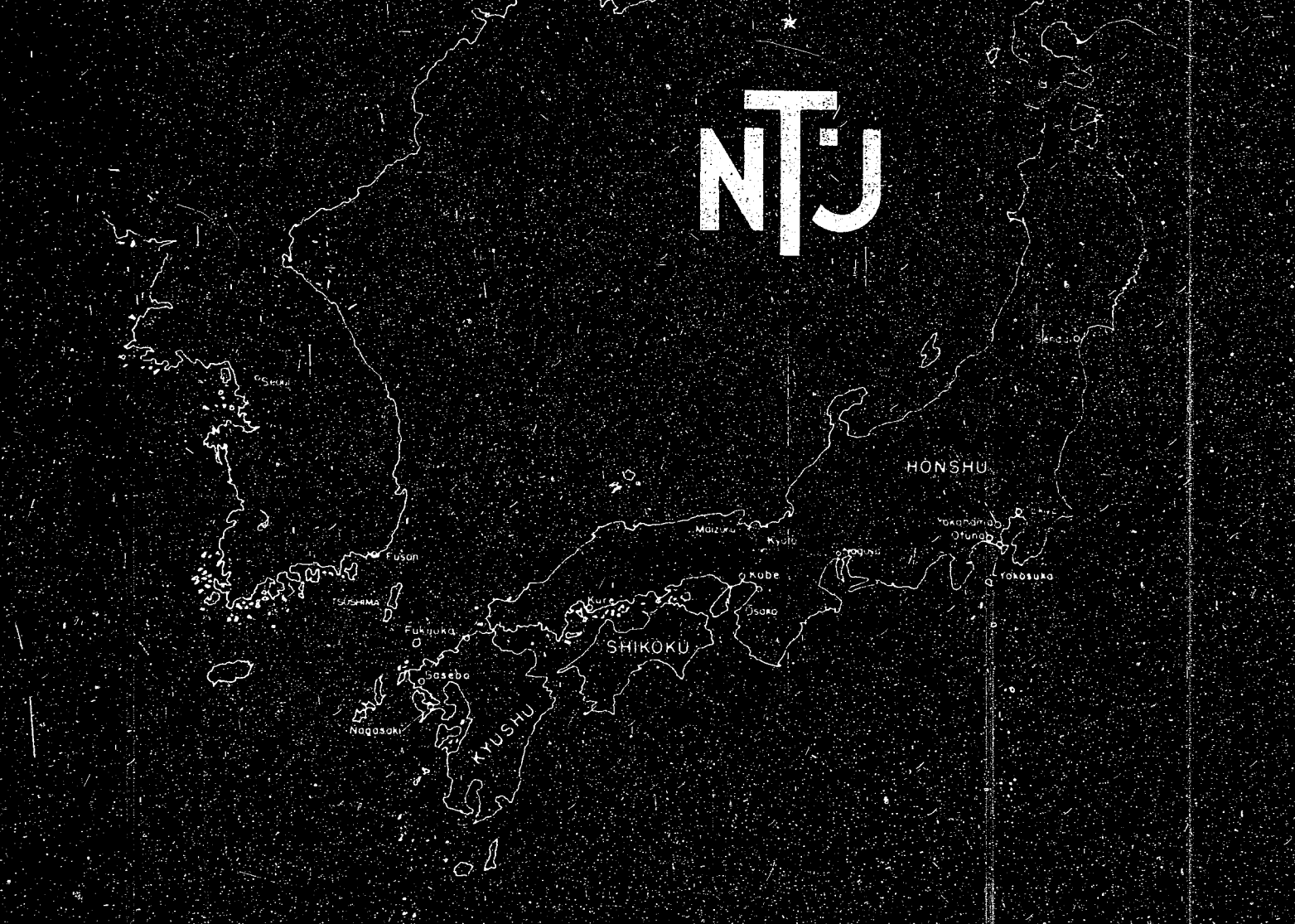
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INDEX NO. S-06-2

SHIP AND RELATED TARGETS

REPORTS OF DAMAGE TO JAPANESE WARSHIPS - ARTICLE 2

YAMATO(BB), MUSASHI(BB),
TAIHO(CV), SHINANO(CV)

U.S. NAVAL TECHNICAL MISSION TO JAPAN

NS/tk

U. S. NAVAL TECHNICAL MISSION TO JAPAN
CARE OF FLEET POST OFFICE
SAN FRANCISCO, CALIFORNIA

6 January 1946

CONFIDENTIAL

From: Chief, Naval Technical Mission to Japan.
To : Chief of Naval Operations.

