Folder No. 1

MISSION #4 ANSHAN "RITUALIST 1"
29 July 44

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XX Bomber Command
Mission No. 4
Date 29 July 1944

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HEADQUARTERS
XX BOMBER COMMAND
APO 493

TACTICAL MISSION

REPORT

Field Order No. 4 Mission No. 4

29 July 1944

PRIMARY TARGETS

SHOWA STEEL WORKS, ANSHAN, MANCHURIA

TAKU HARBOR, CHINA

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Prepared by:
Intelligence Section
XX Bomber Command

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S E C R E T

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: 12-7-44 JDG :
: Date Initials:

13 September 1944

SUBJECT: Report of Operations, 29 July 1944.

TO : Commanding General, Twentieth Air Force, Washington 25, D.C.

1. UNITS PARTICIPATING: The 40th, 444th, 462nd and 468th Bombardment Groups furnished the aircraft for a maximum-effort daylight attack on D-Day against the coke-steel target at the SHOWA STEEL WORKS, ANSHAN, MANCHURIA.

2. IDENTIFICATION OF MISSION:

a. Attack Number 4.

b. Targets Planned:

(1) Primary Target: Showa Steel Works, ANSHAN, MANCHURIA (Objective Folder No. 93.3-29).

(2) Secondary Target: Port Facilities and Shipping at CHINWANGTAO (Objective Folder No. 83.12-202).

(3) Tertiary Target: Port Facilities and Shipping at TAKU (Objective Folder No. 83.12-201).

(4) Last Resort Target: Railroad Yards at CHENGHSIEN (CHENGCHOW) at 34° 43'N - 113° 41'E.

3. STRATEGY AND PLAN OF OPERATION:

a. Importance of Targets:

(1) Primary Target:

(a) The Anshan Coke Plant of the Showa Steel Works is a target of vital importance, since Showa's iron and steel furnaces (which rank second in the Empire's production of pig iron and third in the production of both steel ingot and rolled steel products) are dependent upon its production.

(b) The Anshan Coke plant annually produces 3,793,000 metric tons of metallurgical coke. Prior to the expansion of the coke plant at Yawata, this represented 34.4 per cent of the Empire's total output. Preliminary examination suggests that the capacity at Yawata, formerly 1,784,000 metric tons, has been slightly more than doubled. Japan's total production of metallurgical coke, therefore, approximates 13,000,000 metric tons a year, of which Anshan's output represents about 29 per cent and Yawata's current output about 28 per cent. Thus, the Anshan plant is probably Japan's largest.

(c) Of its annual production, a maximum of 1,875,000 metric tons is consumed at the Showa Steel Works. The remaining 1,918,000 metric tons of coke are partly employed in the manufacturing

of hydrogen, produ:er gas, and synthetic oil in Manchuria; the rest is transported to Korea and Japan and is principally used in pig-iron production.

(2) Secondary Target: Chinwangtao is the port through which flows the coking coal from the great Kailan mines en route to Japan. It is estimated that a minimum of 3,600,000 metric tons, and as much as 5,600,000 metric tons, a year are loaded into ships at this harbor. It is further estimated that the movement of these tonnages will require the presence at Chinwangtao of between 6 and 8 large vessels (4700-7000 tons) at any one time. The loss of these vessels would be a considerable blow to Japan and incidental destruction of wharves and handling facilities would substantially increase the "turn-around" time for shipping.

(3) Tertiary Target: Taku Harbor, the port for Tientsin, is estimated to export 350,000 metric tons of non-coking coal, 150,000 metric tons of cotton, 200,000 metric tons of iron ore, 100,000 metric tons of pig iron, and 600,000 metric tons of salt. In addition, it is possible that, due to congestion in the port of Chinwangtao, a part of the coking coals from Kailan is now being exported through Taku. In order to export these commodities, it is estimated that a considerable number of vessels will be required, including 3-5 ocean-going ships of 3000-5000 tons. Destruction of shipping would be a blow to the Japanese and incidental damage to wharves and handling facilities would increase the "turn-around" time for shipping.

(4) Last Resort Target: One hundred and forty cars have been observed recently in these yards, which have assumed increased importance with the Japanese occupation and reconstruction of the Peking-Hankow Railroad. This line provides the enemy with an alternate supply route, relieving Yangtze River traffic of part of the burden. The Chenghsien Yards form one of the possible bottlenecks on the railroad, and an attack against them would temporarily impede the flow of Japanese military traffic along the line.

b. Details of Planning: (See Annex M, Field Orders)

(1) Strategic Considerations and D-Day: At the end of June, the Twentieth Air Force directed this Command to conduct a major daylight attack on the target at Anshan with at least 100 aircraft between 20 and 30 July. Since this directive could not be accomplished under normal conditions, Twentieth Air Force Headquarters was notified that every effort would be made to maximize the number of aircraft over the target and a plan, involving a certain risk to B-29's on the ground in the Forward Area, was submitted. This Command was then notified that the risk involved was understood and would have to be accepted. As a result, the mission was tentatively planned for 30 July with the Groups being allowed to move their aircraft to the Forward Area over a period of five days prior to D-Day. This was done for two reasons: (1) to permit abortives on the Hump flight to be redispatched to the Forward Area on a subsequent day, and (2) to allow for maintenance time in the Forward Area subsequent to the Hump flight and prior to the time of scheduled take-off for the mission. In addition, a longer period (10 days) was established for maintenance in the Rear Area subsequent to the cessation of Hump cargo flights. Previously, the longest time used for maintenance prior to a mission was seven days (Yawata Mission). This was done in order to increase still further the percentage of combat aircraft available for the strike against Anshan.

(2) Determination of Bomb Load:

(a) Bomb loading (accomplished at the Rear Area bases)

was as follows: Light 500-pound GP AN-M-64 (Composition B) bombs in each aircraft with one-tenth (.1) second nose and twenty-five thousandths (.025) second tail fuses. (Fuses were to be carried in each aircraft but the bombs were not to be fused until after the Forward Area bases were reached.) It was estimated that this bomb would be adequate in size to penetrate and disrupt the coke ovens.

(b) Although it was realized that a larger bomb would be desirable against other structures in a steel plant, the force available was not adequate to neutralize the coke ovens unless the bombing accuracy were under a 1000-foot Cep. Therefore, it was decided to concentrate the striking force on a single aiming point with the type of bomb load that would give the greatest assurance of success against the coke ovens.

(c) Each battery of coke ovens covers an area approximately 40 feet by 185 feet. They are constructed of special brick joined with a light binder and are, therefore, subject to penetration or ground shock. It was estimated that two direct hits per battery should result in complete destruction and a possible explosion. Since the by-products plant, with its highly inflammable contents and its latent source of fire, was located in close proximity to the coke ovens, no incendiary bombs were carried. Analysis of the target indicated that if a near miss in the by-products plant failed to start a fire, incandescent coke (which would be scattered through the by-products area as a result of a direct hit on the coke batteries) probably would.

(3) Formation to be Flown:

(a) The formation planned as set up in the Command's Tactical Doctrine) was the 4-plane diamond with wingmen flying level, approximately nose to tail and at a 100-foot interval from tip to tip with the leader, and number 4 flying well forward, approximately nose to tail with the wingmen and laterally in either the right or left interval between the lead and wing planes. Formations were to reach an altitude of 15,000 feet or 500 feet under an overcast (but in no case under 10,000 feet) before crossing over into enemy-held territory. On the return route, formations were to remain above 20,000 feet until clearing enemy-held territory.

(b) Aircraft failing to join a formation of at least 3 planes before penetrating enemy territory were instructed to bomb the last resort target at Chenghsien and return to their proper bases. Furthermore, formations reduced to a strength of less than 3 planes after having penetrated enemy territory were to join another formation in the vicinity, if possible. If not, they were to bomb the nearest designated target from an altitude of not less than 25,000 feet.

(4) Bombing Data: Bombing was to be by flights of four aircraft from 25,000 feet in the case of three Groups and from 26,000 feet in the case of one (444th). If an overcast were to prevent visual bombing from 25,000 feet, visual bombing was to be accomplished from an altitude not more than 2000 feet below the overcast, and, in no case, below 15,000 feet. Intervalometer setting was 50 feet for three Groups and 300 feet for one (444th), and the axis of attack was planned as 85° magnetic (visual) or 90° magnetic (radar) for three groups and 10° magnetic (visual) or 49° magnetic (radar) for one (444th). The Aiming Point in all cases was planned so that the center of impact would be on the middle coke oven.

(5) Route to be Flown: Route out was to be the same for all Groups except for the Initial Point, which was to be 41° 01'N -

121° 48'E for three Groups and 40° 33'N - 122° 14'E for one (444th). Route back was to be the same for all Groups.

(6) Photo Reconnaissance Aircraft: One B-29 aircraft was to be equipped with special cameras and to obtain photo coverage of Taku, Chinwangtao, Anshan, Pensihu (Objective Folder No. 93.3-30, 41° 20'N - 123° 43'E) and Darien (Objective Folder No. 93.5-2, 38° 55'N - 121° 40'E). It was to proceed in formation to a certain point, at which time it was to proceed as a single aircraft to 26,000 feet (Taku) and then to 30,000 feet, photographing the targets in the order given. It was specified that on the return route this aircraft was to join a formation if any were encountered en route.

(7) Aircraft Loading: In addition to the bomb load already mentioned, each combat aircraft taking off from the Rear Area bases was to carry three auxiliary fuel tanks and a full load of 50-cal. and 20-mm. ammunition. Furthermore, all aircraft, upon departure from the Rear Area, were to be fully serviced with POL and oxygen in order to minimize servicing requirements in the Forward Area, where they were to be topped off to the same loading.

(8) Fighter Cover: As in previous missions, arrangements were made with the 312th Fighter Wing to provide fighter cover for the VLR bases in the Chengtu Area.

(9) Miscellaneous Provisions:

(a) Designated bombing altitudes were true altitudes.

(b) Fuel was to be transferred from auxiliary tanks to wing tanks before reaching the primary target.

(c) Aircraft were not to be in lead positions in formations over the target if their radar sets were inoperative.

(d) After landing at the Chengtu Area bases, upon completion of the mission, aircraft were to be reserviced to a total of 3200 gallons of burnable fuel and necessary engine oil and kept on the alert during the remainder of the day. Return to Rear Area bases was set for D-Day plus one.

4. MOVEMENT FROM REAR TO FORWARD AREA: (See Annex A)

a. The movement from Rear to Forward Area was begun on D-Day minus 5 (25 July) with 19 aircraft landing in the Forward Area on D-Day minus 5, 52 on D-Day minus 4, 17 on D-Day minus 3, and 18 on D-Day minus 2, a total of 106. As a result of weather considerations, however, D-Day was moved up to 29 July (originally D-Day minus 1), a day earlier than planned. Nevertheless, on 29 July, 88 per cent of the available aircraft had already taken off for the Forward Area and 95 per cent of those airborne had actually reached it.

b. The decision to allow Groups to move aircraft to the Forward Area over a period of five days proved to be a wise one. Seven aircraft that returned to their Rear Area bases as a result of mechanical failures on their first attempt to move to the Forward Area completed without incident the trip to the Forward Area on their second attempt. Furthermore, additional time was allowed for maintenance, and no enemy air action eventuated.

c. A net total of 111 aircraft were airborne to the Forward Area. Eleven aircraft returned to their bases as a result of mechanical difficulty, but, as has been indicated, 7 of these were subsequently airborne again, making 4 net early returns for the movement. One aircraft of the 40th Group, airborne on 26 July, crashed shortly after take-off near Midnapore, resulting in the death of 8 crew members. Thus, on 29 July, with the addition of one combat aircraft already in the Forward Area, there were on hand for the mission 107 aircraft (including one non-combat aircraft equipped for photo reconnaissance).

5. EXECUTION OF THE MISSION - ANSHAN: (See Annexes B and J)

a. Take-off:

(1) Take-off time was set at 2215Z (28 July) for the 462nd Group, 2221Z for the 40th and 468th Groups, and 2232Z for the 444th Group. However, as a result of heavy rains during the night before scheduled take-off and the resulting unsatisfactory conditions on the runway, the 444th take-off was cancelled. Thus, 72 aircraft of the other Groups were airborne at the scheduled time as follows:

Group	A/C in Fwd. Area	A/C Airborne	First A/C off	Last A/C off	Elapsed Time between First and Last A/C
40th	27	24*	282225Z	282301Z	36 minutes
462nd	23	21	282215Z	282304Z	49 minutes
468th	29	27	282221Z	282316Z	55 minutes
	79	72	282215Z	282316Z	61 minutes

* Includes photo reconnaissance plane which carried no bombs.

(2) One aircraft of the 40th Group, taking off at 282228Z, turned back shortly after take-off as a result of the initial loss of number 4 engine. This was followed by the loss of number 3 engine on a landing attempt and the aircraft crashed at 290015Z 3 miles southeast of Hsinching, resulting in the death of 8 crew members. Bombs were jettisoned in friendly territory prior to the crash.

b. Route Out:

(1) Aircraft flew a route from the Chengtu area bases (40th - Hsinching; 462nd - Kunglai; 468th Pengshan) as follows: 32° 35'N - 111° 29'E to 37° 32'N - 118° 55'E to 40° 25'N - 121° 00'E to Initial Point (41° 01'N - 121° 48'E) to Target.

(2) Deviations from the planned route were fairly numerous (but minor) and resulted mostly from mechanical difficulties. Of the 11 aircraft failing to reach the primary target, 1 bombed the secondary target, 2 bombed the last resort target, 4 bombed targets of opportunity, 3 jettisoned their bombs (including the crashed aircraft already mentioned), and 1 brought its bombs back.

c. Primary Target:

(1) The first formation over the target was at 0357Z, and the bombing continued until 0455Z, an elapsed time over the target of 58 minutes. During that time, 60 aircraft dropped a total of 448 500-pound GP bombs on the target, a total of 112 short tons.

(2) Total possible bomb load of the aircraft reaching

the primary target was 480 bombs (120 short tons), but 4 aircraft experienced rack malfunctions and released only a portion of their load or none at all. Furthermore, the bombing effort of 2 more was almost completely nullified by a personnel error causing the premature release of the entire bomb load of one aircraft and half that of the other.

(3) Although the bombing run presented few problems as a result of the still air and negligible drift, these relatively ideal bombing conditions were completely negated for formations after the first wave. Bombs from the first aircraft over the target had hit a by-products installation close to the Aiming Point, and the dense smoke resulting made identification of the Aiming Point difficult.

(4) Bombing altitudes varied from the planned altitude of 25,000 feet in a number of cases, ranging from 19,000 to 26,000 feet, with 34 aircraft (59 per cent), however, bombing between 24,000 and 26,000 feet. The axis of attack at the Primary Target also varied in a number of cases from the planned axis of 85° magnetic. Thirty-eight aircraft (66 per cent), however, bombed on axis of attack from 80° to 95° magnetic. Indicated air speed over the target ranged from 182 to 212 mph, with 42 aircraft reporting IAS between 195 and 201 mph.

d. Route Back:

(1) On the return route, aircraft flew a route as follows: target area to 32° 35'N - 111° 29'E to bases.

(2) In addition to the losses already mentioned (the crash en route to the Forward Area and that shortly after take-off for the target), only two aircraft failed to return to the Forward Area. One aircraft crashed in enemy-held territory after a combination of mechanical trouble and damage by enemy antiaircraft and enemy fighters over the last resort target. (See Annex I - Battle Losses). Eight crew members have been safely returned, however, and only 3 are missing. The other aircraft has since been located with all crew members safe.

(3) Aircraft 312 (462nd Group) bombed the secondary target as a result of mechanical difficulty which persisted on the return route. As a result, this plane landed at Ankang (32° 35'N - 109° 14'E) at 290830Z because of engine failure and fuel shortage. Despite attempts by the Japanese to destroy this aircraft (attempts which cost them the loss of one Lily), an engine change was made and number 312 took off at 0505Z on 3 August and made a successful landing at Kunglai at 030705Z.

e. Photo Reconnaissance Aircraft: This plane proceeded to its target area without incident, but, upon encountering thunderstorm activity over Taku, it dropped to 9500 feet for its photo attempts. Weather prevented the photographing of Chinwangtao, but clear weather prevailed at Anshan, Pensihu and Darien and photographs were taken from an altitude of 25,000 feet. Planned altitude was 30,000 feet, but a lower altitude was necessitated by the last-minute substitution in the forward camera well of plexiglass in place of the regular glass that had cracked under altitude pressure on the trip to the Forward Area.

6. EXECUTION OF THE MISSION - TAKU: (See Annexes B and J)

a. After the initial cancellation of the take-off of the 444th Group, favorable weather resulted in the improvement of the runway to such an extent that by approximately 0300Z it was possible to get aircraft safely into the air. As a result, a strike against the tertiary

target at Taku was ordered. Of the 28 combat aircraft in the Forward Area for the mission, 24 were airborne, the first at 290316Z, the last at 290410Z, an elapsed time of 54 minutes.

b. Eight of the aircraft airborne failed to reach the Taku area. Of these, 3 bombed the last resort target, 3 jettisoned their bombs, and 2 returned with their bombs.

c. The first formation over Taku dropped its bombs at 0658Z and the last at 0817Z, an elapsed time of 79 minutes. During this period, 16 aircraft dropped a total of 114 500-pound GP bombs, a total weight of 28½ short tons. The total possible load for these 16 aircraft was 128 500-pound bombs (32 short tons), but 4 aircraft dropped only a portion of their load on the target as a result of rack or release malfunctions. Bombs not dropped (14 in total) were subsequently returned (7) or dropped on a target of opportunity.

d. Bombing altitudes varied from 17,000 to 21,000 feet, with the majority bombing at the higher altitude. The axis of attack varied around the clock (5° to 360° true) with indicated air speeds ranging from 185 to 208 mph. No enemy antiaircraft or enemy fighter opposition was encountered over the target area. Weather was reported as CAVU with intermittent scattered undercast.

7. OPERATIONAL RESULTS OF THE MISSION: On D-Day, 90 per cent of the 107 aircraft in the Forward Area were airborne on strikes against the two targets. Of aircraft airborne, 77 (80 per cent) reached the prescribed primary target areas, but, as a result of mechanical difficulties and personnel error, the total bombs dropped represented the effective bomb load of only 70 aircraft (73 per cent). Valuable experience, however, was gained in formation flying and other aspects of day missions, and, despite the enforced reduction of the force sent against Anshan, the results (as presented in detail in Annex K) appear to be good to excellent.

