.0		
	Reproduced ingot											
Cast or forged ordinary steel	" " special steel	1619.7		cast		forged						
				"		"	1619.7					
Pig iron			92.0	ferro-chrome		ferro-silicon		ferro-tungsten		others		
Ferro-alloy				bar	10.7	plate		tube		wire 9.5	→ gum covered wire	
Copper	5.3	14.9		raw material		electrolytic copper	6.0	Cast or forged	16.2	recoverable waste 24.0		

includes phosphor bronze

No. 6

Production after the War

Item of Production	Machinery and plant utilized	Opening date of production	Amount of products up to Oct. 28 1945	Producing capacity per day at present (Oct. 28 1945)	Estimated amount of future production per day
Recovery of metallic instrument	Press 1	Sept. 15 1945	¥ 5,000	¥ 3,000	¥ 5,000
Scaling	Drilling machine 1				
Mending	Gas welder 1				
Plating	Plating bath 21				
Quenching	Gas furnace 29				
Wooden products	A set of tools of repair 1	Sept. 23 1945	¥ 500	¥ 1,250	¥ 2,000
Furniture	Round saw 1				
Kitchen utensils	Machine tool 6				
Salt	Iron bath 3	Aug. 15 1945	1,400 Kg	36 Kg	180 Kg
	Wooden bath 5				
	Transformer 6				
	Electric pole 4				
	Heater 2				
Remarks					
Plan of salt-producing in future	Iron bath 4 Wooden bath 8 Transformer 6 Electric pole 16 Heater 8				180 Kg

No. 7

Planning of Production Using Present Stock

We wish to make air pumps for bicycle, gears of every kind and to repair machines, tools and their parts also for peace industry using a part of material in stock prepared for manufacture of munitions of war.

(1) Quantity and location of materials to be used

name	bar	plate	tube	location
Special steel	96 ton	17 ton	1 ton	main works
Common steel	73	89	57	"
Aluminium	8	—	—	"
Copper alloy	11	—	—	"

We wish to use a part of these materials of our stock to make above-mentioned articles.

(2) Machineries to be used

Machine-tool 150 sets

(3) Original purpose to use and supplier of above-mentioned materials.

(a) Original purpose to use the materials.

Manufacture of aero-engine

(b) Supplier.

The ex-Munitions Department

No. 8

Materials for Settlement (Existing state on Oct. 25 1945)

Materials	Description	Stock on Oct. 25 1945	Estimated quantity to be used in the works	Quantity capable to offer
Lumber	The lumber of ^(Broad-leaf) needle-leaf tree is offered	910 m ³	660 m ³	250 m ³
Nail	1 ~ 6 inches	2.191 kg	1.471 kg	720 kg
Wire	#12 ~ #30	1.450 "	1.000 "	450 "
Wire rope	10 ~ 26 mm	8.368 "	5.868 "	2.500 "
Electric wire	Captive cable	490 m	490 m	0 m
"	Damp proof cord (Provisional specification) 0.75	1.000 "	600 "	400 "
"	Cord (Provisional specification) 0.75	11.800 "	11.800 "	0 "
"	#2 cord	0 "	0 "	0 "
"	Electric wire insulated with cotton (war time specification) 2.0 mm	27.300 "	0 "	27.300 "
"	" 2.6 mm	26.790 "	0 "	26.790 "
"	" 5.0 "	9.000 "	0 "	9.000 "
"	" 14 x 7/1.6	1.200 "	0 "	1.200 "
"	" 22 x 7/2.0	1.200 "	0 "	1.200 "
"	" 30 x 7/2.3	1.800 "	0 "	1.800 "
"	" 100 x 19/2.6	300 "	0 "	300 "
"	#4 insulated electric wire 1 ~ 100 mm (Provisional specification)	88.300 "	88.300 "	0 "

No. 9

Employees' Welfare Equipment

Name of dormitory	Location	Capacity of Accommodation	Lodging number on Oct. 28 '45	Bedding	Remarks
Ryōsei-ryō	No. 1 Ozika, Shizuoka	245	55	0	for staffs
Furyō-ryō	No. 2 Yonchōme Higashi-wakamatsucho	30	5	0	"
Midori-ryō	"	36	2	(m) 0	for workers
Higashi-wakamatsu-ryō	"	1,536	0	(n) 20	"
Ozika-ryō	No. 1 Ozika, Shizuoka	3,030	465	(m) 1,511	"
	Total	4,877	527	(n) 130	

Note (1) The figure in this table shows the state on Oct. 28 1945.

(2) (m) and (n) mark in the column of "Bedding" means. (m) is mattress, and (n) is mosquito net.