Subject: Target Report - Reports of Damage to Japanese Warships, Article 2.

Reference: (a)"Intelligence Targets Japan" (DNI) of 4 Sept. 1945.

1. Article 2 of the report covering Target S-06 of Fascicle S-1 of reference (a), dealing with the loss of four major Japanese vessels, is submitted herewith.

2. The investigation and the report were accomplished by Commander E.C. Holtzworth, USN, assisted by F.H. Dannenhauer, CSp(X), E.D., USNR.

C. G. GRIMES
Captain, USN

REPORTS OF DAMAGE TO JAPANESE WARSHIPS - ARTICLE 2

YAMATO(BB), MUSASHI(BB), TAIHO(CV), SHINANO(CV)

"INTELLIGENCE TARGETS JAPAN" (DNI) OF 4 SEPT. 1945

FASCICLE S-1, TARGET S-06

JANUARY 1946

U.S. NAVAL TECHNICAL MISSION TO JAPAN

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SUMMARY

SHIP AND REALATED TARGETS

REPORTS OF DAMAGE TO JAPANESE WARSHIPS - ARTICLE 2
YAMATO (BB), MUSASHI (BB), TAIHO (CV), SHINANO (CV)

This report describes the loss of each of the four finest warships produced by the Japanese. Three of them, YAMATO (BB), MUSASHI (BB), and SHINANO (CV) were the largest, and, in many respects, the most powerful warships in the world. The fourth, TAIHO (CV), was the latest large carrier to be designed and built as a carrier by the Japanese.

YAMATO and MUSASHI comprised the YAMATO Class. SHINANO, initially, was to have been the third ship of the class. She was converted to a carrier, however, during the building period. The YAMATO Class was designed during the years 1934-37. The ships were built for world conquest, by admission of the Japanese, who were responsible for their design and construction. There were few, if any, restrictions placed on the Japanese naval constructors, who were given the simple directive to produce the most powerful warships in the world. The design was conceived more than eleven years ago, when the largest Japanese warship was NAGATO (BB)*. Under the circumstances, and considering that warship design as a science in the Japanese Navy dates back only to the last year years of World War I, the boldness of the design of the YAMATO Class is impressive. The ships, fully loaded, displaced some 73,000 tons and mounted a 46cm (18.1 inch) main battery.

YAMATO was sunk on 7 April 1945 by U.S. naval aircraft. She was struck by four bombs and at least nine torpedoes. An additional three torpedo hits were reported, but few substantiating details concerning these could be obtained from survivors. The majority of the torpedoes struck on the port side. Some 20 to 30 minutes after the last attack, YAMATO capsized. Her magazines exploded as she rolled under.

MUSASHI was sunk on 24 October 1944 also by U.S. naval aircraft. Although 16 bombs struck her, these had no important effects insofar as sinking was concerned. The Japanese reported that 21 torpedoes (including two duds) struck her, but interrogation of survivors and other Japanese naval personnel produced information from which only ten certain and four possible (but not probable) hits could be identified and located. It is considered that the ten torpedo hits, about equally divided on both sides in the forward three-quarters of her length, were sufficient to have caused her to sink. This occurred some four hours after the last and most vicious attack. She went down by the bow, capsizing when the forward flying (U.S. forecastle) deck was submerged.

On 19 June 1944, a single submarine torpedo struck TAIHO on the starboard side in way of the forward gasoline tanks. Apparently but moderately damaged, an enormous gasoline vapor explosion occurred some five hours later. Following this, progressive flooding caused her to sink bodily with a heavy starboard list. This occurred about 1½ hours after the explosion.

*NAGATO displaced about 43,000 tons, fully loaded, after modernization in 1935.

continued

On 29 November 1944, SHINANO was struck by four submarine torpedoes from a single salvo. All hit on the starboard side. She was on her maiden voyage, and was not quite finished. Sealing of holes in bulkheads and decks for electric cables, pipelines, and ventilation ducts had not been completed. Progressive flooding caused her to capsize about seven hours after the attack.