8. ENEMY OPPOSITION: (See Annex C)

a. Enemy Antiaircraft:

(1) Heavy antiaircraft, reported as having been encountered by 90 per cent of the aircraft over Anshan, was inaccurate to accurate and meager to intense from at least 20 heavy antiaircraft guns defending the area. The majority of the fire encountered was Predicted Concentration with a small amount of Continuously Pointed. No heavy AA fire was encountered at Chinwangtao or Taku, but inaccurate and meager heavy AA fire was reported on three separate occasions at Chenghsien, each subsequent firing improving in accuracy. Heavy AA was also reported at Tichlu, Yellow River Bridge (34° 57'N - 113° 33'E), Darien, Yinkow, Kaiping, and Siyangtai. No automatic weapons fire was encountered.

(2) Evasive action generally consisted of a turn and loss of altitude after bombs away.

(3) No smoke screens or confirmed balloon barrages were reported.

(4) RCM observers reported continuous tracking of our aircraft along the route, indicating the presence of a radar warning net in occupied China. (See Annex F for details of RCM activity.)

b. Enemy Aircraft:

(1) Although the enemy attempted more attacks than in

any previous B-29 mission, air opposition in the final analysis was weak and ineffectual. Thirty-eight singel or coordinated passes and attacks were executed against 18 B-29's by 44 enemy aircraft (identified as 15 ZEKES, 13 OSCARS, 9 TOJOS, 5 TONYS, 1 HAMP, and 1 unidentified) with enemy fire being definitely observed in only 3 of the 38 attempts. Two of our aircraft sustained slight damage, in both cases the result of frontal attacks. The Japanese pilots apparently again experienced difficulty in timing their attacks and in attaining a proper firing position. Approximately 50 per cent of the passes were pressed to 500 yards or less.

(2) Seventy per cent of the encounters occurred in the immediate vicinity of Anshan and Chenghsien. No opposition was encountered over Taku. In attacking formations of 3 and 4 B-29's, the enemy concentrated 63 per cent of his efforts against the wing planes. Level and low approaches between 2 and 7 o'clock predominated, with breakaways generally low, many terminating in a dive. Single-plane attacks predominated. Reports from returning crews indicate that the enemy probably employed aerial bombs of the phospherous type in several instances.

(3) Claims by B-29 crews include 3 enemy aircraft probably destroyed and 4 damaged.

9. WEATHER: (See Annex D)

a. Weather at bases at take-off was favorable for the mission with the exception of Kwanghan (444th), where soft runways caused by heavy rains during the night resulted in the cancellation of the take-off for Anshan. Favorable early-morning weather, however, resulted in the drying of the runways sufficiently to allow this Group to take-off on a strike against Taku.

b. Formation flying was possible at all times.

c. Cloud cover for tactical use was reported as present at all times over enemy territory except for the area from the Initial Point to the Target.

d. Cloud cover and visibility over the target were excellent for high-altitude visual bombing.

10. COMMUNICATIONS: (See Annex E) Radio communication, both air-to-ground and air-to-air, was generally excellent. Some interference, attributable to both the enemy and weather, was encountered, but it was not serious enough to cause any breakdown in communications. Comments about various subjects are as follows:

a. Air-ground communication was conducted from one ground installation located at Hsinching, China.

b. Requests for navigational aids were not as numerous as on previous missions, and general comment indicates that D/F requests were handled satisfactorily.

c. Point-to-point and air-to-air communications were excellent.

d. Only minor breaches of radio discipline were reported.

e. Enemy radio activity was logged, but it is doubtful if any activity could be specifically classified as jamming.

f. Each group was assigned a code word to be transmitted over the target to indicate "bombs away."

g. Signal security was achieved by the use of CSP 1270 and a series of code words. Only one breach of security was reported.

11. RADAR AND RCM: (See Annex F)

a. Radar:

(1) Since all aircraft on this mission bombed visually, the major use for radar was in aiding navigation and in starting the bombing run by locating check points and the target area beyond the range of visibility. Excellent experience was gained by the radar operators in making radar fixes, locating the Initial Point, and checking the visual bombing run by radar. Considerable difficulty, however, was encountered due to the transfer of fuel near important radar check points and even at the I.P. itself. Furthermore the need for flight training of radar operators against inland targets was emphasized by the large number (20) who did not identify the radar target at usable ranges. Part of this difficulty may be ascribed to poor radar serviceability, the main cause of radar failure being pressurization at the higher altitudes used on the mission.

(2) The auxiliary radar sets showed excellent serviceability and the SCR-729 (Interrogator Responser) was used to advantage in locating YJ Beacons at China Bases. The SCR-718 (Altimeter) was not used.

b. RCM:

(1) As in previous missions, RCM activities were confined to searching for enemy radar signals and no offensive action was taken. Although 14 RCM-equipped aircraft were scheduled to participate in the mission, only 10 actually were airborne. Four frequency ranges were searched, two of these (140-300 megacycles and 70-110 megacycles - 6 observers) were active while the other two (300-1000 megacycles and 1000-3300 megacycles - 3 observers) showed no indication of enemy radar signals. (Detailed RCM interceptions are included in Annex F.)

(2) The initial use of Direction-Finding antennas in the 75-megacycles band resulted in the inconclusive location of two enemy radar stations. The need for additional training with the D/F antenna is indicated.

(3) There was no evidence of radar-controlled anti-aircraft fire.

12. CENTRAL STATION FIRE CONTROL: (See Annex G) The functioning of the CSFC System was satisfactory on this mission, but this conclusion is based only on the functioning of the equipment and not on the extent of damage inflicted on enemy aircraft. There were only a few co-ordinated attacks reported by enemy aircraft, and the ability of the gunners cannot be judged from the results of this mission. (Rounds expended numbered 25,130, but only 1230 rounds were fired at enemy aircraft.) However, the number of turrets and guns tested in the air was far in excess of any mission previously flown, and performance indicated was satisfactory. Overall, there were only 28 gun or cannon malfunctions and 20 turret malfunctions.

13. CAMERAS AND PHOTOGRAPHS: (See Annex H)

a. In all, 146 cameras of various types were installed in combat aircraft. Photographs were taken by 93 of these cameras with 920 usable negatives resulting. Types of cameras used were the K-17b, K-18, K-19, K-20, and C-3.

b. The photo reconnaissance aircraft was equipped with 2 split-vertical K-18 cameras, 2 split-vertical K-22 cameras, and 3 Tri-met K-17b cameras. All cameras functioned, but usable negatives were obtained only from the K-18 cameras. Vibration spoiled the K-22 negatives and the Tri-met was rendered unusable because of clouds.

14. BATTLE LOSSES AND BATTLE DAMAGE: (See Annex I) Only one aircraft was lost as a result of enemy action. This plane experienced mechanical difficulty en route to the target and proceeded to the last resort target, where it was hit by enemy antiaircraft and then attacked by 5 enemy fighters. Damage caused by enemy action was sufficient to cause it to be abandoned over enemy territory, where it crashed. (Eight crew members have returned safely, however.) Battle damage from both enemy antiaircraft and fighters was negligible with 5 planes suffering minor AA damage and 2 suffering minor damage from enemy aircraft.

15. FUNCTIONING OF EQUIPMENT: (See Annex J)

a. Of the total aircraft involved in the movement (134 - see Annex A and J with notes for explanation of this total), 60 experienced major mechanical difficulty of a nature that interferred with the ultimate aim--the bombing of the assigned primary targets. These difficulties break down into the following classes: (1) failed to take off for Forward Area or on mission - 24 (does not take into account aircraft in the Rear Area assigned to take off but not airborne that may have become airborne on subsequent assignment to take off); (2) returned to bases during movement to Forward Area - 11; (3) crashed en route to Forward Area - 1; (4) failed to drop entire bomb load or none of load on primary targets - 8; (5) bombed other targets - 8; (6) jettisoned bombs - 5; and (7) brought bombs back - 3.

b. A more detailed study of the functioning of equipment (other than engine or bomb-rack or release malfunctioning) shows that ordinary difficulties were encountered in flight with inoperative tachometers (18) and oil leaks (16) heading the list.

c. Thirty-six aircraft (62 per cent) burned from 5400 to 6045 galloons of gasoline in bombing the target at Anshan. Twenty-two others burned more than 6045 gallons, with 4 aircraft burning between 6721 and 7050 gallons. An interesting conclusion resulting from the fuel consumption analysis is that the difference in fuel consumption between wingmen and formation leaders was negligible, whereas pre-flight calculations had set this difference as relatively large. The same small difference existed between those aircraft bombing above 24,000 feet and those bombing under that altitude. This unexpected result is not considered as conclusive, however, because of the probable influence of the so-called "coal-burners" on the over-all results.

16. TARGET DAMAGE ASSESSMENT: (see Annex K)

a. Summary of Damage:

(1) Showa Steel Works, Anshan, Manchuria.

(a) Considerable damage was effected at vital and critical points in the target area. The south coke battery was hit at least once and a number of near misses was noted. While recon-

naissance photos do not confirm a direct hit on the old central Koppers battery, one or two bombs are known to have fallen in the immediate vicinity, and a very near miss or direct hit may have damaged the new central Otto battery. There are no known direct hits in the north battery, although one very near and two near misses can be seen.

(b) Elsewhere in the plant the destruction or serious damage to other installations should make it difficult if not virtually impossible to service for an indefinite period coke ovens not affected by the attack. This includes damage to the principal coal-handling installations near the center of the coke-installations group. At this point, the building housing the crushing, screening, and cleaning facilities has been severly damaged. Furthermore, part of the coal distributing system has been destroyed at its primary distribution point as has the conveyor system serving the north battery. A pusher serving the south battery is almost certain to have been damaged. As the result of the great vulnerability of coke ovens to damage by near misses as well as by direct hits (because of the fragility of their ceramic linings), damage is believed to be considerable.

(c) In addition, the coke by-products plant has been heavily damaged. In one nine-acre area of this installation, approximately 50 per cent of the buildings and other structures have been virtually destroyed or severely damaged.

(d) The Darien-Mukden railroad line, severed in a number of places by direct hits, was quickly repaired and a train can be seen passing through at the time of reconnaissance.

(2) Chinwangtao Harbor, China: This target was attacked by one aircraft of 462nd Group bombing through a hole in 10/10 undercast. Results were not observed and no photos are available.

(3) Taku Harbor, China: Damage has been inflicted on 2 large godowns and associated wharves near the center of the target area. A direct hit is seen on a 150/200-foot collier-type vessel and a near miss on a similar vessel. Rail lines and sidings are seen to have been damaged in a number of places. Direct hits were scored on several buildings of the Yung Li Alkali plant. In addition, approximately 25-30 business/residential buildings appear to be damaged or destroyed.

(4) Chenghsien Railroad Yards, China: Damage is seen to have been inflicted in the northeast end of the yards, probably breaking the Peking-Hankow lines in several places and halting traffic temporarily. To the north, another break, possibly two, appears to have occurred in several of the lines of the rail complex. In addition, direct hits appear to have been scored on a 150-foot by 40-foot building, reported to be a school and possibly used as a barracks, probably destroying the building as well as damaging several smaller buildings nearby.

b. Estimate of Time for Replacement of Reconstruction:

(1) Showa Steel Works, Anshan, Manchuria: It is conservatively estimated that at least 4 to 6 months will be required to restore operations in the Showa Steel Works to full capacity, and that, during the period of clearance and rebuilding, very little if any coke can be produced in the three old batteries. The new battery is thought to have been least damaged and operations there can probably be resumed more quickly than elsewhere.

(2) Chinwangtao Harbor, China: Damage was not observed.

(3) Taku Harbor, China: Although damage to the main wharf area and godowns is severe, it is not thought that the result will be felt seriously, since many other wharf areas exist and damage inflicted can probably be repaird in a month's time. The Alkali plant, however, probably suffered somewhat heavier damage and reconstruction here will probably take from one to two months. Damage to rail lines is of a temporary nature.

(4) Chengtsien Railroad Yards, China: It is felt that damage sustained by this yard is of a temporary nature.

c. Estimate of Strategic Effects of the Mission:

(1) Reconnaissance photographs of Showa Steel Works made subsequent to the raid show that there is little sign of activity throughout the entire plant. Coking operations, however, were being conducted in some ovens of the south battery and it is believed that this operation could take place by the use of a crushed and screened coal stockpile at the crusher.

(2) Because of the known vulnerability of coke ovens to attack by high explosives, it is conservatively estimated that 4 to 6 months will be required for restoring full operations within the Showa Works. An undetermined number of individual coke ovens must have been severely damaged, and, according to authoritative opinion, any damage to a coke oven necessitates complete rebuilding. It is believed that rebuilding of the coal-handling devices alone will require considerable time.

For the Commanding General:

Leo I. Herman

LEO I. HERMAN,
Colonel, Air Corps,
Acting Adjutant General.

ANNEX

A

MOVEMENT FROM REAR TO FORWARD AREA

MOVEMENT FROM REAR TO FORWARD AREA

Mission No. 4

29 July 1944

	D-Day Minus 5	D-Day Minus 4	D-Day Minus 3	D-Day Minus 2	Total D-Day
40th Group:					
Assigned to take off	10	16	5	4	35
Airborne	8-a	16	3	3	30
Crashed en route	0	1	0	0	1
Returned to base	0	2-b	0	0	2
Forced landing en route	0	0	0	0	0
Missing	0	0	0	0	0
Landed in forward area	8	13	3	3	27
A/C already in forward area	-	-	-	-	0
Total available for mission	-	-	-	-	27
444th Group:					
Assigned to take off	16	10	2	7	35
Airborne	14	10	2	7	33
Crashed en route	0	0	0	0	0
Returned to base	3-c	1-d	0	1	5
Forced landing en route	0	0	0	0	0
Missing	0	0	0	0	0
Landed in forward area	11	9	2	6	28
A/C already in forward area	-	-	-	-	0
Total available for mission	-	-	-	-	28
462nd Group:					
Assigned to take off	-	14	9	9	32
Airborne	-	12	6	8	26
Crashed en route	-	0	0	0	0
Returned to base	-	1-e	0	2	3
Forced landing en route	-	0	0	0	0
Missing	-	0	0	0	0
Landed in forward area	-	11	6	6	23
A/C already in forward area	-	-	-	-	0
Total available for mission	-	-	-	-	23

MOVEMENT FROM REAR TO FORWARD AREA (Continued)

	D-Day Minus 5	D-Day Minus 4	D-Day Minus 3	D-Day Minus 2	Total D-Day
468th Group:					
Assigned to take off	-	20	6	3	29
Airborne	-	20	6-a	3	29
Crashed en route	-	0	0	0	0
Returned to base	-	1-f	0	0	1
Forced landing en route	-	0	0	0	0
Missing	-	0	0	0	0
Landed in forward area	-	19	6	3	28
A/C already in forward area	-	-	-	-	1
Total available for mission	-	-	-	-	29
Total:					
Assigned to take off	26	60	22	23	131-g
Airborne	22	58	17	21	118-h
Crashed en route	0	1	0	0	1-i
Returned to base	3	5	0	3	11-j
Forced landing en route	0	0	0	0	0
Missing	0	0	0	0	0
Landed in forward area	19	52	17	18	106
A/C already in forward area	-	-	-	-	1
Total available for mission	-	-	-	-	107

a. Took off from Mohanbari.
b. Subsequently airborne and landed in forward area on D-Day minus 2.
c. One A/C subsequently airborne and landed in forward area on D-Day minus 4 and a second on D-Day minus 2.
d. Subsequently airborne and landed in forward area on D-Day minus 2.
e. Subsequently airborne and landed in forward area on D-Day minus 2.
f. Subsequently airborne and landed in forward area on D-Day minus 2.
g. Excluding A/C assigned to take off twice as a result of turning back on initial attempt, total aircraft assigned to take off is 124, with Group totals as follows: 40th - 33; 444th - 32; 462nd - 31; and 468th - 28. Does not take into account aircraft assigned to take off that were not airborne on initial attempt but may have become airborne subsequently.
h. Excluding A/C becoming airborne twice as a result of turning back on initial attempt, total aircraft airborne is 111 with Group totals as follows: 40th - 28; 444th - 30; 462nd - 25 and 468th - 28.
i. Does not include A/C 228 (444th Group) that crashed on movement from forward to rear area after mission.
j. Excluding A/C making early returns but subsequently becoming airborne and landing in forward area, this total is 4.

ANNEX

B

EXECUTION OF THE MISSION

I - Details of Routes

II - Track and Vertical Flight Path-Anshan

III - Track and Vertical Flight Path-Taku

IV - Bombing Data - Anshan

V - Bombing Data - Taku

VI - Disposition of Bombs

VII - Formation Flown

VIII - Navigation Report

I - DETAILS OF ROUTES

Mission No. 4

29 July 1944

A. Primary Target - Anshan

40th Group *	Location	Time at Point (Z time)	Altitude (feet)	IAS (mph)
Base to:	Hsinching	282225 - 282301	-	-
First Check Point To:	32°35'N - 111°29'E	290042 - 290111	10,000 - 17,000	190 - 205
Second Check Point To:	37°32'N - 118°55'E	290242 - 290319	13,000 - 18,000	190 - 200
Third Check Point To:	40°25'N - 121°00'E	290332 - 290415	17,000 - 25,000	190 - 200
Initial Point To:	41°01'N - 121°48'E	290345 - 290429	19,000 - 25,000	190 - 200
Target	Anshan	290357 - 290441	19,000 - 25,500	182 - 212
First Return Check Point To:	32°35'N - 111°29'E	290723 - 290830	20,000 - 13,000	190 - 200
Base	Hsinching	290934 - 291055	-	-

* Deviations from route to primary target were as follows:

1. A/C 351 crashed 3 miles southeast of Hsinching.
2. A/C 348 bombed last resort target (Chenghsien).
3. A/C 237 bombed target of opportunity at 33°35'N - 114°00'E.
4. A/C 466, after rack malfunction over primary target, proceeded to secondary and tertiary targets, but was unable to bomb and finally jettisoned its bombs.
5. A/C 294 dropped 4 bombs on PT and 4 on LRT.

SECRET

XX BOMBER COMMAND
TRACK AND VERTICAL FLIGHT PATH
MISSION #4
(40TH-462ND-468TH GROUPS)

110° 120° 130°

40°

30°

41°-02' N.
121°-48' E. (IP #2)

MUKDE

ANSHAN

41°-08' N.
122°-57' E (TARGET)

40°-25' N.
121°-00' E.

40°-33' N.
122°-15' E. (IP #1)

37°-32' N.
118°-55' E. (ISLAND)

32°-35' N.
111°-29' E. (RIVER FORK)

CHENGTU

VERTICAL FLIGHT PATH
THOUSAND FEET
24
20
16
12
8
4
0

ROUTE OUT
ROUTE BACK

CHENGTU LOCAL AREA

31°

30°

104°

•KWANGHAN
444 GP.

CHENGTU

•KUNGLAI
462 GP.

•HSINCHING
40 GP.

•PENGSHAN
468 GP.