(3) Capacity of accommodation is assumed to be 1.25 ryō or 2.07 m² per man.

No. 10

Cars for Transportation

Name	Type	Capacity	Number	Remarks
Large size truck	Three side open, ordinary type	4 ^{ton}	3	Heavily damaged, now under repairs
Small size truck	Box type	1/2"	1	
Automobile	"Dodge brothers" "Nash" sedan type		2	
Small size automobile	"Datsun"		1	
Battery-car	Ordinary low floor type	1 ^{ton}	5	
"	Low floor loading type	1"	1	
"	Tractor type	5"	1	
Cast	Japanese type, 2 wheels		3	
Bicycle	2 wheels		30	



三菱重工業株式會社
名古屋發機製作所

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名古屋東區幸町 電話(代表)千〇二一

Description of Air raid

On the Mitsubishi No. 6 Aeroengine Works.

Several airplanes flew over the works in the morning April 12 th from S.W. to N. E. and at about 10.00 AM one B29 dropped 2 bombs on the road northside of the main machine shop which destroyed the N.W. corner of the shop and the warehouses of the opposite side.

At about noon on the same day the last formation of B29 (9 planes) which ~~was~~ ^{supposed} the home-ward flight from attacking Tokyo bombed the works resulting the attached details.

The bomb marks were mostly about 25 m in diameter and about 18 m. in depth.

No. 6 Works, Mitsubishi Heavy Industries Ltd.

NAME	TITLE
AKIO FUJIMOTO	General Manager
TEIICHI KAKUTANI	Manager, Business Department
MIKIO MAYUZUMI	Manager, Production Department
SAICHIRO FUJITA	Sub-Manager, Business Department
SHINGO INOUE	Chief of Engineering Section
TAKAHISA HATTORI	Chief of No. 5 Machine shop (Mochimune)
TAKEO NAKAMURA	In charge of Business Section

Target: 9015 - 9011 Chiyoko Aircraft Engine Plant

Mission _____ 45

12 April 45

Wing Bombing: 73 Aircraft Bombing Target: 10

Type Bomb: AN M65 2000lb

Type Fuzing: Nose - .025, Tail - .025

Type Airborne: 25

Wing Released over target: 25-55

Altitude of Release: Low 21000 (7 A/C only)

High 18000

Type Bombing: Visual 10
Radar 0

Aiming Points: 2

Formations Bombing: 1

Burst in Target: 25

Visual Hits: 45

Bombing Accuracy:

~~XXXXXXXXXX~~

0' to 500'

500' to 1000'

1000' to 2000'

20 - 35.7%

20 - 35.7%

5 - 8.9%

Total Roof Area of Plant: 955,710 sq ft

Destroyed	55,000 sq ft	6.5%
Structural Damage	140,000 sq ft	14.6%
Cutted	545,000 sq ft	57.0%
Minor	55,100 sq ft	5.8%
Total	825,100 sq ft	86.3%

Probably an excellent example. There is a possibility there were a few M-64s dropped later but should be a minor factor.

Ok with Maj Diller
MFB

On Mission #55 target was attacked but not hit. Mission #46 dropped a few bombs on 4 small bldgs

2000^F

Target: 90:18 - 2011 Shizuoka Aircraft Engine Plant

Mission 63 12 April 45

Wing Bombing: 73 Aircraft Bombing Target: 10

Type Bombs: AN M66 2000lb
Type Fuzing: Nose - .025 , Tail - .025
Tons Airborne: 56
Tons Released over target: ~~59~~ 55
Altitude of Release: Low 11500 (7 A/C only)
High 18200

Type Bombing: Visual 10
Radar 0

Aiming Points: 1

Formations Bombing: 1

Burst in Target: 25

Visual Hits: 45

Bombing Accuracy:

XXXXXXXXXX		
0' to 500'	500' to 1000'	1000' to 2000'
20 - 35.7%	20 - 35.7%	5 - 8.9%

Total Roof Area of Plant: 955,710 sq ft

Destroyed	58,000 sq ft	6.5%
Structural Damage	140,000 sq ft	14.6%
Gutted	546,000 sq ft	57.0%
Minor	<u>79,100 sq ft</u>	<u>8.2%</u>
Total	823,100 sq ft	86.3%

Probably an excellent example. There is a possibility there were a few M-64s dropped later but should be a minor factor.

chk with Maj Diller
MB

On Mission #55 target was attacked but not hit. Mission #96 dropped a few bombs on 4 small bldgs



三菱重工業株式會社
名古屋發動機製作所

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名古屋市長區幸町 電話(代表)千〇二一—番

Description of Air raid

on the Mitsubishi No. 6 Aeroengine Works.