Damage control performance was reasonably good in MUSASHI's case, mediocre in YAMATO's case, and conspicuously poor aboard TAIHO and SHINANO. The faith which the Japanese had in counterflooding of outboard voids to control list was proven to have been misplaced. Counterflooding measures, although reasonably well executed, were inadequate aboard YAMATO and SHINANO. Serious design errors were made in locating TAIHO's forward gasoline tanks beyond the torpedo defense system and immediately below the floor of the forward elevator pit - itself below the waterline when the ship was fully loaded.

The lingering death throes of MUSASHI, in which four hours were required for her to sink after the last attack, is an impressive demonstration that torpedo hits equally distributed on both sides of a capital ship are not as lethal as in the case where they are concentrated only on one side.

* * * * *

REFERENCES

A. Japanese Personnel Interviewed:

1. Tech. Rear Adm. KATAYAMA, ex-IJN, Chief of the Design Branch, Fourth Section (Ship Construction), Technical Department, Japanese Naval Ministry, from 1943 to 1945.

2. Tech. Vice Adm. FUKUDA, ex-IJN, formerly Chief of the Fourth Section. Had been in direct charge of preliminary design of YAMATO class, (as a Captain), from 1934 to 1937.

3. Tech. Capt. MATSUMOTO, ex-IJN, assistant to Vice Adm. FUKUDA, during design of YAMATO class. More recently, Design Superintendent at Kure Navy Yard.

4. Naval Engineer MORI, ex-IJN, employee of the Fourth Section, Principal assistant to Vice Adm. FUKUDA during design of YAMATO class.

5. Tech. Rear Adm. YAGASAKI, ex-IJN, of the Fourth Section. Had been in direct charge of preliminary design of TAIHO and of conversion of SHINANO.

6. Tech. Capt. INAGAWA, ex-IJN, of the Fourth Section. Had been the principal assistant to rear Adm. YAGASAKI during design of TAIHO and conversion of SHINANO.

7. Rear Adm. MORISHITA, ex-IJN, Chief of Staff to the OTC of YAMATO group on 7 April 1945, and on board YAMATO until sunk.

8. Capt. NOMURA, ex-IJN, Executive Officer of YAMATO, on board until sunk.

9. Capt. OYAMA, ex-IJN, Formerly Chief Engineer of YAMATO, but not on board when sunk.

10. Lt. Comdr. SHIMIZU, ex-IJN, Assistant Gunnery Officer of YAMATO, on board until sunk.

11. Capt. KATO, ex-IJN, Executive Officer of MUSASHI on 24 October 1944, on board until sunk.

12. Capt. NAKAMURA, ex-IJN, Chief Engineer of MUSASHI on 24 October 1944, on board until sunk.

13. Comdr. KAZUMA, ex-IJN, the Navigator of TAIHO on 19 June 1944, on board until sunk.

14. Comdr. MIKAMI, ex-IJN, First Lieutenant and Damage Control Officer of SHINANO on 29 November 1944, on board until sunk.

15. Lieut. SAWAMOTO, ex-IJN, Assistant Damage Control Officer of SHINANO, on board until sunk.

16. Comdr. ISHIWATA, ex-IJN, formerly attached to the General Affairs Department, Japanese Naval Ministry, where many records were kept. Was also member of special committee formed to study the losses of SHINANO and TAIHO. Was line officer rather than technical officer, but proved very valuable in gathering information, rounding up survivors, etc.

continued

B. Pertinent USSBS Reports:

1. USSBS Interrogation Report No. 133, Nav. No. 32 (25 October 1945). (Interrogation of Comdr. MIYAMOTO, ex-IJN, of staff of OTC of YAMATO group and on board YAMATO until sunk.)

2. USSBS Interrogation Report No. 149, Nav. No. 35 (24 October 1945). (Interrogation of Rear Adm. KOYAMAGI, ex-IJN, Chief of Staff to OTC of Japanese Center Force during Battle for Leyte Gulf, 24-26 October 1944.)

3. USSBS Interrogation Report No. 47, Nav. No. 9 (16, 17 October 1945). (Interrogation of Vice Adm. KURITA, ex-IJN, in command of Japanese Center Force at Battle for Leyte Gulf, 24-26 October 1944.)