SECRET

10.06

"SECRET"

"SECRET"

SECRET

100° 110° 120° 130°

40°

30°

39°- 00' N.
117°- 40' E. (TARGET)

TAKUO

32°- 35' N,
111°- 29' E. (RIVER FORK)

KWANGHAN
444 GP.

VERTICAL FLIGHT PATH

THOUSAND FEET
24
20
16
12
8
4
0

ROUTE OUT ——————
ROUTE BACK - - - - - -

XX BOMBER COMMAND
TRACK AND VERTICAL FLIGHT PATH
MISSION 4
(444TH GROUP)

10.07

SECRET

"SECRET"

"SECRET"

I - DETAILS OF ROUTES (Continued)

A. Primary Target - Anshan (Continued)

462nd Group *	Location	Time at Point (Z time)	Altitude (feet)	IAS (mph)
Base To:	Kunglai	282215 - 282304	-	-
First Check Point To:	32°35'N - 111°29'E	290044 - 290143	9,500 - 15,000	198 - 210
Second Check Point To:	37°32'N - 118°55'E	290245 - 290342	13,800 - 19,720	200 - 210
Third Check Point To:	40°25'N - 121°00'E	**	**	**
Initial Point To:	41°01'N - 121°48'E	290344 - 290443	18,000 - 25,000	190 - 210
Target To:	Anshan	290497 - 290455	18,900 - 24,500	190 - 205
First Return Check Pt. To:	32°35'N - 111°29'E	290746 - 290828	18,000 - 11,240	185 - 202
Base	Kunglai	291000 - 291121	-	-

* Deviations from route to primary target were as follows:

1. A/C 359 could not get above 19,000 feet and bombed air base at Linyi (37°12'N - 116°52'E).

2. A/C 360 bombed railroad bridge at 34°00'N - 113°47'E.

3. A/C 444 jettisoned its bombs at 30°40'N - 104°45'E.

4. A/C 287 bombed railroad yard at Sinsiang (35°17'N - 113°55'E).

5. A/C 273 returned to Kunglai with its bombs.

6. A/C 312 landed at Ankang (32°25'N - 109°15'E) after bombing the secondary target (Chinwangtao).

7. A/C 270 dropped only 4 bombs on primary target and then proceeded to last resort target (Chenghsien, where it dropped the remaining 4.

** Not available.

I - DETAILS OF ROUTES (Continued)

A. Primary Target - Anshan (Continued)

468th Group *	Location	Time at Point (Z time)	Altitude (feet)	IAS (mph)
Base To:	Pengshan	282221 - 282316	-	-
First Check Point ** To:	32°35'N - 111°29'E	290048	8,000	200
Initial Point ** To:	41°01'N - 121°48'E	290325	25,000	200
Target To:	Anshan	290401 - 290455	20,000 - 25,300	195 - 200
First Return Check Pt. To:	32°35'N - 111°29'E	290728	15,000	195
Base	Pengshan	290939 - 291052	-	-

* Deviations from route to primary target were as follows:

1. A/C 284 bombed last resort target (Chenghsien).
2. A/C 274 made 2 runs on last resort target but could not release. Bombs were finally jettisoned 10 to 15 miles southwest of Chenghsien before crashing in enemy territory.

** Details of time, altitude, and indicated air speed for second and third check points are not available.

B. Primary Target - Taku

444th Group *	Location	Time at Point (Z time)	Altitude (feet)	IAS (mph)
Base To:	Kwanghan	290316 - 290410	-	-
Target To:	Taku	290658 - 290818	17,000 - 22,000	185 - 208
Base	Kwanghan	291136 - 291237	-	-

* Deviations from route to Taku were as follows:

1. A/C 212 bombed last resort target (Chenghsien).
2. A/C 462 bombed last resort target (Chenghsien).
3. A/C 262 bombed last resort target (Chenghsien).
4. A/C 307 jettisoned its bombs (pilot refused to land with bombs).
5. A/C 320 jettisoned its bombs at 31°20'N - 104°56'E.
6. A/C 286 jettisoned its bombs.
7. A/C 321 landed with bombs.
8. A/C 330 landed with bombs.
9. A/C 300 dropped 1 bomb on PT and 7 on target of opportunity at 35°46'N - 112°39'E.

IV - BOMBING DATA - ANSHAN

Mission No. 4

29 July 1944

A. Time of Bomb Release

Z times	40th	462nd	468th	Total
0350 - 0359	3	-	12	15
0400 - 0409	3	2	-	5
0410 - 0419	3	2	-	5
0420 - 0429	6	7	-	13
0430 - 0439	-	-	9	9
0440 - 0449	4	-	-	4
0450 - 0459	-	4	3	7
Total	19-a	15-b	24-b	58

a. Includes 2 A/C that dropped only 4 bombs each on PT. Does not include photo plane or 1 A/C that was over PT but dropped no bombs.

b. Includes 1 A/C that dropped only 4 bombs on PT. Does not include 1 A/C that was over PT but dropped bombs before reaching Aiming Point.

B. Bombing Altitudes at PT

Within 1000' difference	40th	462nd	468th	Total
19,000	3	-	-	3
20,000	6	5	3	14
21,000	1	-	-	1
22,000	2	-	-	2
23,000	1	-	3	4
24,000	1	4	3	8
25,000*	4	3	15	22
26,000	1	3	-	4

*Briefed altitude

IV - BOMBING DATA - ANSHAN (Continued)

C. Indicated Air Speed at PT

Miles per hour	40th	462nd*	468th	Total
180 - 184	1	-	-	1
185 - 189	-	-	-	-
190 - 194	6	2	-	8
195 - 198	4	4	4	12
199 - 201	5	5	20	30
202 - 205	2	2	-	4
206 - 210	-	-	-	-
211 - 215	1	-	-	1

* 2 A/C not reported

D. Axis of Attack at PT

Magnetic Headings (Degrees)	40th	462nd	468th	Total
40 - 49	1	-	4	5
52	-	-	1	1
60 - 69	1	-	3	4
70 - 79	1	-	1	2
80 - 84	3	1	2	6
85*	4	-	3	7
86 - 90	4	2	4	10
91 - 95	1	11	3	15
96 - 100	2	-	3	5
195	1	-	-	1
330	1	-	-	1
347	-	1	-	1

* Briefed axis of attack

IV - BOMBING DATA - ANSHAN (Continued)

E. Comments

1. Bombing equipment was satisfactory with only a few exceptions. Four aircraft used the automatic gyro leveling device modified sights. The bombardiers of these aircraft found them extremely useful and requests have been made for additional sights of this type. The C-1 autopilots were also used to excellent advantage.

2. The procedure in which the bombardiers immediately push the selector handle to salvo position after the indices meet proved to be of value, since several bombs were released on the target that otherwise might not have been.

3. Bombardiers in formations heading for the target after the initial aircraft had little difficulty in identifying the target area, since the smoke from the burning by-products area was visible from the Initial Point approximately 50 miles away. The bombing run was made in smooth air with little drift and enemy antiaircraft was not accurate enough to cause distraction during the run. It is to be noted that the bombardier could have easily begun his run when the target came into view, even with extended vision in his sight, since, in the majority of cases, there was no cause for evasive action.

V - BOMBING DATA - TAKU

Mission No. 4

29 July 1944

A. Time over Target (Z time):

0658	2
0702	1
0721	2
0728	1
0730	3
0745	2
0750	1
0815	2
0817	2

B. Altitude (feet):

17,000	1
18,000	-
19,000	5
20,000	-
21,000	10

C. IAS (mph):

185	2
187	1
190	3
195	1
200	8
208	1

D. Axis of Attack (true):

5°	3
30°	1
171°	3
225°	1
245°	3
333°	1
340°	2
355°	1
360°	1

VI - DISPOSITION OF BOMBS*

Mission No. 4

29 July 1944

("Gp" equals General Purpose bombs)

Arshan	40th		462nd		468th		Total		444th - Taku		Gp Total
	No. A/C	No. Gp	No. A/C	No. Gp	No. A/C	No. Gp	No. A/C	No. Gp	No. A/C	No. Gp	
A/C Airborne	24	184-a	21	168	27	216	72	568-a	24	192	760
A/C over PT and total possible load	21-b	160	15	120	25	200	61-b	480	16	128	608
Bombs actually dropped on PT		144-c		116-d		188-e		448		114-f	562
Bombed secondary target	-	-	1	8	-	-	1	8	-	-	8
Bombed last resort target - mechanical difficulty	1	12-g	-	4-h	1	8	2	24	1	4-i	44
Bombed last resort target - personnel error	-	-	-	-	-	-	-	-	2	16	
Bombed targets of opportunity	1	8-j	3	24-k	-	-	4	32	-	7-l	39
Jettisoned-crashed aircraft	1	8-m	-	-	-	-	1	8	-	-	
Jettisoned-mechanical difficulty	-	12-n	1	8	1	20-o	2	40	2	16	72
Jettisoned-personnel error	-	-	-	-	-	-	-	-	1	8	
Brought Back	-	-	1	8	-	-	1	8	2	27-p	35
Totals	24	184	21	168	27	216	72	568	24	192	760

Notes are on page B-9

VI - DISPOSTION OF BOMBS (Continued)

* Each A/C, except photo reconnaissance plane (A/C 288 of 40th), carried 8 500-pound AN-M-64 (Composition B) GP bombs, fused one-tenth second nose and twenty-five thousandths second tail.

a. One A/C airborne (photo reconnaissance plane) carried no bombs.

b. Includes photo plane which got over PT, but which carried no bombs.

c. 40th Group: A/C 294 dropped 4 on PT, 4 on last resort target.
A/C 301 dropped 4 on PT, 4 jettisoned.
A/C 466 went to PT, ST, and TT and finally jettisoned all 8 bombs.

d. 462nd Group: A/C 270 dropped 4 on PT, 4 on last resort target.

e. 468th Group: A/C 356 dropped 8 bombs 12 to 15 miles before reaching target as result of personnel error.
A/C 442, dropping on 356, dropped 4 with 356 and remainder on PT.

f. 444th Group: A/C 452 dropped 6 on PT; 2 were brought back.
A/C 420 dropped 5 on PT; 3 were brought back.
A/C 228 dropped 6 on PT; 2 were brought back.
A/C 300 dropped 1 on PT; 7 were dropped on target of opportunity.

g. Includes 4 bombs from A/C 294 (see note c).

h. Includes 4 bombs from A/C 270 (see note d).

i. A/C 212 (444th) dropped 4 on LRT, and remaining 4 were brought back.

j. A/C 237 (on railroad tracks at 33°35'N - 114°00'E).

k. A/C 359 (8 bombs on runway at airfield near Linyi: 37°12'N - 116°52'E).
A/C 360 (8 bombs on railroad bridge at 34°00'N - 113°47'E).
A/C 287 (8 bombs on railroad yards at Sinsiang: 35°17'N - 113°50'E).

l. Bombs dropped by A/C 300 (see note f) on supply dump at 35°46'N - 112°39'E.

m. A/C 351 - crashed shortly after take-off.

n. Includes 4 bombs from A/C 301 and 8 from 466 (see note c).

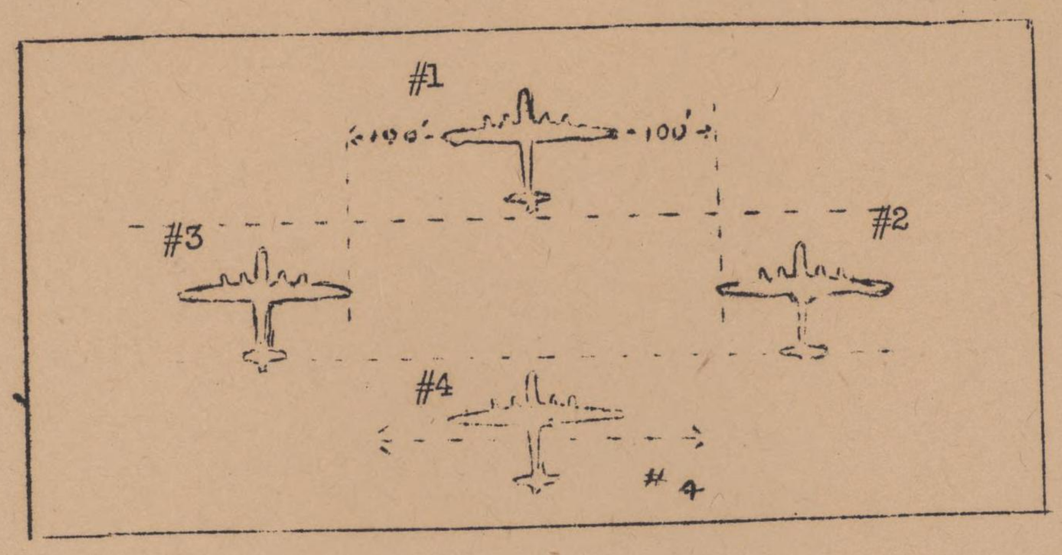
o. Includes A/C 356 (8 bombs) and A/C 442 (4 bombs) - see note e.

p. Includes A/C 452 (2 bombs), 420 (3 bombs), and 228 (2 bombs) - see note f; and A/C 212 (4 bombs), see note i.

VII - FORMATION FLOWN

Mission No. 4

29 July 1944



1. Formation flown was the 4-plane diamond with wingmen flying level, approximately nose to tail with #1 aircraft and at a 100-foot interval from tip to tip with #1. Number 4 flew well forward, approximately nose to tail with #2 and #3 and laterally in either the right or left interval between the lead and wing planes to avoid prop wash and empty shell cases.

2. In order to gain fire support from the rest of the formation, #4 was briefed to drop low on high tail attacks and to rise above formation level on low tail attacks. Conversely, in order to support the formation with its own fire, #4 was to rise on high nose attacks and drop on low nose attacks.

3. The execution of the planned formation, with the exception of the aircraft that actually flew in the planned formation over the target, is not considered satisfactory, since the formations varied from 2 to 6 aircraft. However, the basic 4-plane formation is still considered excellent from a bombing viewpoint and deviations from this basic pattern, while sometimes better from a defensive viewpoint, are thought in the long run to offer less chance for maximum damage to the target.

* See also Annex J, Part IV.

VIII - NAVIGATION REPORT

Mission No. 4

29 July 1944

1. Navigation was highly satisfactory. The principal methods used were dead reckoning and pilotage and one Group used celestial navigation to a much greater extent than did the others. Furthermore, computed winds indicated that the navigators were in general agreement concerning wind direction and velocity. Specific navigators, however, varied widely from the average figures in a number of cases.

2. As a result of the experience gained in day navigation in formation, it is obvious that wing navigators must be prepared to take over in their own behalf or in behalf of their formation at all times. In one case, the disparity between ETA and ATA at base was fifty minutes. This was caused by the navigator not having sufficient confidence in his own work and placing too great a reliance on radio. This aircraft came in 90 miles north of the route and conflicting information received caused further confusion.

3. An important deficiency uncovered by this mission was the inability to use "Q" signals for communicating navigation information within a formation.

4. Another important lesson learned is the fact that except for one Group no extensive use of celestial navigation was made. The fact that celestial navigation was possibly not needed on the mission did not alter the fact that using this method provides better answers and practice in navigation work.

5. Comments by Groups are as follows:

a. 40th Group:

(1) Relatively extensive use of celestial navigation (including some sun-moon fixes) was made.

(2) Use of the True Course on the GFG compass to facilitate follow-the-pilot is suggested.

(3) Average navigation time out was five hours and thirty-five minutes; average navigation time back was five hours and forty minutes.

(4) Average winds and altitudes computed were:

(a) Half-way out: 15000' 224° 17mph.

(b) Target area: 21000' 260° 24mph.

(c) Half-way back: 16000' 251° 22mph.

b. 444th Group:

(1) Navigators were not specific in all cases in reporting chart inaccuracies.

(2) There were several cases of failing to calculate winds aloft.

(3) Average navigation time out was three hours and forty-seven minutes; average navigation time back was four hours and fifteen minutes.

(4) Average winds and altitudes computed were:

(a) Half-way out: 14000' 215° 15 mph.

(b) Target area : 19000' 254° 21 mph.

(c) Half-way back: 16000' 248° 25 mph.

c. 462nd Group:

(1) Use of radar altimeter at all times is recommended.

(2) Average navigation time out was five hours and thirty-four minutes; average navigation time back was five hours and fifty-seven minutes.

(3) Average computed winds and altitudes were:

(a) Half-way out : 16000' 220° 18 mph.

(b) Target area : 22000' 253° 26 mph.

(c) Half-way back : 17000' 241° 22 mph.

d. 468th Group:

(1) Average navigation time out was five hours and twenty-six minutes; average navigation time back was five hours and thirty-three minutes.

(2) Average computed winds were:

(a) Outbound: 230° 15 mph.

(b) Inbound : 241° 20 mph.

ANNEX

C

ENEMY OPPOSITION

I -Enemy Antiaircraft

II -Enemy Aerial Tactics

III-Clock Summary of Attacks and Claims

I - ENEMY ANTIAIRCRAFT

Mission No. 4

29 July 1944

A. Heavy Antiaircraft Fire

1. Anshan (41 08'N - 122 58'E):

a. Accurate to inaccurate and meager to intense heavy antiaircraft fire was reported by approximately 90 per cent of the aircraft over the target. Fire was encountered between 0357Z and 0456Z with altitudes varying from 19,000 to 26,000 feet. The majority of the fire encountered was Predicted Concentration (patterns of 20-30 bursts intermittently over the target area) with probably a small amount of Continuously Pointed.

b. Lone single-engine aircraft were reported on the same course and same altitude, possibly transmitting data to antiaircraft installations.

c. Deviations of bursts and intensity of fire were reported as follows:

Deviations:		Accuracy:	
Above	15 per cent	Struck	3 per cent
Below	32 per cent	Rocked	8 per cent
Level	53 per cent	Missed	89 per cent
Ahead	35 per cent		
Accurate	No reports		
Behind	65 per cent		
		Intensity:	
Left	40 per cent	Meager	44 per cent
Accurate	17 per cent	Moderate	41 per cent
Right	43 per cent	Intense	15 per cent

d. From provisional photo interpretation of strike photographs taken on 29 July 1944, this area is defended by at least twenty heavy antiaircraft guns and possibly more. This number of guns checks with reports of quantity and type of fire encountered.

2. Chinwangtao (39° 55'N - 119°37'E): One aircraft was over the area (10/10 undercast) at approximately 0440Z at an altitude of 20,000 feet, but no heavy antiaircraft fire was reported.

3. Taku (39°00'N - 117°40'E): Sixteen aircraft were over Taku at altitudes of 17,225 to 25,000 feet from 0658Z to 0817Z, but no heavy antiaircraft fire was encountered.