Several airplanes flied over the works in the morning April 12 th from S.W. to N. E. and at about 10.00 AM one B29 dropped 2 bombs on the road northside of the main machine shop which destroyed the N.W. corner of the shop and the warehouses of the opposite side.

At about noon on the same day the last formation of B29 (9 planes) which suspected the home-ward flight from attacking Tokyo bombed the works resulting the attached details.

The bomb marks were mostly about 25 m in diameter and about 18 m. in depth.



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Damage due to Bombing

1. One airplane B29 bombed at 9.50 am. on April 12. 1945.
2. 9 airplanes B29 bombed at 11.55 am. the same day.

	Description
1. Number of bombs dropped	Inside of machine shop (main shop) 9
	Around the machine shop and stores 17
	District of residence 4
	Total... 30
N.B. (Some probably air-burst bombs are excluded.)	
2. Damage of employee.	Nothing.

Object	Description
1. Machine tools	412 sets destroyed.
2. Buildings	A) Completely destroyed.
	Trans porting office (wooden structure)
	4 warehouses (")
	Painting shop (")
	Company's residence (")
	B) Seriously destroyed
	Machine shop (Steel girder & slate walled)
	Ware house (Wooden structure)
	Cooking- house (")
	Packing- shop (")
C) Half destroyed	
Dining- room (wooden structure)	
Workmen office.	



三 菱 重 工 業 社 有 限 公 司
名 古 屋 發 動 機 製 所

名 古 屋 市 東 區 幸 町 電 話 (代 表) 千 二 〇 一 一 番

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- D) Slightly destroyed.
Heat treatment shop (Steel girder & slate
Walls)
Boiler-room (Concrete & steel girder)
Test bench (Concrete & wooden)
Accessories-testing shop (wooden)
Plant-maintenance office (")
Oil - store (Plaster - built)
3. Power system
- A) 6 switch boards in the machine shop seriously destroyed.
B) Gas and water pipings seriously destroyed
C) Steam pipes between boiler room & machine-shop seriously destroyed.
4. Complete engines
- A) Seriously destroyed 25 sets.
B) Slightly destroyed 64 sets.
5. Engine parts.
- Many engine parts including those of under machining were buried.



三 菱 重 工 業 社 有 限 公 司
名 古 屋 發 動 機 製 作 所

名 古 屋 市 東 區 幸 町 電 話 (代 表) 千 二 〇 一 一 番

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	Production of Engines	No. of Employees.
July. 1944	10	4.716
Aug. "	57	5.571
Sept. "	102	6.742
Oct. "	105	6.950
Nov. "	90	7.424
Dec. "	130	7.688
Jan. 1945	171	8.897
Feb. "	360	9.195
March "	195	9.122
April "	85	9.053
May "	70	9.136
June "	82	9.357
July. "	119	9.749
Aug. "	39	5.776

NB. Production temporarily raised
because the parts were delivered
from Nagoya works due to its bombing.

Bombed on April 12.

Outline of the "Mochimane" Works.

Mitsubishi No. 6 Aeroengine Works.

The Mochimane Works is the underground Machine Shops. We utilised the Government Railway tunnels which became useless due to the completion of the new tunnels.

There are 4 tunnels each 2 for up and downlines and the lengths are about 900 m - 1000 m each.

The undertaking of the project End of Dec. 1944

The starting of the re-construction End of Feb. 1945

The setting of the machine-tools End of May 1945

As the Shizuoka Works were bombed on April 12, 1945.

a part of Machine-tools were transferred to these tunnel shops and two tunnel shops of 4 in total commenced the production of aeroengine parts about middle of July.

The remaining 2 tunnel works are still in the state of under construction.



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NB.* Production temporarily raised
because the parts were delivered
from Nagoya works due to its bombing.

** Bombed on April 12.

REPORT TITLES FOR TEAM #6

1. NAKAJIMA AIRCRAFT ENGINE PLANT MUSASHINO-TAMA(MUSASHI) PLANT, TOKYO, JAPAN
SHORT TITLE -- NAKAJIMA-MUSASHI WORKS
2. MITSUBISHI HEAVY INDUSTRIES LTD. NO. 6 WORKS, SHIZUOKA, JAPAN
SHORT TITLE-- MITSUBISHI-SHIZUOKA WORKS.
3. SUMITOMO CHEMICAL CO. LTD., CHEMICAL WORKS, NIIHAMA, JAPAN.
SHORT TITLE-- SUMITOMO-CHEMICAL WORKS.
4. SUMITOMO CHEMICAL CO. LTD., LIGHT METAL WORKS, NIIHAMA, JAPAN.
SHORT TITLE-- SUMITOMO-LIGHT METAL WORKS.