4. Chenghsien (34°43'N - 113°41'E): Four aircraft reported inaccurate and meager heavy antiaircraft fire over the last resort target at altitudes of 20,000 to 22,900 feet. This fire was encountered at three separate times, and each subsequent time had improved in accuracy, which would indicate that the Japanese will make corrections to their fire when given the opportunity.

a. The first fire was encountered at 0211Z at 20,000 feet, and consisted of 10-12 bursts approximately 2000 feet below, 1300 feet ahead, and far to the right. This same aircraft then made a second run over the area and encountered only 3-4 bursts, but in this case more accurate, being 600 feet below and 300 feet to the right.

b. Another aircraft at 22,900 feet at 0643Z next encountered 10 black bursts, now at the correct altitude but behind the aircraft.

5. 10 Miles West of Chenghsien (Tiehlu: 34°46'N - 113 31'E): At 0644Z a B-29 (at that time over Chenghsien) observed heavy antiaircraft fire directed against other two B-29's at Tiehlu.

6. Yellow River Bridge (34°57'N - 113°33'E): Heavy antiaircraft fire was reported as being both "meager and inaccurate" at 0716Z and as "intense and accurate" at 0725Z by two separate aircraft. In the latter case the aircraft was at 13,500 feet, and deviations varied from level to slightly above, bursts coming up from behind and passing the aircraft, indicating Continuously Pointed fire.

7. Darien (38°50'N - 121°45'E): One aircraft at an unstated altitude and time reported moderate heavy antiaircraft fire in this vicinity. It was observed to be behind and level. Continuously Pointed fire is indicated.

8. Yinkow (40°40'N - 122°15'E): One aircraft at 12,000 feet encountered meager and inaccurate heavy antiaircraft fire at 0700Z. Several bursts were seen 500 feet below and to the left of the aircraft.

9. Kaiping (40°25'N - 122°20'E): Three aircraft encountered meager and inaccurate heavy antiaircraft fire at 18,000 feet at 0450Z.

10. Siyangtai (40°01'N - 119°59'E): Two aircraft reported encountering meager and inaccurate heavy antiaircraft fire at 18,500 feet at 0440Z and 0459Z. Deviations were accurate for altitude but behind and to the right.

B. Automatic Weapons Fire Encountered

None.

C. Searchlights Encountered

None (Daylight Mission).

D. Evasive Action

Evasive action generally consisted of a turn and loss of altitude after bombs away at the target areas. At the Yellow River Bridge, violent evasive action was taken, consisting of climbs and dives with the indicated air speed varying from 175 to 230 miles per hour at 0725Z.

E. Damage from Antiaircraft Fire

Minor damage from AA was sustained by five aircraft. All aircraft bombed the primary target (Anshan) at altitudes between 19,000 and 26,000 feet.

F. Blackouts

None (Daylight Mission).

G. Smoke Screens and Barrage Balloons

No smoke screens were reported, although two aircraft reporrted a balloon barrage at Taku consisting of 10 to 30 balloons in an area to the east of the bomb run close to the shore. This could not be confirmed by photographs because of the poor quality of those available.

H. Warning Nets

RCM Observers intercepted enemy radar signals along the route, indicating continuous tracking by the enemy and the existence of a radar warning net in Occupied China. (See RCM Annex for more detailed information.)

II - ENEMY AERIAL TACTICS

Mission No. 4

29 July 1944

1. Japanese fighters intercepted our aircraft during a 32-minute period (0424Z to 0456Z) in the Anshan area and intermittently during 4 hours and 42 minutes (0223Z to 0705Z) in the Chenghsien area. A total of 18 B-29's were attacked by 44 enemy aircraft identified as 15 ZEKES, 13 OSCARS, 9 TOJOS, 5 TONYS, 1 HAMP, and 1 Unidentified. These enemy fighters executed 38 single and coordinated passes and attacks against our aircraft at altitudes varying between 14,300 feet and 24,500 feet. Seventy per cent of the encounters occured in the immediate vicinities of the targets: 59 per cent at Anshan, 11 per cent at Chenghsien, and none at Taku. The remaining 30 per cent of the encounters occured as follows: 3 encounters over Liaotung Bay, 3 at Hsuchang, 3 within 25 miles of Chenghsien, and 4 at other places. Of the 26 attacks in the vicinity of the targets, it is known that one occurred before the bomb run and nine occurred after; sixteen, however, are idenfinite. Consequently, it is not possible to determine the preference of the enemy in executing his interceptions over targets. Although there was a greater number of encounters than in any previous mission, the opposition was again ineffective.

2. One of the three Groups (24 planes) which attacked Anshan sustained 62 per cent of the attacks; 11 B-29's were intercepted. The other two Groups (49 planes) sustained only 38 per cent of the attacks with 5 B-29's intercepted. All of these planes bombed at approximately the same time, with similar formations, and under similar conditions. On the basis of available information this concentration of attacks on one Group appears to be coincidental and not significant as far as enemy tactics are concerned. The fourth Group, delayed approximately 5 hours in take off, was not intercepted at their primary target, Taku, but did encounter four TOJOS at Chenghsien. Only three of these fighters made passes at our aircraft.

3. The position of the B-29 in the formation seems to have been considered by the enemy when executing his attacks. The distribution of attacks against B-29 formations of three or more planes is as follows: Number 1 planes were attacked 4 times, Number 2 planes 10 times, Number 3 planes 9 times, and Number 4 planes 7 times. Thus it is to be noted that the wing planes of 3-plane and 4-plane formations sustained 63 per cent of the attacks while the number 1 and 4 planes sustained 37 percent of the attacks. One of the B-29's in the Number 4 position became a struggler while at the target. The crew of this plane reported 5 attacks, all of which were pressed within 500 yards and 2 of the attackers closed to 35 yards.

4. Jap pilots continued to misjudge the speed of the B-29 as indicated by poorly executed attacks and by the small amount of fire from the intercepters. Enemy fire was definitely seen in only 3 of his 38 attempts. Two of our aircraft sustained minor damage, (one neglibible) as a result of frontal attacks. The B-29's opened fire on the fighters in 26 of the encounters and claim 2 OSCARS and 2 ZEKES damaged while 1 TOJO, 1 HAMP, and 1 TONY are claimed as probably destroyed. One of the damaged OSCARS was fired on by the tail gunner with both the 20-mm. cannon and 50-cal. gun as OSCAR came within 1500 yards from 6:15 o'clock level. This is the first claim in which the use of the cannon has been reported. (For details of a possible combat loss as a result of enemy fighter action, see Annex I).

5. Some of the enemy pilots were aggressive; about one-half of the attempted attacks were pressed to 500 yards or less, with 9 being pressed within 100 yards. The other half terminated between 500 and more than 1000 yards with 9 of them breaking off between 800 and 1000 yards.

6. Attacks and passes originated from around the clock, but the majority came from the right and rear between 2 o'clock and 7 o'clock. Some of the fighters appeared to be attempting frontal attacks which developed into unsuccessful side attacks because of misjudging the speed of the B-29. Most attackers preferred the level and low approaches in contrast to the high approach favored in all previous missions. The direction of all attacks and passes is given in the following tabular summary:

Direction of Attack or Pass	Left Side			Front			Right Side			Rear			Total
	8	9	10	11	12	1	2	3	4	5	6	7	
High		1			1		2	2				1	7
Level	1			3		1	4	4	1	2	3	1	20
Low				1		2	2	1		1	1	3	11
Total	2			8			16			12			38

7. Breakaways were generally low, the majority ending in a dive. Many were initiated with a half-roll or sharp turn, exposing the belly of the fighter just before the dive. A few of the enemy pilots employed the "Split-S" in their breakaway.

8. Four TOJOS relied on the familiar Jap trick in which one fighter performed slow rolls and other aerobatics while the other three made a series of passes at the B-29. A new type of coordinated attack was made by two ZEKES. One came in at 7 o'clock high and the other at 4 o'clock level. As they approached, the B-29 opened fire on the diving ZEKE at 800 yards and on the other at 900 yards. The latter immediately broke away with a roll and a dive, but the ZEKE at 7 o'clock high closed to 500 yards, made a half-roll to the right, and ended with a dive. No fire was observed from either of the enemy aircraft.

9. Explosions expelling white streamers to the sides and below were seen in the air over Hsuchang and near Chenghsien. These explosions were apparently aerial phosphorous bombs released by enemy planes, but their origin was not observed.

10. Summary of Enemy Tactics:

a. Ineffectual attacks resulting in only a small amount of enemy fire.

b. Seventy per cent of the encounters in the immediate vicinity of the targets.

c. Sixty-five per cent of the attacks against wing planes in three-and four-plane formations.

d. Concentration on stragglers.

e. About 50 per cent of the attackers were aggressive.

f. Attacks from all directions with the majority between 2 o'clock and 7 o'clock, level or low.

g. Breakaways generally low, ending in a dive.

h. Use of aerobatics to divert attention.

i. Continued misjudgment of the speed of the B-29

j. One new coordinated attack from 7 o'clock high and 4 o'clock level.

k. Single plane encounters predominated.

l. Limited use of aerial phosphorous bombs.

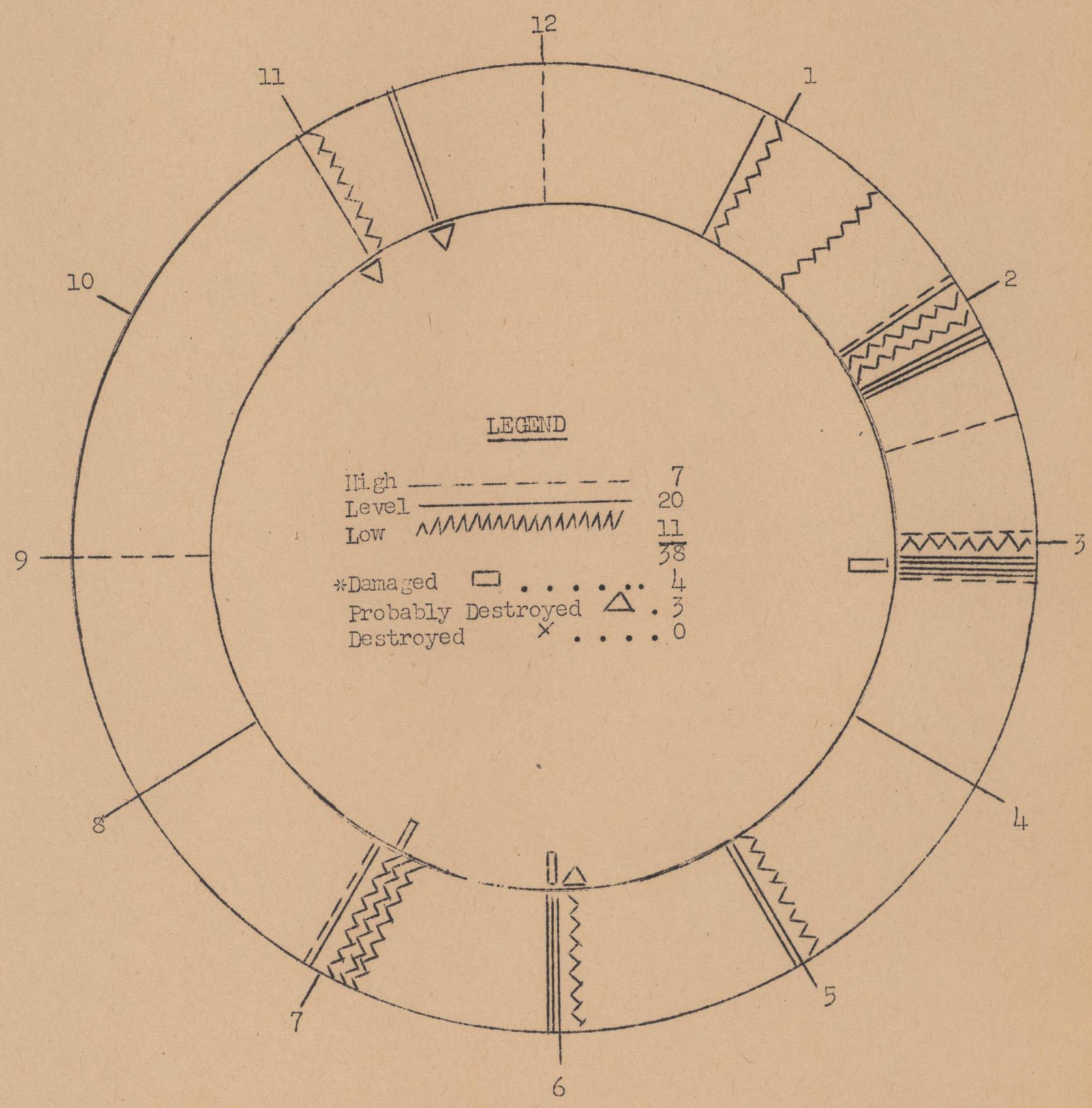
11. Enemy Aircraft Colors and Markings:

	COLOR	AIRCRAFT	DISTINGUISHING MARKINGS
a.	Silver	3 TOJOS	Red Ball insignia on upper side of wing.
		2 TOJOS	One half of tail painted red, red rising sun insignia.
		1 ZEKE	Red ball on left wing.
		2 ZEKES	Red ball insignia on each wing.
		2 ZEKES	Red ball on wings, yellow nose cowling.
		1 TONY	Red ball on wing.
		1 ZEKE	Yellow and green stripe diagonal in front of red ball on fuselage.
		1 Unidentified	Red ball on each wing.
		4 ZEKES	- - - - - - - - - - - - - - - - - - - -
b.	Black	7 TOJOS	Large red disk on belly of fuselage in line with the wings.
		5 OSCARS	- - - - - - - - - - - - - - - - - - - -
		1 TONY	- - - - - - - - - - - - - - - - - - - -
c.	Olive-drab	2 TOJOS	- - - - - - - - - - - - - - - - - - - -
		1 TONY	- - - - - - - - - - - - - - - - - - - -
d.	Olive-drab and Yellow	1 HAMP	Olive-drab fuselage blotched with yellow.
e.	Brown and Grey	1 TONY	Brown wings, grey fuselage.

III - CLOCK SUMMARY OF ATTACKS AND CLAIMS

Mission No. 4

29 July 1944



* One ZEKE claimed damaged, direction of attack unknown

ANNEX

D

WEATHER INFORMATION

I - Weather Information; As Forecast and as Encountered

II - Chart - Weather as Briefed

III - Chart - Weather as Reported by Returning Crews

IV - Synoptic Map as of 0500Z, 29 July 1944

Mission No. 4 I - WEATHER INFORMATION 29 July 1944

	As Forecast (0001 to 2000 Local)	As Encountered
Base Area at Take-off	Scattered thunderstorms in valley, dissipating about 0300, followed by scattered cumulus at 4000 to 5000' at dawn. Cumulus increasing to 4 to 6 tenths by 1000 with little change for remainder of period. Scattered cumulonimbus in valley after noon. Vsby 1 mile at dawn improving by 0900 to more than 5 miles and remaining same except for showers in late afternoon.	5/10 clouds at 2500'. 9/10 clouds at 9 to 10,000 ft. Cirrus overcast. Vsby 2 to 3 miles. Wind calm.
Route Out	HILLS: 3-5/10 layer clouds at 3 to 4000' and 12 to 14,000' with few higher thin clouds at 0500, lower cumulus forming after 0800 at 2-3000' above terrain, becoming 4-6/10 and obscuring peaks after 1100. Vertical development reaching 17,000 - 20,000' in afternoon accompanied by thunderstorms and showers over ridges. Turbulence in clouds with occasional light rime icing above 18,000'. PLAINS TO COAST TO TARGET: Flat fair-weather cumulus and 4-6/10 altocumulus at 10,000 - 12,000' from mountains to 115° E, remainder of route to have 2-3/10 cumulus to target. Cumulus increasing to 2-4/10 by 1000 and 4-6/10 after 1300. Vsby reduced to 1 to 2 miles in ground fog and haze, improving to over 5 miles by 0900. Patches of stratus along coast dissipating by 1000.	BASE TO 114°: 5-8/10 altocumulus at 8000'. 3/10 cirrus at 21,000'. No upper wind data reported. 114° TO GULF OF CHILI: 8/10 cirrus above 20,000'. 7/10 altocumulus, tops 12,000'. Cloud layers merging for 150 miles at 117° E. Light turbulence encountered in clouds and a few reports indicate light rime ice above 18,000'. After 117° E, clouds became 6/10 cumulus, tops at 10,000', with 5/10 altostratus at 17,000', 8/10 cirrus at 25,000 ft.
Target	2-4/10 high clouds 20,000' with lower cumulus 2-4/10 forming by 0930, increasing in amount to 5-7/10 after 1300. Bases at 3-5000'. Tops at 10,000 - 12,000'. Vsby over 5 miles at target.	ANSHAN: 2/10 cirrus at 25,000'. 3/10 altocumulus at 10,000'. Vsby unrestricted. TAKU: 8/10 cirrus at 25,000'. 4/10 altocumulus at 17,000'. Vsby 10 miles.
Route Back	See Route Out.	Conditions similar to route out. Cumulus activity had increased near China Coast and over Hills east of Base Area. Winds aloft: 17,000' - 20,000', 250°, 20 knots.
Base Area on Return	See Base Area at Take-off	3/10 cirrus at 25,000'. 6/10 altostratus at 12,000'. Vsby 7 miles in haze. Wind 345°, 10 mph.

D-1

SECRET

I - WEATHER INFORMATION (Continued)

A. Forecast Winds Aloft

Altitude	Terminal	Midpoint	Target
5000'	180° - 8 K	- - -	- - -
10,000'	210° - 12 K	270° - 18 K	290° - 18 K
15,000'	210° - 15 K	270° - 24 K	280° - 22 K
20,000	- - -	- - -	210° - 25 K

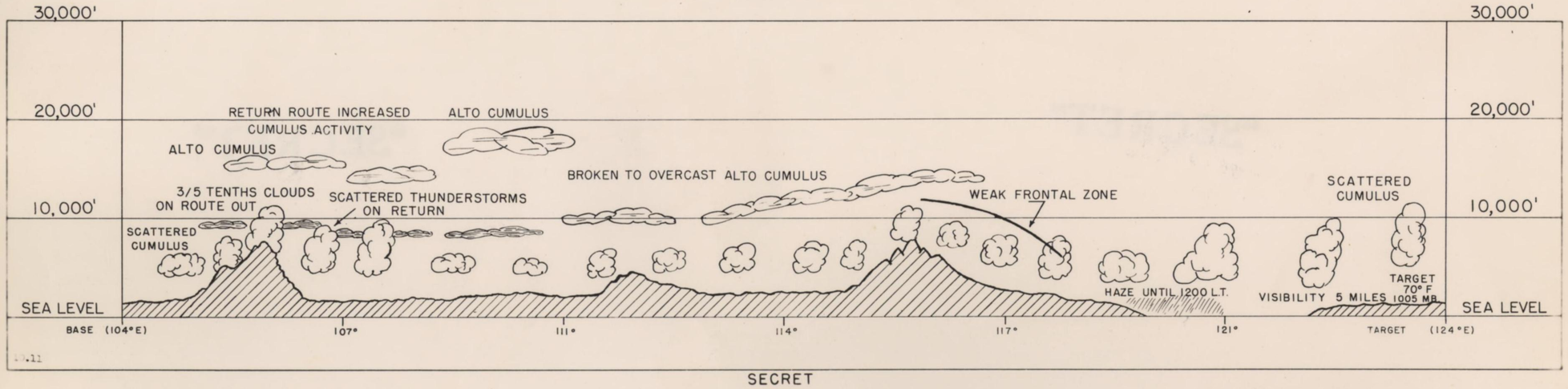
B. Forecast Temperatures Aloft

Altitude	Terminal	Midpoint	Target
5000'	22°	---	9°
10,000	11°	----	0°
16,000	2°	----	-7°
20,000	-5°	----	-11°
24,000	-	----	-18°

SECRET

WEATHER AS BRIEFED

MISSION NO. 4
29 JULY 1944



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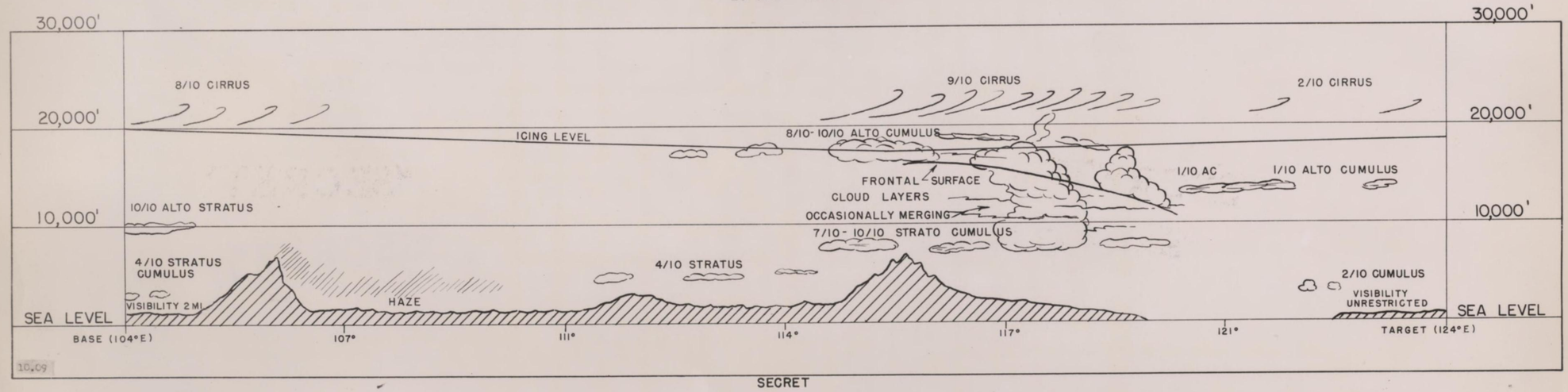
WEATHER AS REPORTED BY RETURNING CREWS — ROUTE OUT

MISSION NO. 4
29 JULY 1944



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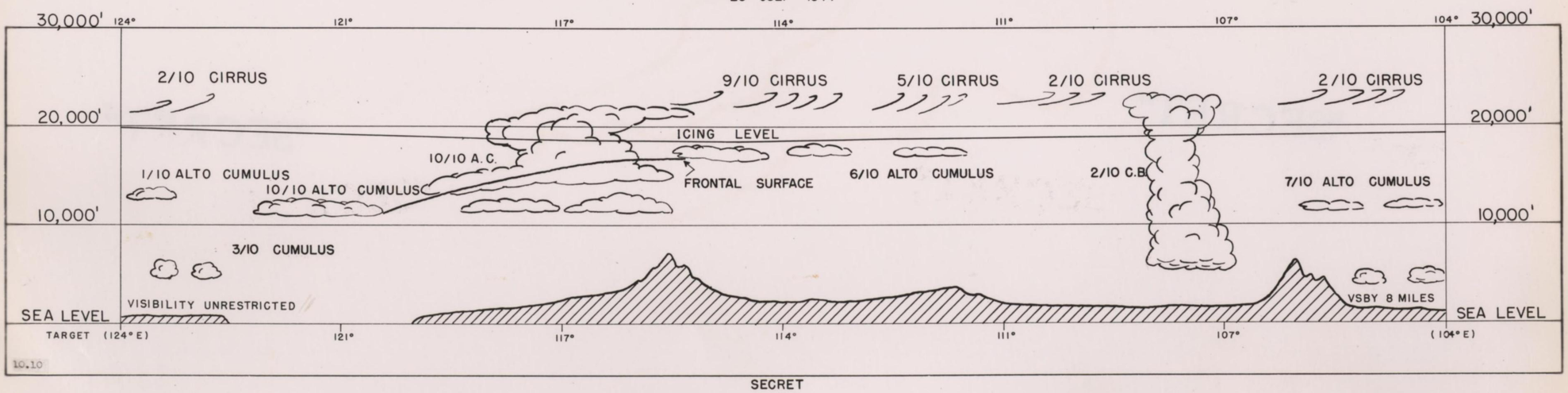
WEATHER AS REPORTED BY RETURNING CREWS —— ROUTE BACK

MISSION NO. 4
29 JULY 1944



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No. 5555

WESTERN NORTH PACIFIC OCEAN—METEOROLOGICAL PLOTTING CHART—U.S. NAVY

SECRET

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ALASKA
BERING SEA
JAPAN
YELLOW SEA
PACIFIC OCEAN
INDIAN OCEAN
CELEBES SEA
BANDA SEA

XX BOMBER COMMAND
MISSION NO. 4
SYNOPTIC MAP
AS OF 29 JULY
0500Z

STATION
DATE
TIME

SECRET

No. 5555

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ANNEX

E

COMMUNICATIONS INFORMATION

I - General Information

II - Functioning of Aircraft Control Center

~~S E C R E T~~

I - GENERAL INFORMATION

Mission No. 4

29 July 1944

A. Air-Ground Communications

Air-Ground communication was generally excellent. Some interference, due to local storms, was encountered on 5530 and 8280 kilocycles, with the lower frequency the worse of the two. However, once the local area was passed, clear reception was the rule. By changing from one frequency to the other when static was present, a relatively clear channel was available at all times.

B. Navigational Aids

Navigational aids most used were the D/F facilities and Homing Beacon. The radio range at two of the Forward Area bases was also used and operation was reported as satisfactory. During previous missions, much congestion in traffic due to numerous D/F requests was encountered. Such congestion did not occur on this mission.

C. Point-toPoint Communications

Point-to-point communication was maintained between the forward and rear areas and no unusual circumstances were encountered. The radio teletype circuit to WAR functioned satisfactorily.

D. Radio Discipline

Radio discipline was satisfactory. Complete radio silence was maintained on the flight to the target. Upon approaching the local control area, however, the fact that flights had become separated led to numerous individual "check in" reports to the Aircraft Control Center. As a result, several instances of "break in" on transmissions of other aircraft were logged.

E. Air-to-Air Communication

Air-to-air communication was excellent with no reports being received of interference on voice channels used or of malfunctions of equipment.

F. Enemy Radio Activity

Enemy radio activity was encountered on both 5530 and 8280 kilocycles in the form of meaningless code transmissions; call signs could not be identified. One group logged a station sending V's and the call sign "WAR" on 5530 kilocycles. No apparent "noise" or "harsh" transmissions by the enemy were reported.

G. "Bombs Away" Messages

"Bombs Away" messages consisted of a code name assigned aircraft of each of the four groups engaged in the mission. All such messages were received by the ground station at Hsinching.

~~S E C R E T~~

H. Signal Security

Signal security was excellent with but one minor discrepancy being logged. In this instance, an aircraft called the ground station on CW and asked, in the clear, if Sugar Queen (Hsinching) was open. The ground station's affirmative reply was also in the clear. GSP 1270 was used to encode all messages not especially assigned code words, and the authentication system contained in that document was used in all air-ground communications.

~~S E C R E T~~

II - FUNCTIONING OF AIRCRAFT CONTROL CENTER

Mission No. 4

29 July 1944

A. Analysis of ACC Log

1. 40th Group:

a. 4 A/C failed to send "bombs away" messages as directed, and 1 A/C sent a "bombs away" message when not supposed to.

b. 4 A/C failed to make requested position reports.

c. 3 A/C requested bearings as follows:

No.	Time	Bearings	Landed
301	0943Z	195	1006Z
322	0846Z	240	0948Z
305	0937Z	290	1033Z

2. 444th Group:

a. 4 A/C failed to send "bombs away" messages as directed, and 1 A/C sent a "bombs away" message when not supposed to.

b. 6 A/C failed to make required position reports.

c. 3 A/C requested bearings as follows:

No.	Time	Bearings	Landed
472	1227Z	210	
	1240Z	220	
	1254Z	275	
	1322Z	300	1338Z
420	1058Z	230	1212Z
300	1251Z	225	
	1339Z	335	
	1342Z	335	
	1404Z	340	
	1425Z	280	
	1432Z	280	1511Z

3. 462nd Group:

a. 2 A/C failed to send "bombs away" messages as directed.

b. 4 A/C failed to make required position reports.

c. 6 A/C requested bearings as follows:

No.	Time	Bearings	Landed
827	0832Z	225	
	0920Z	255	
	0941Z	255	1000Z

~~S E C R E T~~

No.	Time	Bearings	Landed
223	0830Z	220	
	0925Z	225	
	0927Z	295	
	1015Z	295	1035Z
270	0859Z	205	
	0902Z	225	1033Z
346	1010Z	290	1053Z
332	1015Z	290	1030Z
243	0911Z	285	
	0932Z	290	
	1004Z	210	1041Z

d. Discrepancies between ETA and ATA:

No.	Message Sent	ETA	ATA
360	0345Z	0500Z	0515Z
444	0059Z	0130Z	0211Z

4. 468th Group:

a. 1 A/C failed to send "bombs away" messages as directed.

b. All A/C rendered the required position reports.

c. 4 A/C requested bearings as follows:

No.	Time	Bearings	Landed
353	0915Z	225	0959Z
390	0847Z	225	0940Z
253	0940Z	260	1028Z
354	0935Z	205	
	0953Z	205	
	1027	220	1049Z

d. A/C 284 sent a message at 0400Z giving ETA as 0511Z. It actually landed at 0530Z.

B. General Comments

1. Several aircraft used an incorrect tactical call sign in sending messages to the Control Center. As a result it has been recommended that the radio operator be required to have at his position at all times a card containing the serial number call sign and the tactical call sign of his aircraft.

2. Take-off and landing reports rendered by the Group Operations Officers to the ACC were excellent.

3. The Controller observed one returning aircraft drop a flare and telephoned the Control Tower for information. The Tower, however, had not seen the flare and was unable to give any information regarding the aircraft. As a result, Control Tower operators have been cautioned to be on the lookout for flares and blinking lights.

ANNEX

F

RADAR AND RCM

I - Radar Information

II - RCM Activity

I - RADAR INFORMATION

Mission No. 4

29 July 1944

A. Radar Summary of the Mission

No aircraft on this mission bombed by Radar; therefore its principal use was as a navigational aid. The I.P. was identified by 52 Radar Operators at an average distance of 22 nautical miles, and other radar check points were used for fixes on the mission. Excellent experience in tracking a radar target was obtained by 41 Radar Operators, but considerable difficulty was encountered by others due to camera operating requirements and the transfer of fuel, necessitating the equipment being turned off just at the critical period near the I. P. and near the start of the bomb run. The serviceability of the radar set was much lower than on any other mission with 22 sets out over the various targets, due mainly to altitude-induced troubles. Reduced range was also reported on a number of other sets. The level of operator efficiency did not show noticeable improvement, but this may be ascribed to the fact that new operators were sent on this daylight mission to obtain experience.

B. Radar Navigation and Bombing Checks

1. As a result of the excellent weather conditions, CAVU almost throughout, radar navigation was not needed or employed to any great extent, except in the 444th Group on the late return trip. However, radar was used for locating the I. P. and target at ranges beyond optical limits.

2. Radar Operators (at least 20) experienced considerable difficulty in picking up and identifying the excellent radar signal from the steel works. Some of these failures to identify the target at ranges greater than 12 miles may be ascribed to the inexperience of the Radar Operators, some of whom were on their second flight with the APQ-13 set (their first combat flight). There was also considerable reduction in range due to the higher altitudes at which most planes attacked. On only 40 out of 59 aircraft with usable radar sets did the operator report he was ready to take over for a radar run if called upon; one of the Groups was particularly delinquent in this respect with only 4 Radar Operators ready to take over out of 10 possible.

C. Radar-Scope Photography

C-3 Radar-Scope cameras were installed on a total of 19 aircraft, but only 16 were airborne. Of these, 4 were early returns, 2 are missing, and 3 reported reception too weak for photography. Pictures and negatives were received from 4 of the remaining 7 airplanes. Aircraft #288 of the 40th Group, a special photographic reconnaissance airplane, returned with many excellent photographs, one set of which is furnished with this report.

D. Radar Serviceability

The record of serviceability on this attack was considerably lower than in the past. This was caused directly in 11 cases by the higher altitudes at which most aircraft flew. Another major source of trouble was the failure of the inverter power supply on at least 6 aircraft. Tilt motors and gear failures also caused frequent trouble. The Group Radar Officers also report several minor faults repaired and 2 major faults replaced (an inverter and a low voltage rectifier) in flight.

E. Auxiliary Equipment

The auxiliary radar sets SCR-695 (IFF) and SCR-729 (Interrogator Responser) had no failures reported. All crews were instructed not to use the SCR-718 (Altimeter). A few violations of this instruction were reported. The SCR-729 was used to advantage on several planes for homing on the YJ beacons and ranges up to 80 miles were reported.

I - RADAR INFORMATION (Continued)

Table I - Radar Operator Efficiency

	40th		444th		462nd		468th		Total	
	No.	% to total	No.	% to total	No.	% to total	No.	% to total	No.	% to total
No. A/C airborne	24		24		21		27		96	
No. Operators reporting	23	100	23	100	16	100	26	100	88	100
No. using Azimuth Stabilization	10	43	9	39	5	31	17	65	41	47
No. using Sector Scan	5	22	12	52	1	6	16	62	34	39
No. obtaining radar ground speed and drift	3	13	13	57	5	31	12	46	33	38
No. following Bomb Run	13	57	10	43	4	25	14	54	41	47
No. Identifying Target	11	48	12	52	7	44	15	58	45	51

Table II - Radar Cameras

	40th	444th	462nd	468th	Total
A/C with scope camera installed	4	4	6	4	18
A/C airborne with cameras	4	3	5	4	16
A/C delivering scope pictures	3	1	2	1	7
A/C producing usable pictures	1	1	2	0	4

Table III - AN/APQ - 13 Radar Serviceability

	40th		444th		462nd		468th		Total	
	No.	% to total	No.	% to total	No.	% to total	No.	% to total	No.	% to total
No. A/C airborne	24		24		21		27		96	
No. A/C reporting	23	100	23	100	16	100	26	100	88	100
No. sets serviceable at take-off	22	96	22	96	16	100	26	100	86	98
No. sets serviceable over target.	19	83	15	65	10	63	17	65	61	69
Pressurization failures	1	4	2	9	1	6	7	27	11	13
Inverter failures	-	-	1	4	3	19	1	4	5	6

AAF TARGET CHART CHINA NO. 26

U. S
Equals

AIRCRAFT NO 288 – MISSION NO 4

9 INDICATES POSITION & DIRECTION OF FLIGHT WHEN PICTURE NO 9 WAS TAKEN.

I-YÜAN-K'OU
SHIH-MEN-CHAI
coal mine
LIU-K'OU
narrow gauge railroad
The Great Wall of China
CHIU-MEN
Shih Ho (River)
Round Top Fort
LIN-YU
(SHANHAIKWAN)
Temple Head
Shoal Point
HAI-YANG
pumping station
pipe line
abandoned railroad
CH'IN-HUANG-TAO
(CHINWANGTAO)
power house
PAI-T'A
TS'AI-KO-CHUANG
PEI-TAI-HO
Rocky Point
PEI-TOL-HO (RIVER)

GULF OF CHIHLI

DASHED OUTLINE IN BLACK INDICATES AREA COVERED BY RECOGNITION CHART ON THE REVERSE SIDE.

THIS CHART IS PREPARED FOR USE IN DAYLIGHT, UNDER WHITE, ULTRA-VIOLET, RED, AND AMBER LIGHT.

COMPASS ROSE INDICATES MAGNETIC BEARING TOWARD THE TARGET

SUPPLEMENTING THIS CHART IS A SET OF PERSPECTIVES CONSTRUCTED ON THE FOLLOWING HEADINGS: 37°, 110°, 180°, 245°, 330°.

LEGEND

- Primary Highways
- Secondary Highways
- Single Track Railroad
- Double Track Railroad
- Electric Railroad
- Power Lines

Elevations in Feet

10′ Center Target Elevation
4175′ Highest Known Elevation

Polyconic Projection — Scale 1:180,000

OFFICE OF THE ASSISTANT CHIEF OF AIR STAFF, INTELLIGENCE WASHINGTON, D. C.

…IS SIDE OF THIS CHART …IS CENTERED. OTHER …ADIUS ARE SHOWN ON …SE SIDE AND MAY BE …EFERENCE TO DETAIL …E CENTER TARGET AS

…NUMBERED FROM ONE …E NUMBERS ARE COM… …OBJECTIVE AREA, AND …RITISH PACIFIC ISLANDS …ET 5, BRITISH PACIFIC …O RELATION TO LOCA… …OF TARGETS.

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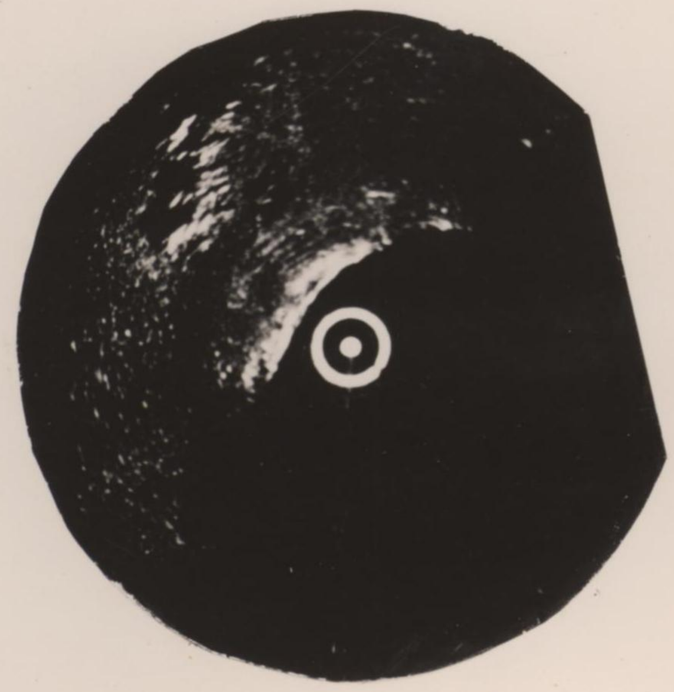
AAF TC CHIN.

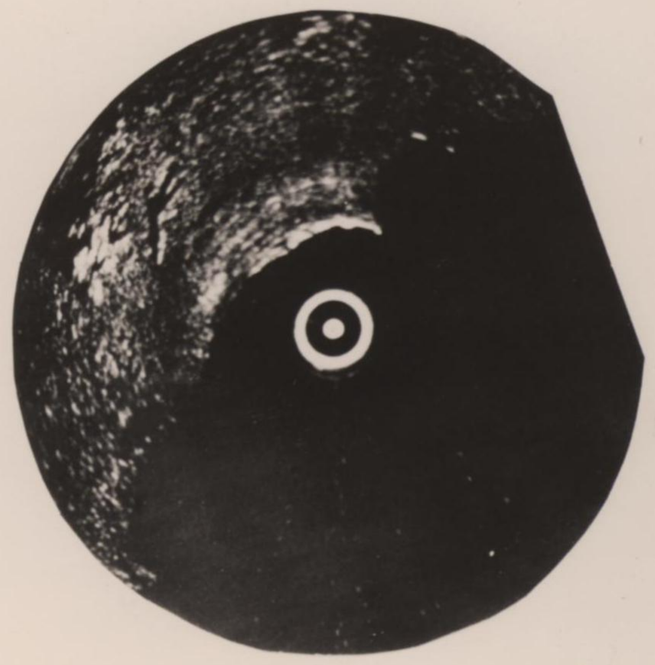
SECRET

RADAR SCOPE PHOTOGRAPHS
CHIN WANG TAO HARBOR AREA
A/C # 288 PHOTO RECONNAISSANCE

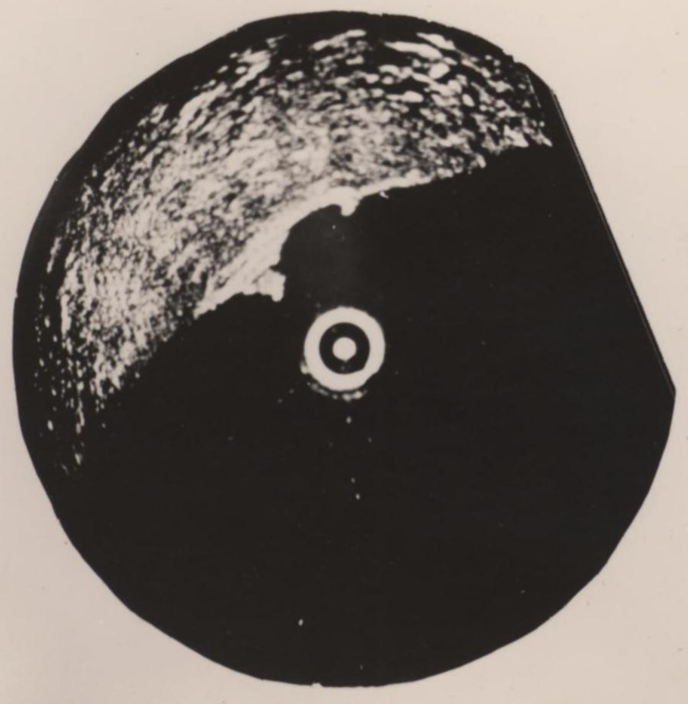


7 8

20 MILE SWEEP
CHIN WANG TAO HARBOR
APPEARING 17 MILES AT 2 O'CLOCK

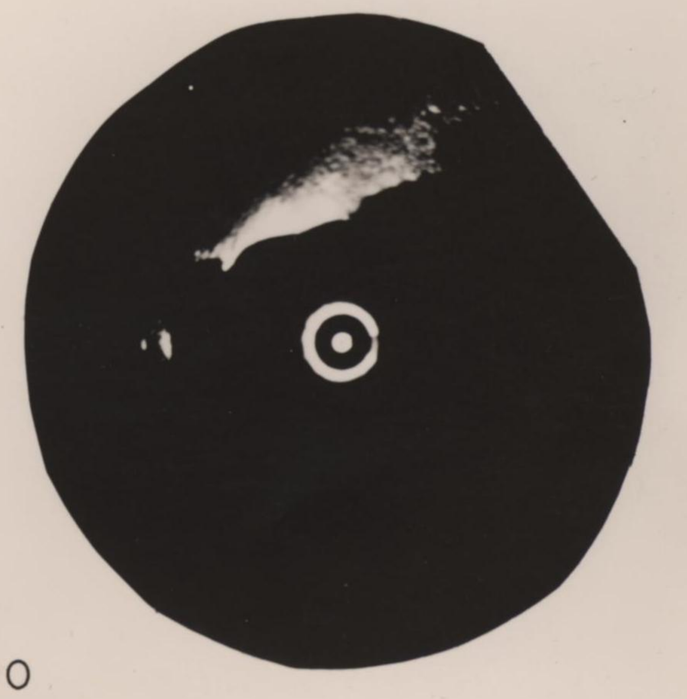


20 MILE SWEEP
HEADING 69°
ROCKY POINT 7 MILES AT 1 O'CLOCK

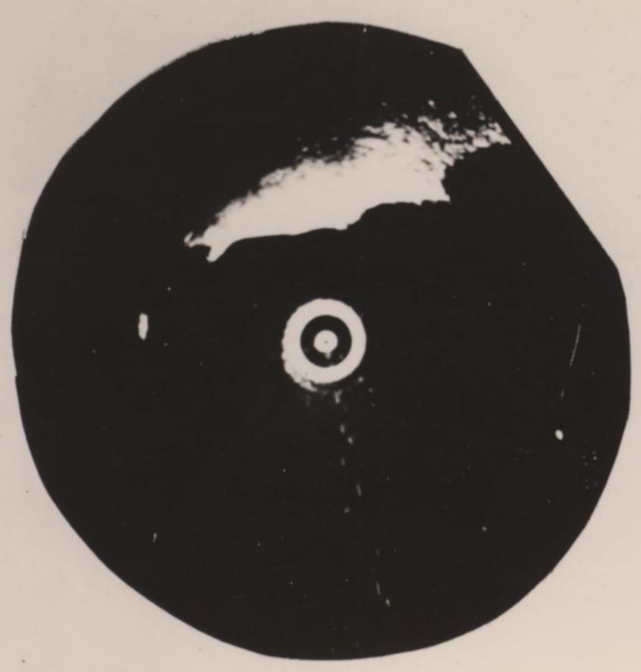


9 10

20 MILE SWEEP
CHIN WANG TAO HARBOR
8 MILES AT 12 O'CLOCK



20 MILE SWEEP
PLANE BANKING, SHOAL POINT AT 12 O'CLOCK
ROCKY POINT AT 9 O'CLOCK



11 12

20 MILE SWEEP
PLANE STILL BANKING
HARBOR 9 MILES AT 10 O'CLOCK

20 MILE SWEEP
PLANE STILL BANKING
TEMPLE POINT 10 MILES AT 1 O'CLOCK

9.84

SECRET

II - RCM ACTIVITY

Mission No. 4

29 July 1944

A. General

1. As in previous missions, RCM activities were confined to searching for enemy radar signals from take-off to target and return.

2. The search was divided among frequency ranges as follows:

1000-3300 mc. - one observer
300-1000 mc. - three observers
140-300 mc. - four observers
70-110 mc. - two observers

3. Fourteen RCM-equipped aircraft were scheduled to take-off. Of these, four did not participate in the mission because of mechanical failure preventing take-off or causing early return.

B. Results

1. No interceptions were made of enemy radar signals in the 1000 to 3300 or in the 300 to 1000 mc. ranges.

2. One signal at 178 mc. (320 and 870 pulse repetition frequency and 7.2 and 9.6 microseconds) was intercepted at 35°00'N - 110°30'E near the battle line. Several other signals in the 140-300 mc. range were intercepted, but doubt exists concerning their validity.

3. Initial use of the D/F antennas in the 75-mc. band resulted in the inconclusive location of two enemy radar stations. The interceptions of the cuts were too widely scattered for pin-pointing the transmitters. Additional experience with the D/F antenna is needed and is being currently acquired by the RCM observers.

4. There was no evidence of radar-controlled antiaircraft fire.

C. Interceptions Made

1. 1000-3300 mc. range: None

2. 300-1000 mc. range : None

3. 140-300 mc. range :

a. Two signals intercepted at this range are believed to have been harmonics of 70-72 mc. signals.

b. Two signals, intercepted near Taku (one at 147 mc. and one at 258 mc.) "appeared (in the AN/APA-6) as a sine wave rather than a square wave" and "also caused the trace to rise to the top of the scope occasionally ---" This indicates the presence of a possible type of C.W. jamming.

c. One signal at 178 mc. (320 and 870 PRF and 7.2 and 9.6 microseconds pulse length) was intercepted at 35°00'N - 110°30'E.

4. 70-110 mc. range:

a. Two aircraft with D/F antennas searched the 75 and 100 megacycles bands. However, due principally to the inexperience of the observers, it was impossible to pin-point any of the transmitters. Rough indications of enemy radar transmitters were obtained, however, by one observer near Fuchow (39°45'N - 121°45'E) and somewhere in the vicinity between Hsuchang (34°00'N - 113°40'E) and Kaifeng (34°45'N - 114°25'E).

b. Enemy radar stations in the 75 megacycle band were logged to and from the target. Concentrated searching of the 75-mc. band precluded securing information on signals in the 100-mc. band.

D. Equipment Troubles in Flight

1. One AN/APA-6 failed to trigger after five hours operation, and a spare set was substituted.

2. One Jackson Oscillator functioned erratically after several hours operation. Here again a spare was substituted.

3. Two Jackson Oscillators would not oscillate in the 20-200 cycle range.

4. One Hewlett-Packard Oscillator blew a fuse.

5. One observer reported hand-capacitance effect, making the Hewlett-Packard Oscillator difficult to use.

6. D/F Antennas: Intermittent open appeared in circuit between non-directional antenna and R.F. switch.

ANNEX

G

CENTRAL STATION FIRE CONTROL

CENTRAL STATION FIRE CONTROL

Mission No. 4

29 July 1944

1. The functioning of the Central Station Fire Control System on this mission was satisfactory. This conclusion is based not on the number of enemy aircraft destroyed or damaged but on the functioning of the equipment used. For example, the number of turrets and guns tested in the air on this mission was far in excess of any mission previously flown.

2. The gunners had ample time in which to check, adjust, repair, or replace defective parts in the Central Station Fire Control System before the mission was actually flown. This time element is extremely important since insufficient time spent in making harmonization or computer checks may result in subsequent inaccurate fire of the guns.

3. There were a total of 960 50-cal. machine guns and 96 20-mm. cannons on the mission. Of these 805 50-cal. machine guns and 71 20-mm cannons were tested in the air. There were 24 50-cal. machine gun malfunctions and 4 20-mm. cannon malfunctions. Out of the total of 480 turrets, there were 20 malfunctions.

4. A total of 25,130 rounds of ammunition was expended, of which 23,900 rounds were fired testing the guns and 1,230 rounds fired at enemy aircraft.

5. There were only a few coordinated attacks reported. Hence the ability of the gunners cannot be judged from the results of this mission. All of the gunners, however, are gaining experience in the handling of the CSFC equipment and in recognition of enemy aircraft.

ANNEX

H

CAMERAS AND PHOTOGRAPHS

CAMERAS AND PHOTOGRAPHS

Mission No. 4

29 July 1944

A. Combat Aircraft

1. 40th Group:

	K-17b	K-18	K-19	K-20	C-3
Cameras installed	8	6	-	28	4
Cameras taking photographs	6	4	-	21	3
Usable negatives	37	61	-	26	70

Note: a. One K-17b failed to take photos as a result of faulty camera doors.

2. 444th Group

K-17b	K-18	K-19	K-20	C-3
5	3	-	12	4
3	3	-	3	1
46	40	-	none	24

Note: a. Nine K-20 cameras were not used at all by the operators.

3. 462nd Group:

	K-17b	K-18	K-19*	K-20	C-3
Cameras installed	3	5	6	21	6
Cameras taking photographs	2	5	3	13	2
Usable negatives	none	65	34	**	35

* Night cameras used for day photography.
** Not available.

Notes: a. One K-17b failed to function as a result of a magazine failure. No negatives were obtained since light conditions caused under-exposure.

b. The results on K-18 cameras are not as good as expected as a result of insufficient vacuum on two cameras and the blowing shut of the camera doors on another.

c. One C-3 failed to take pictures as a result of a radar failure.

4. 468th Group

K-17b	K-18	K-19	K-20	C-3
7	5	-	19	4
5	4	-	14	1
28	94	-	350	10

Notes: a. Two K-17b cameras failed to obtain pictures as a resul of bombardiers failure to turn on camera master switch. Some unusable negatives from this camera resulted fro insufficient vacuum

b. Two K-20 cameras in A/C completing mission were not operated.

c. Three out of four C-3 cameras were no used by operators.

5. Total:

	K-17b	K-18	K-19	K-20	C-3	Total
Cameras installed	23	19	6	80	18	146
Cameras taking photographs	16	16	3	51	7	93
Usable Negatives	111	260	34	376	139	920

B. Photo Reconnaissance Aircraft

1. Cameras used in the single aircraft assigned a photo-reconnaissance mission were two split-vertical K-18 cameras, two split vertical K-22 cameras, and three Tri-met K-17b cameras.

2. All cameras functioned over the photographic targets with the exception of one K-18 which, after fifteen exposures, sheared the taper pin in the case drive.

3. The only usable negatives were made by the K-18 cameras. There was too much vibration of the K-22, and the Tri-met was rendered unusable because of clouds.

ANNEX

I

BATTLE LOSSES AND BATTLE DAMAGE

BATTLE LOSSES AND BATTLE DAMAGE

Mission No. 4

29 July 1944

A. Battle Losses

There was only one loss in which enemy action can be considered a contributing cause. Aircraft 274 (468th Group) developed trouble with #2 engine 40 miles south of last resort target at Chenghsien. It then proceeded to this target where enemy antiaircraft caused some damage. At the same time, this aircraft was attacked by 5 enemy fighters - 3 TONYS, 1 TOJO, and 1 P-40 with CACW insignia. Considerable additional damage was inflicted by these aircraft, causing the eventual failure of #3 and #4 engines and resulting in the abandonment of the B-29. The aircraft crashed in Occupied China, but eight crew members, one of whom was wounded, have returned safely.

B. Battle Damage

Battle damage from both enemy antiaircraft and enemy fighters was negligible. Damage summary is as follows:

a. Enemy Antiaircraft (5):

(1) A/C 474 (462nd): Small hole in left side of stabilizer.

(2) A/C 408 (468th): 5-inch rip in rudder.

(3) A/C 397 (468th): Small hole in right side of stabilizer.

(4) A/C 253 (468th): 4 small holes in nose-wheel door.

(5) A/C 272 (468th): 3-inch cut in propeller.

b. Enemy Aircraft (2):

(1) A/C 466 (40th): Minor damage including a ruptured hydraulic line and a punctured fuel tank.

(2) A/C 344 (40th): Minor damage including several small bullet holes.

ANNEX

J

FUNCTIONING OF EQUIPMENT

I - Summary of Mechanical Failures

II - Details of Mechanical Failures

III - Malfunctions of Equipment - Engineering

IV - Fuel Consumption Data

I - SUMMARY OF MECHANICAL FAILURES

Mission No. 4

29 July 1944

Aircraft involved in movement	132
Failed to take off for forward area or on mission	24
Returned to bases - movement to forward area	11*
Crashed en route to forward area	1
Failed to drop entire bomb load or no bombs at all on PT.	8
Bombed secondary target	1
Bombed last resort target	3
Bombed target of opportunity	4
Jettisoned bombs	5
Brought bombs back	3
Ttoal A/C experiencing major mechanical difficulty	60

* Excluding 7 aircraft assigned to take off twice as result of turning back on initial attempt in the Rear Area, this total becomes 124. Seven of eleven that returned to rear bases, therefore, were subsequently airborne and landed at the Forward Area.

II - DETAILS OF MECHANICAL FAILURES

Mission No. 4

29 July 1944

1. A/C assigned to take off to Forward Area 131
(excluding A/C assigned to take off twice as a result of turning back on initial attempt, this total becomes 124)

2. Less A/C failing to take off for mechanical reasons..... 13

3. A/C airborne to forward area 118
(Excluding A/C becoming airborne twice as a result of turning back on initial attempt, this total becomes 111)

4. Less A/C returning to bases..... 11

* a. A/C 276 (40th): Gas line separation on #1 engine.

* b. A/C 306 (40th): Loss of all oil in #1 engine.

c. A/C 280 (444th): Faulty engine.

* d. A/C 452 (444th): Loss of power in #1 engine.

* e. A/C 330 (444th): Landing gear malfunction.

* f. A/C 286 (444th): Engine failure.

g. A/C 202 (444th): Not specified.

* h. A/C 285 (462nd): Oil leak #4 engine.

i. A/C 299 (462nd): Engine trouble.

j. A/C 209 (462nd): Failure of #3 engine.

* k. A/C 390 (468th): Failure of #3 engine.

(A/C marked * were subsequently airborne again and reached Forward Area.)

5. Less A/C crashing en route to Forward Area (A/C 291, 40th Group which crashed near Midnapore shortly after take-off)..... 1

6. A/C landing in Forward Area 106

7. Plus A/C already in Forward Area..... 1

8. Total A/C on hand for mission 107

9. Less A/C failing to take off for mission 11

II - DETAILS OF MECHANICAL FAILURES (Continued)

a. A/C 268 (40th) : Failure #3 engine (cylinder).

b. A/C 269 (40th) : Oil leak #2 engine and ignition trouble.

c. A/C 452 (40th) : Leaking carburetors in all 4 engines.

d. A/C 234 (444th): Bogged down in mud.

e. A/C 315 (444th): Engine trouble (cylinder).

f. A/C 353 (444th): Engine trouble (fouled plugs).

g. A/C 3360(444th): Engine trouble.

h. A/C 305 (462nd): #2 engine failure (exhaust stack).

i. A/C 830 (462nd): Bogged down in mud.

j. A/C 362 (468th): Engine trouble (magnetos cutting out on two engines).

k. A/C 487 (468th): Not scheduled to participate in mission.

10. A/C airborne on mission 96

11. Less A/C over PT and dropping only a portion of bombs or failing to bomb for mechanical reasons (not included in total deductions) 8

a. A/C 294 (40th): 4 on PT, 4 on LRT -rack malfunction.

b. A/C 301 (40th): 4 on Pt, 4 jettisoned - rack malfunction.

c. A/C 466 (40th): Over Pt, ST, and TT but dropped no bombs and finally jettisoned - rack malfunction.

d. A/C 452 (444th): 6 on PT, 2 brought back -release malfunction.

e. A/C 420 (444th): 5 on PT, 3 brought back -release malfunction.

f. A/C 228 (444th): 6 on PT, 2 brought back -release malfunction.

g. A/C 300 (444th): 1 on PT, 7 on opportunity - rack malfunction.

h. A/C 270 (462nd): 4 on PT, 4 on LRT - rack malfunction.

12. Less A/C over PT and dropping only a portion of bombs or failing to bomb for personnel reasons (not included in total deductions) 2

II - DETAILS OF MECHANICAL FAILURES (Continued)

a. A/C 356 (468th): Dropped all 8 bombs outside target area.

b. A/C 442 (468th): Dropped 4 with A/C 356 and 4 on PT.

13. Less A/C failing to reach PT for mechanical reasons .. 16

a. Bombed secondary target: A/C 312 (462nd) - engine failure and fuel shortage.

b. Bombed last resort target:

(1) A/C 348 (40th): Loss of oil in #3 engine.

(2) A/C 212 (444th): Engine trouble (swallowed valve): 4 bombs returned as result of release malfunction.

(3) A/C 284 (468th): Failure of fuel-transfer system and excessive loss of oil from #3 engine.

c. Bombed targets of opportunity:

(1) A/C 237 (40th): Oil leak #3 engine and blown cylinder.

(2) A/C 6360 (462nd): Blown stack #1 engine and voltage regulator blown out.

(3) A/C 287 (462nd): Fuel booster pump failure.

(4) A/C 359 (462nd): Unable to attain altitude.

d. Jettisoned bombs:

(1) A/C 351 (40th): Crashed shortly after take-off as result of initial loss of #4 engine followed by loss of #3 in landing attempt.

(2) A/C 286 (444th): #2 engine failure.

(3) A/C 320 (444th): Fuel leak in bomb-bay tank.

(4) A/C 444 (462nd): Excessive oil leak.

(5) A/C 274 (468th): Initial loss of #2 engine followed by cutting out of #3 and #4 engines as a result of enemy action.

e. Brought bombs back:

(1) A/C 321 (444th): Engine cut out at 2000 rpm.

(2) A/C 330 (444th): Broken exhaust stack bracket.

(3) A/C 273 (462nd): Instrument failure and #2 engine out.

14. Less A/C failing to bomb PT for personnel reasons 3

II - DETAILS OF MECHANICAL FAILURES (Continued)

15. Aircraft over Primary Targets 77*

* For details of A/C bombing Primary and other targets, see Exhibit B, Part VI.

III - MALFUNCTIONS OF EQUIPMENT - ENGINEERING

Tachometer Inoperative	18	Exhaust stack trouble	4
Engine oil leaks	16	Pilot's flight indicator inoperative	3
Generator inoperative	10	Prop dome leak	2
Cylinder head temperature guage out	9	Turbo out	2
Oil pressure low	8	Navigator's airspeed indicator inoperative	1
Fuel pressure high	7	Pilot's bank and turn indicator out	1
C.A.T. guages out	4	Nacelle doors stuck open	1
Fuel transfer pump inoperative	4	D.C. voltmeter out	1

IV - FUEL CONSUMPTION DATA

Mission No. 4

29 July 1944

A. Gallons of Fuel Consumed - Anshan

Fuel Consumed (gals.)	# A/C*	% to total
5400 - 5760	20	34.5
5761 - 6045	16	27.6
6046 - 6365	8	13.8
6366 - 6720	10	17.2
6721 - 7050	4	6.9

* 3 A/C not reporting

B. Fuel Burned in Relation to Formation Position - Anshan

	Over-all Averages			A/C bombing above 24,000'			Pre-flight Calculation	
	All	Lead	Wing	All	Lead	Wing	Lead	Wing
Total Flight Time	11:23	11:34	11:18	11:23	-	-	11:24	11:24
Time to Target	5:38	-	-	-	-	-	5:48	-
Fuel Burned*	6040	5960	6055	5950	5975	5940	5500	6045
Gals. per Air Mile	2.06	2.03	2.07	2.04	2.06	2.04	2.03	2.23
Air Miles	2927	2937	2923	2910	2900	2915	-	-
Ground Miles	2770	2782	2763	2762	-	-	2705	2705

* For A/C bombing from 24,000 feet and above, the smallest amount of fuel burned was 5530 gallons, the greatest 7050.

C. Conclusions

1. The most unexpected development resulting from this mission was the small difference in fuel consumption between formation leaders and wingmen. In some cases, wingmen actually burned less gasoline than the leaders. However, despite the small difference in fuel consumed between aircraft in formation, it is not felt that the 10 per cent formation allowance factor can be eliminated.

2. It is also to be noted that average fuel consumption of aircraft bombing at 24,000 feet and above was less than the average of aircraft bombing at lower altitudes. The explanation is believed to be that many of the aircraft unable to reach 24,000 feet were also aircraft that burn an excessive amount of fuel (the so-called "coal burners").

ANNEX

K

TARGET DAMAGE ASSESSMENT

I - Damage Assessment Report No. 3

A Annotated Print

B Analysis of Coke Oven Vulnerability and Importance

C Bomb Plot

D Plan of Showa Steel Works

II - Provisional Damage Assessment Report No. 3

III - Photographic Supplement to Provisional D. A. Report No. 3

IV - Provisional Damage Assessment Report No. 4

V - Provisional Damage Assessment Report No. 5

Prepared by:

TARGET INTELLIGENCE SECTION

XX BOMBER COMMAND

S E C R E T

SECRET
Auth: CG XX BC
Initials WX
Date 14 Aug 44

HEADQUARTERS
XX BOMBER COMMAND
Intelligence Section
APO 493

13 August 1944

DAMAGE ASSESSMENT REPORT NO. 3

TARGET: Showa Steel Works, Anshan, Manchuria 41° 08' N; 122° 57' 45" E.

GENERAL STATEMENT:

This report relates to damage resulting from an attack by 59 B-29 aircraft of XX Bomber Command on 29 July 1944, and is based on interpretation of excellent reconnaissance photographs of medium scale made by the 21st Reconnaissance Squadron of the Fourteenth Air Force on 4 August 1944. Taken together with selected strike photographs (see Provisional Damage Assessment Report No. 3) which show the condition of the target at the time of attack and which were used as the only available comparative, these photos indicate that considerable damage was effected at vital and critical points in the target area. The south coke battery has been hit at least once and a number of near misses are seen. While reconnaissance photos do not confirm direct hit on the old central Koppers battery, one or two bombs are known to have fallen in the immediate vicinity and it is now seen that a very near miss or direct hit may have damaged the new central Otto battery. There are no known direct hits in the north battery although one very near and two near misses are observed. It is thought to be highly significant that elsewhere in the coke plant portions thereof which have been destroyed or severely damaged will make it difficult if not virtually impossible to service coke ovens not affected by the attack for an indefinite period. This includes damage to the principal coal handling installations near the center of the coke installations group. Here the building housing crushing, screening, and cleaning facilities has been severely damaged. Further, part of the coal distributing system has been destroyed at its primary distribution point as has the conveyor system serving the north battery. A pusher serving the south battery is almost certain to have been damaged. Given the high vulnerability of coke ovens to damage by near misses as well as by direct hits, because of the fragility of their ceramic linings, damage is believed to be considerable.

In addition, the coke by-products plant has been very heavily damaged. In one nine acre area of this installation, about half the buildings and other structures are virtually destroyed or severely damaged.

The Dairen-Mukden rail line, severed in a number of places by direct hits, has now been repaired and a train is seen to be passing through at the time of reconnaissance.

CONCLUSIONS:

At the time reconnaissance photographs were made there is little sign of activity throughout the whole plant area. It is apparent that coking operations are being conducted in some ovens of the south battery,

AND IT IS BELIEVED NOT UNLIKELY that this could take place by coking from crushed and screened coal stockpiled at the crusher. Because of the known vulnerability of coke ovens to attack by high explosive (see Annex 2), an estimate of four to six months for restoring full operation within the Showa Steel Works is though to be conservative. An unestimated number of individual coke ovens must have been severely damaged, and according to the best authoritative opinion any damage to an oven requires complete rebuilding. Rebuilding of the coal handling devices alone will require considerable time, it is believed.

REMARKS:

The term "battery" is used herein to denote either of four groups of coke ovens running roughly on a north-south axis each of which, strictly speaking, includes a number of smaller batteries. The original nomenclature of all previous communications is retained.

REFERENCE: Air Objective Folder No. 93.3, Mukden Area.

WEIGHT OF ATTACK: 468 GP 500# AN-M-64 Bombs (Composition B) fused 0.1 seconds nose, 0.025 tail.

PHOTOGRAPHY: Scale: Approximately 1/13,000. Quality: Superior.

PREVIOUS PHOTO COVER: Strike photographs of 29 July 1944.

AIMING POINT: Center of coke oven area.

ANNEXES:
I. Annotated Print.
II. Analysis of coke oven vulnerability and importance. (For special distribution only).
III. Bomb Plot.
IV. Plan of Showa Steel Works.

DETAILS OF DAMAGE:

(NOTE: Numbers refer to annotations on Annexed print. All measurements are approximate and are based on a photo scale of 1/13,000).

1. At least one direct hit on the south coke oven battery about 170 feet from south end and 50 feet from a cross over main. The tops of 20 to 25 ovens, where a fire was seen to be burning on strike photographs, differ notably in texture from those of ovens where no hits are known to have been effected, indicating undoubted damage. In addition there is indication that a portion of the hydraulic main has been buckled or severed or both at at least one point. At the rear of the ovens there is a noticeable bulge immediately opposite the point of bomb impact. The possibility exists that another direct hit was effected on the extreme south end of the battery, in addition to another very near miss although in the latter case there is no well defined crater. In addition to all these it is certain that at least one other bomb fell immediately to the rear of this battery with two other probable near misses. Three craters astride the pusher tracks at this point suggest filling. The pusher serving this end of the south battery has been moved to the south end of the battery. This pusher is almost certain to have been damaged in some degree by a very near miss marked by strike burst. The known crater of the latter has also been filled. One other additional near miss on this battery is known.

2. Smoke is seen to be emitting from the center of the northern half of the south battery.

3. Shed, 250' x 40', unidentified probably related to coking operations, damaged at one end by near miss.

4. These photographs do not confirm direct hit (two near misses are seen) claimed on the old central battery of Koppers ovens although area of known impact is slightly obscured by a light smoke drifing across battery. It is noteworthy that pushers for the old battery occupy precisely the same positions observed at the time of strike. On the other hand one of two direct hits on the multiform building housing cleaning-crushing-screening installation, which is partly destroyed, landed at a critical point marked by the juncture of two similar distributor arms of the powder coal conveyor system. Substantial portions of both these arms are seen to be destroyed or severely damaged. It is now noted that this system of coal handling installations serves three out of four of the Anshan batteries.

5. Further it is observed that a conveyor by which coal is passed over the old battery to the new Otto battery has been partly destroyed by a bomb which fell between these parallel batteries.

6. It is probable that a very near miss or direct hit has also damaged the new central Otto battery near the base of the most southerly coaling tower, but a definite statement cannot be made.

7. Slight damage to edge of coal receiving installation by near miss.

8. Small shed related to gas distribution main partly destroyed and 2 or 3 near misses marked by nearby craters, one of them showing apparent tangency to coal receiving shed.

9. Direct hit has partly destroyed unidentified shed, 125' x 60'.

10. Probable direct hit on choke point of rail lines serving coal receiving bins, the crater thought to be filled in.

11. Part of building, 170' x 45', partly destroyed by direct hit or near miss.

12. More than 450 feet of coal conveyor for north coke oven battery destroyed or severely damaged.

13. Approximately half of building 170' x 45', severely damaged.

14. Unidentified building, 150' x 45' probably related to railroad roundhouse, almost completely destroyed.

15. At least one very near and one near miss on north coke battery. It is noteworthy that two pushers serving this battery occupy the same positions they held at time of strike.

16. Direct hit has partly demolished unidentified building, 150' x 125', of calcining plant.

17. One direct hit and two near misses at corner of unidentified building, 320' x 65', of Manshu Roll Kaisha Plant (rolling mills, possibly for special types of steels), causing slight damage. Crater also astride adjacent road.

18. One bomb falling between a coke conveyor leading from the base of the quenching tower of the north battery to a loading tower, and an outlet reaching from the main gas line to the by-products plant, has left a neatly rounded crater with no visible damage. Another crater is seen immediately south. Neither has been filled.

19. An unidentified cylindrical structure, diameter approximately 120', undoubtedly related to b-products operations, has been partly destroyed by a direct hit.

20. A long shed, curvilinear in plan, is partly destroyed due to direct hit.

21. The roof of this by-products building, 170' x 100' appears to have been affected by fire and a crater is seen adjacent.

22. At least six buildings in this part of the by-products plant have been damaged, two of them severely. A small hole is seen in the roof of what is thought to be a small power plant. At least half of a long shed adjoining an oddly T-shaped building has been wrecked. The roof of the cross-piece of the T-shaped building appears slightly damaged. One of nine small tanks is virtually destroyed.

23. Two unidentified sheds, each 90' x 80', destroyed by two direct hits.

24. An area of almost nine acres in the by-products plant is very heavily damaged. Much of this is virtually total destruction. Of six storage tanks, diameter 45', three have been destroyed and the others damaged. One shed, 115' x 40', destroyed. Another building 160' x 115' almost completely destroyed. Another building 160' x 130' destroyed and small adjacent shed severely damaged. L-shaped building, 130' x 80', destroyed. Another building, 150' x 45', damaged over a third of its area by fire. Another building, 190' x 150', severely damaged over a third of its area by fire. Much of this damage is the result of a large fire and explosion observed in strike photographs.

25. Severe damage to one of two buildings of the chemical and metallurgical laboratory and substantial damage to the other.

26. Building, 200' x 65', probably related to chemical and metallurgical laboratory, totally destroyed.

27. Large hole in roof of large machine shop has been squared off and it is now noted that two adjoining bays have also been damaged.

28. Two small sheds partly destroyed.

29. At least one direct hit between No. 4 and No. 2 blast furnaces, although no measurable damage is seen.

30. A shed over rail lines which probably serve ore and limestone unloading facilities for blast furnaces, about half destroyed.

A. Damaged buildings, thought to be workmen's homes, and related installations.

B. Damage to at least one building probably housing military personnel serving 4 gun flak positions.

Prepared by:
TARGET SECTION
XX BOMBER COMMAND

JAMES D. GARCIA
Colonel, Air Corps
Chief, Intelligence Section

S E C R E T

ANNEX NO. 2

Damage Assessment Report No. 3

Showa Iron and Steel Works

ANSHAN, MANCHURIA

Susceptibility of By-product Coke Ovens Plants to Damage by Aerial Attack.*

1. Susceptibility of coal handling equipment. Responsible authorities estimate that if a direct hit is made on the coal bin, the ovens previously receiving coal from this bin would be rendered substantially inoperative for 3 to 4 months at least. If a direct bomb hit were made on the conveyor system, with no major damage to the coal bins, the Japanese should reasonably be expected to effect repairs within a few weeks, if not sooner.

2. Susceptibility of coke ovens. The nature of coke ovens lends itself peculiarly well to effective demolition. The major part of the structure is composed of approximately 700,000 silica bricks of delicate design and of approximately 800 different shapes and sizes.

No actual knowledge is available on damage done to a battery by aerial bombing. As far as is known here, no battery has been hit in England, and the results of bombing on the few batteries in Germany and in Holland are not definitely known. The following discussion of the damage by bombing is therefore necessarily based on experiences with damage caused by accidents, on the judgement of people who have knowledge of building and operating batteries, and on information as to the general effects of bombing on houses and plants.

All such sources, as well as the committee, agree on one basic fact, na ely, that a coke oven battery is highly susceptible to damage by a direct hit with medium-sized bombs, as well as by near misses with medium to larger bombs. This belief is based on the structural characteristics of batteries as described below:

A. The battery is made of perfectly shaped refractory blocks of various shapes which are carefully fitted togather with a minimum of refractory cement.

B. These blocks are made to withstand high temperatures but not mechanical stresses, and are, therefore, fragile.

C. The whole structure must be perfectly gas-tight and any leakage is fatal to the structure.

DD. The structural strength of the whole battery is based only on the buck stays and tie rods of steel located on the outside of the battery or in the relatively cool outer shell.

E. Neither the oven nor flues contains any reinforcing elements and the force of the bursting bomb would doubtless be transmitted to the masonry of the battery.

F. The whole battery structure must be in perfect alignment with a maximum tolerance of 1/8 inch.

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* This material is extracted from The Report to Committee of Operations Analysts by Subcommittee on Far Eastern Coke and Coal Industries, 8 October 1943.

S E C R E T

S E C R E T

G. The battery is erected over a relatively thin concrete mat, which if of little protection against any shock tending to throw the battery out of alignment.

H. Throwing of the battery out of perfect alignment will result in stoppage of operations and will result in secondary damage which is described later.

The MEW(1) is of the opinion that a direct hit by a bomb of any size on the structure of the coke oven battery would almost certainly put the plant out of action for a long time. Major General K. C. Appleyard(2) was the only competent authority willing to make an estimate of the size of bomb which would cause complete destruction of the battery by a direct hit. He believes that a direct hit by bombs of 250 pounds and up, would not only wreck the structure of many ovens, but would result in gas explosions which would almost certainly destroy the battery sufficiently to require complete reconstruction.

The Coal Economics Division, Bureau of Mines, Department of Interior(3) while not estimating the size of the bomb necessary, states the following: "A bomb hit anywhere on the battery proper would crack oven walls, form leaks and damage the battery sufficiently to put it out of operation. Due to the nature of the refractories, sudden shanges of temperature would permanently injure the oven walls and cause great damage. Therefore, once the battery is put out of operation, considerable time is lost to rebuild and fire the battery to operating temperature."

Professor J. E. Burchard, of the Bomb Damage Study Institute at Princeton University, estimated that a 2,000-pound bomb would crush the walls of the coke oven battery when exploding at a distance of 40 feet away from it, while a 1,000-pound or 500-pound bomb would crush the walls when exploding at a distance of 32 or 25 feet respectively from the battery.(4)

However, as stated before, much less damage than that done by a force which would lead to the crushing of the walls would put the battery out of operation and destroy it. It is therefore to be assumed that the distance of the near misses which would put a battery out of operation should be definitely higher than estimated by Professor Burchard.

Some of the effects of a shock to the battery resulting in its disalignment are outlined below:

A. It might send an explosive mixture of gases into the draft stack which might explode there, demolishing the 200-foot stack, and causing it to fall on the ovens.

B. Gas leaks which might be caused would result in fires and the fluxing of brick masonry, putting it into an irreparable condition.

C. Disalignment would prevent the discharging of the coke ovens by the pusher ram, and the ovens cannot be discharged manually over any period of time.

D. Air entering through the leaks would burn the coke in the ovens, would reduce the amount of by-products, and,

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(1) Comments on the vulnerability of coke oven plants, Aug. 9, 1943
(2) Interviews on Sept. 23 and 29, 1943, and letter to Dr. H. H. Lowry, of Carnegie Institute of Technology, dated Sept. 27, 1943
(3) "Effectiveness of Bombing Germany's By-product Coke Plants" July 1, 1942
(4) Comments on vulnerability of coke ovens to earth shock,

if sufficient quantities of air entered through the leaks, explosions would occur in the main, cross-over main, and the by-products plant. This might result in collapse of all the construction supporting these overhead structures. (See next section on damage to by-products plant.)

E. Sudden stoppage of operations would lead to a rapid cooling of the masonry, which was red- to white-hot at the time of the damage. Sudden cooling lead to shattering of the refractory blocks into fragments, thus completely destroying the structure. This has happened at various times in England when a sudden strike at a coke plant caused stoppageof operations and rapid cooling of the ovens.(1)

3. Susceptibility of by-product recovery and gas handling equipment. A direct hit on the by-product buildings by a large bomb, especially if followed immediately with incendiaries, would render it totally inoperative. The equipment not actually destroyed by explosive force would be so buckled and warped by the ensueing fire and secondary explosions as to redner it of value only as scrap metal. The fire would probably be of sufficient magnitude to extend to all structures contiguous to the by-product building. The large volumes of gaseous and liquid hydrocarbons handled in the by-product building make it a potential bomb in itself.

ANNEX 3
DAMAGE ASSESSMENT REPORT NO. 3
SHOWA IRON AND STEEL WORKS
ANSHAN, MANCHURIA

Bomb Study

Bomb Study and Bomb Plot

1. A total of 308 of the 464 bombs reported dropped on the Showa Iron and Steel Works on 29 July 1944 have been found on strike photography and on reconnaissance photography of 4 August 1944. These 308 bombs represent 67% of the number dropped.

2. Assuring that these bombs not found are distributed equally throughout the area bombed, the following table may be prepared.

AREA*	NO. OF BOMBS FOUND**	PERCENTAGE OF BOMBS
0-1000'	30	9.8
1000'-2000'	123	40.1
2000'-3000'	52	16.8
3000'-4000'	9	2.9
4000'-5000'	14	4.5
5000'-6000'	23	7.5
6000'-7000'	15	4.8
7000'-8000'	8	2.6
8000' and over	34	11.0
TOTAL	308	100%

* Aiming Point is center of central Kopper's Coke Oven Battery.

** See attached Photo Bomb Plot for location of bomb hits.

ANNEX 3

D.A. REPORT NO. 3

SHOWA IRON AND STEEL WORKS

ANSHAN, MANCHURIA

0 500 0 1000' 2000' 3000

SECRET

TARGET SECTION, A-2
XX BOMBER COMMAND

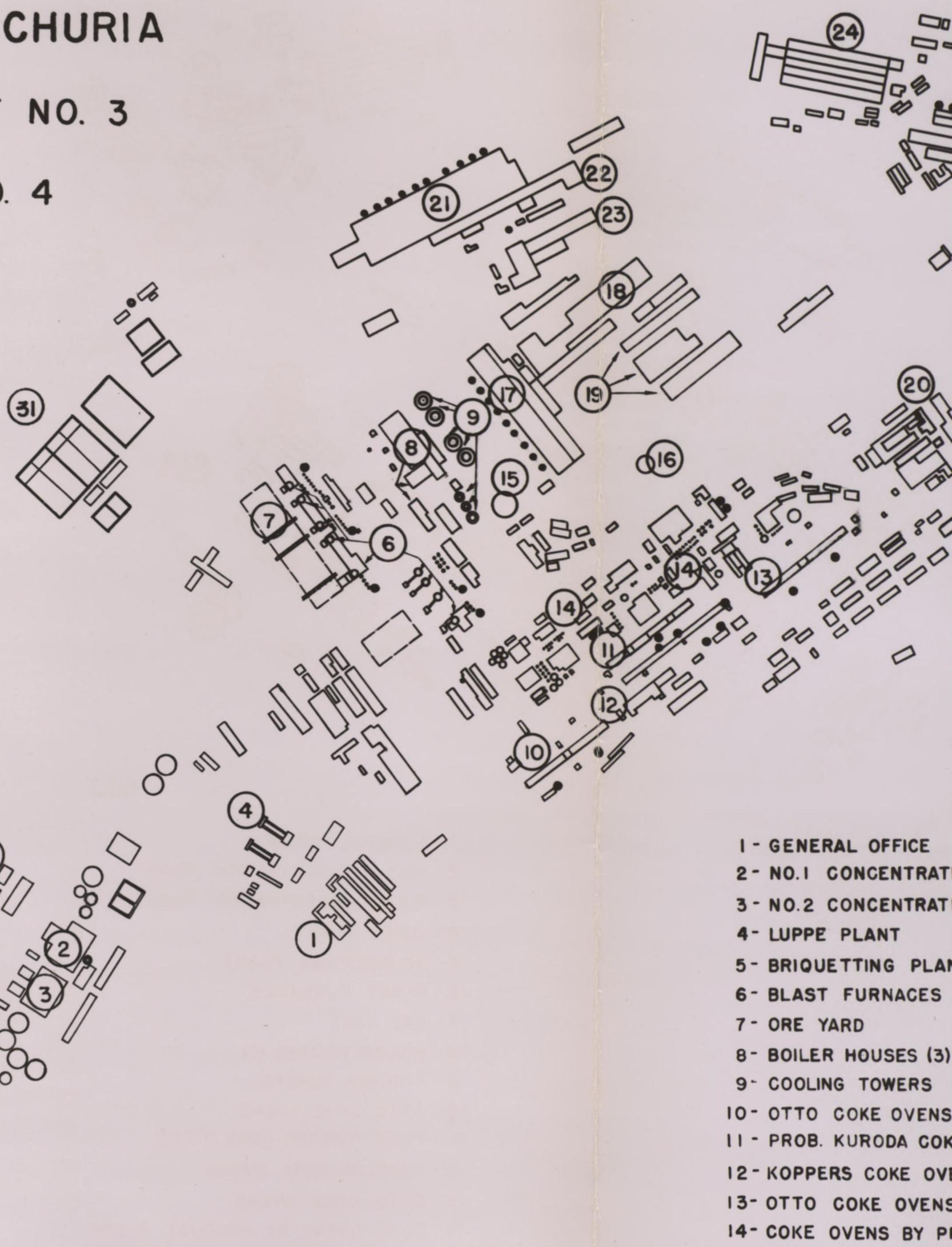
SECRET

SHOWA STEEL WORKS

ANSHAN, MANCHURIA

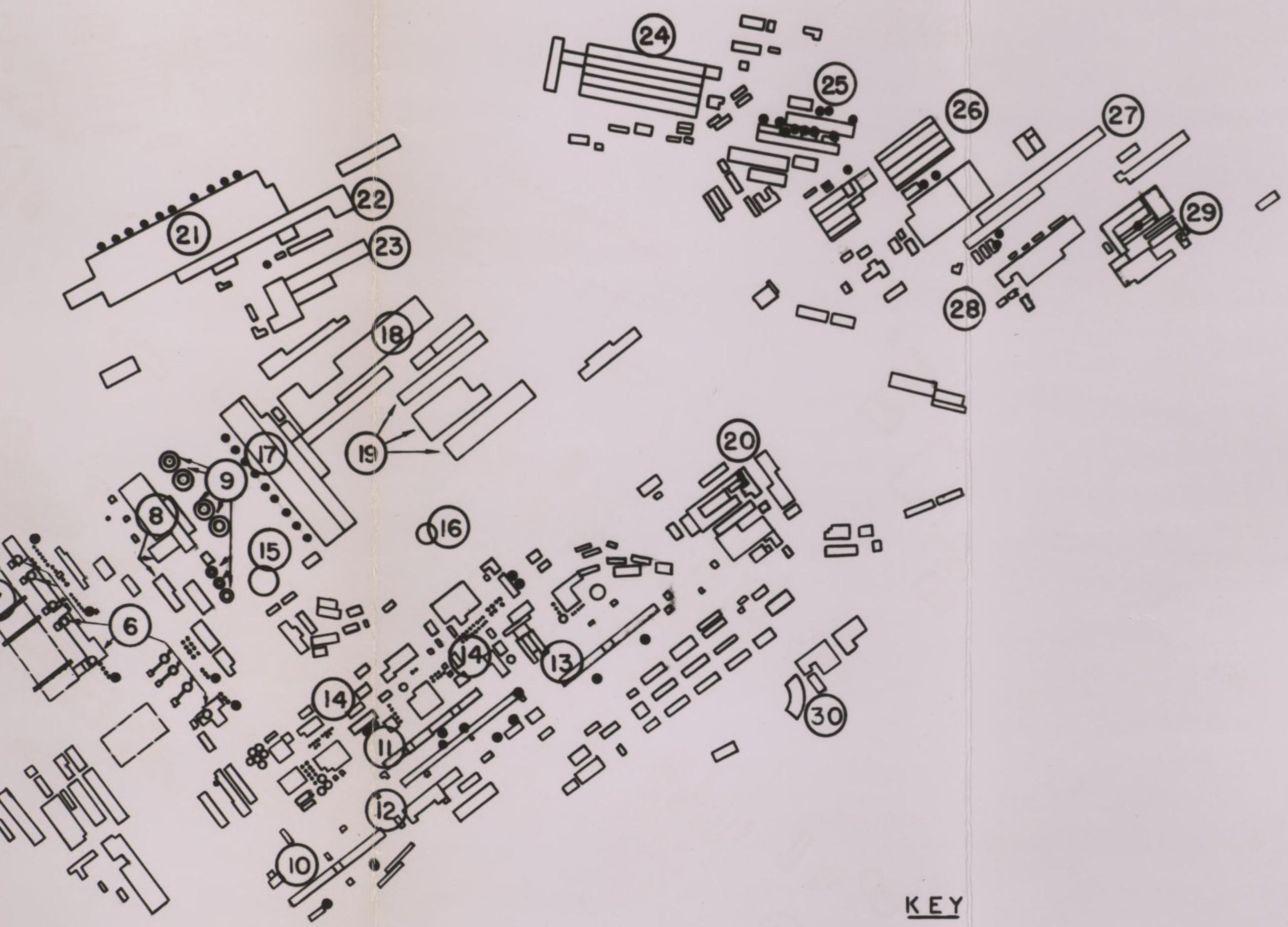
D. A. REPORT NO. 3

ANNEX NO. 4



1 - GENERAL OFFICE
2 - NO.1 CONCENTRAT
3 - NO.2 CONCENTRAT
4 - LUPPE PLANT
5 - BRIQUETTING PLAN
6 - BLAST FURNACES
7 - ORE YARD
8 - BOILER HOUSES (3)
9 - COOLING TOWERS
10 - OTTO COKE OVENS
11 - PROB. KURODA COK
12 - KOPPERS COKE OVE
13 - OTTO COKE OVENS
14 - COKE OVENS BY PR
15 - BLAST FURNACE G
16 - COKE OVEN GAS H

9.76



KEY

1 - GENERAL OFFICE
2 - NO.1 CONCENTRATION PLANT
3 - NO.2 CONCENTRATION PLANT
4 - LUPPE PLANT
5 - BRIQUETTING PLANT
6 - BLAST FURNACES
7 - ORE YARD
8 - BOILER HOUSES (3)
9 - COOLING TOWERS
10 - OTTO COKE OVENS
11 - PROB. KURODA COKE OVENS
12 - KOPPERS COKE OVENS
13 - OTTO COKE OVENS
14 - COKE OVENS BY PRODUCT PLANT
15 - BLAST FURNACE GAS HOLDER
16 - COKE OVEN GAS HOLDER
17 - NO.1 OPEN HEARTH PLANT
18 - RAIL MILL
19 - SHEET AND BAR MILLS
20 - CALCINING PLANT
21 - DUPLEX PLANT
22 - SHEET & BAR MILL
23 - PLATE MILL
24 - MANSHU ROLL KAISHA PLANT
25 - MANSHU CHUKO KAISHA PLANT
26 - MANSHU SUMITOMA KOKAN
27 - ANZAN KOSAI KAISHA PLANT
28 - NICHIMAN KOKAN KAISHA PLANT
29 - MANSHU AENTO KAISHA PLANT
30 - ROUNDHOUSE
31 - SETTLING PONDS

TARGET SECTION A-2
XX BOMBER COMMAND

HEADQUARTERS
XX BOMBER COMMAND
Office of the Assistant Chief of Staff, A-2
APO 493

S E C R E T
Auth CG XX BC
3 Aug 44 JJC
Date Initials

3 August 1944

PROVISIONAL DAMAGE ASSESSMENT REPORT NO. 3

TARGET: Showa Steel Works, Anshan, Manchuria: 41° 03'N; 122° 57' 45"E.

GENERAL STATEMENT:

This report relates to damage resulting from an attack by 59 B-29 aircraft of XX Bomber Command on 29 July 1944. The Target had not previously been attacked. The assessment of damage derives exclusively from interpretation of strike photographs and, pending accomplishment of reconnaissance flight over this target, should be regarded as a provisional and conservative estimate.

Damage to installations of the Showa Steel Works is seen to be very severe, particularly in those parts of the plant known to be exceedingly vulnerable to attack by high explosive. Areas of known concentrated damage include the coke oven batteries and the coke by products plant, and a further concentration of bursts is seen in the vicinity of the blast furnaces and related installations.

Because one of the earlier bombs released resulted in a great explosion and fire in the coke by-products plant, a towering plume of dense black smoke soon enveloped much of the main target area, blotting out significant parts of the Showa Works and preventing assessment of damage to buildings, on or near which it is though part of the weight of the attack is almost sure to have fallen.

CONCLUSION:

It is conservatively estimated that at least four to six months will be required to restore normal operations in the Showa Steel Works, and that during the period of cleara nce and rebuilding very little if any coke can be produced in the three old batteries. The new battery is thought to have been least damaged and operations there can probably be resumed more quickly than elsewhere. A more definite statement may be possible following assessment of reconnaissance photographs.

REMARKS:

The attack is seen to have developed across the target area in an azimuth of approximately 85° T. It is noteworthy that so far as can be determined from strike assessment, virtually no damage resulting directly from the attack is observed in non-industrial areas, although slight damage to two or three workmen's homes may exist.

REFERENCE: Air Objective Folder No. 93.3, Mukden Area.

WEIGHT OF ATTACK: 476 GP 500# AN-M-64 Bombs (Composition B) fused 0.1 nose, 0.025 tail.

PHOTOGRAPHY: Scale: Approximately 1/13,000 and 1/26,000. Quality: Excellent to poor.

PREVIOUS PHOTO COVER: None.

AIMING POINT: Center of coke oven area.

ANNEXES: Will be issued as a supplement.

DETAILS OF DAMAGE:

I. Showa Steel Works.

A. Coke Oven Batteries.

1. South Battery.

a. At least one (confirmed in a later strike photograph) and probably two direct hits on the south battery.

b. 4 to 5 additional bursts are seen in vicinity of this battery.

c. A crater marking near miss on a coaling tower of this battery is seen to be tangent to the end of one of two coke pushers serving the ovens. This is almost certain to have severely damaged the pusher mechanism and destroyed its alignment.

2. Central Battery.

a. One direct hit and one hair-miss or direct hit on Koppers coke oven battery near coaling tower.

b. One direct hit on southwesterly coaling tower of above battery.

c. Two direct hits at northeast end of multiform building housing cleaning, crushing, and screening apparati for central battery. (A later photo shows this installation to be burning fiercely and one end of the building appears demolished).

(NOTE: These photographs show that approximately 20 Koppers type ovens in the central battery were either being repaired or rebuilt at the time of attack. The strike photographs further reveal for the first time that a whole new battery of Otto type ovens, approximately 200 in number, has been built parallel to and immediately west of the old central battery)

3. North Battery.

a. Five bursts, two of which are very near misses, are seen immediately to the east of the center of this battery. Two additional bursts are seen to the west of the battery.

(NOTE: Serried plumes of white smoke are seen to be rising from at least half of the coke ovens, pointing to unmeasured damage by concussion, thrust, and blast. That this phenomenom does not result from a ruse by which the enemy sought to screen this vital target area with his own industrial smoke is indicated in that oven breaching occurred after bursts are seen; in that some ovens are not vented; and in that white smoke developing intensely in the southern quarter of the south battery, later in the attack changes to dense black, showing that the coke or coal in these ovens is burning. Fires are almost certain to have been transmitted through the principal gas distributing mains of the coke batteries. The pluming of white smoke is also seen in several of the new Otto type ovens parallel to the central battery).

B. Coke By-Products Plant.

1. One of the first bombs to be released is seen to have fallen on or in a group of six unidentified storage tanks related to the coke by-products plant. This burst however is seen not to be the origin of the huge enveloping column of black smoke which undoubtedly resulted from a later burst either on a large unidentified building or in a group of 12 unequal size tanks east southeast of the above 6 tanks. This is revealed in a great burst of flame seen in consecutive strike photographs to have developed over the designated installations, while no notable damage is evident in the area of the 6 tanks previously mentioned, at the moment of flame burst.

2. Because of the volatile nature of derivatives from coke by-productive operations, it is thought that reconnaissance photographs may reveal great destruction in this part of the Showa Works, although smoke-obscured strike photography does not permit a definite statement.

C. Blast Furnaces.

1. One hair-miss on No. 4 Blast Furnace, the bomb falling astride or immediately next the incline tracks carrying Skip car to top of furnace; also, one additional near miss on No. 4 Blast Furnace, which has damaged related building.

2. One or two direct hits or near misses on small shed at base of above incline.

3. One direct hit or near miss on three-unit heating stove element (blowers) serving No. 4 Blast Furnace.

4. One additional burst is seen to mark near miss on very high stack related to blast furnaces but it is not though that significant damage to stack would result.

5. One or two direct hits or near misses on small shed at base of incline leading to top of No. 2 Blast Furnace.

6. Four or five additional bursts near Blast Furnaces.