4. USSBS Interrogation Report No. 32, Nav. No. 3 (16 October 1945). (Interrogation of Vice Adm. OZAWA, ex-IJN, in command of Japanese Task Force at Battle of the Philippine Sea, 19-20 June, 1944.)

LIST OF ILLUSTRATIONS

INTRODUCTION

When this investigation was begun, an almost complete lack of authentic information existed. The dates on which the ships were sunk were known, but little else. For example, intelligence reports estimated the displacement of YAMATO as 45,000 tons standard, although prisoner-of-war reports gave vague indications of a much larger ship. It was found that generally the Japanese kept scanty and incomplete records. Their action reports, some of which are briefed in Reference (B), were unbelievably inaccurate and incomplete. The Fourth Section (Ship Construction) of the Technical Department did not make damage reports and analyses as they are known in either the Bureau of Ships or the British Admiralty. Commanding officers were not required to submit damage reports as in the U.S. and British navies. About all that was done by the Fourth Section was to keep records of damaged and lost ships, and even this was allowed to lapse in 1943. Such records as existed either were destroyed in the fire raids of 1945, when a large part of the Naval Ministry was burned, or by order during the period 15 - 17 August 1945. Some analysis was done, however, by the Fourth Section in those cases where remedial action was indicated as necessary by complaints of the operating forces. In special cases, a thorough investigation was ordered by the Naval Ministry. Thus, the loss of both TAIHO and SHINANO seems to have been thoroughly investigated by special committees, composed of representatives from all sections of the Technical and General Affairs Departments, including the Fourth Section, which furnished the technical experience and background. The records of these investigations were reported to have been destroyed, but questioning of members of the committee produced considerable information concerning the findings and conclusions. In general, however, the Japanese were poor record-keepers by almost any standards.

In the beginning of this investigation, conferences were held with various technical Japanese officers in order to determine the design characteristics of the ships, as well as the technical background of certain features. While the Japanese were co-operative, they were quoting from memory. Next a search of the four major Japanese Navy Yards was made for plans. Many detail plans were found, but few key plans turned up. Natural Japanese secretiveness, carried to extraordinary lengths even among themselves, together with orders to burn all documents, caused this situation. Some few key plans and documents were found, however, and these were very valuable in checking later information.

The next step was a directive to the Japanese officers of the Fourth Section to re-draw key plans and re-calculate basic characteristics, using former employees of that section. This was done. The completed plans and calculations were checked against what original plans and data were available, and also against the statements of various technical naval officers. There is no question of the general accuracy of the plans and calculations so produced. They will be found as enclosures to "Characteristics of Japanese Naval Vessels Article 3". In addition, the plates in this report are based on these redrawn plans.

Finally, directives were issued to the remnants of the Japanese Naval Ministry to produce the key survivors of each ship for interrogation. These individuals were made available after some difficulties. They are listed by name, rank, and position under Reference (A). Language difficulties were solved by Japanese Language Officers and the local employment of a Japanese national with an extensive educational background in the United States. In connection with interrogation of survivors, it was found that, by U.S. standards, Japanese enlisted men and junior officers were hopelessly ignorant. This fact accounts for the high rank of the Japanese personnel interrogated.

continued

The United States Strategic Bombing Survey reports listed in the references provided an invaluable background of general naterial and a ready means of checking the general authenticity of the accounts of the personnel interrogated.

Many technical discussions were held with the principal Japanese technical officers. Except for an understandable pride in the four ships which made them reluctant to express opinions, they were found to be generally cooperative.

THE REPORT

Section I - FOREWORD

Plates I and II

1. The underwater protection system of ships of the YAMATO Class (including SHINANO) was designed following a series of model caisson tests conducted at the Yokosuka Navy Yard. The program was started in 1934 in connection with the modernization of NAGATO (BB), as well as with the design of YAMATO. Models of one-third scale size were employed and subjected to attack with 9kg (19.8 pounds) charges. In the beginning, the explosive used was TNT, but towards the end of the program the explosive was changed to one containing 60 per cent TNT and 40 per cent hexatrinitrodiphenolamine, which U.S. tests have shown to be about equivalent to TNT. The Japanese considered 9kg to be equivalent to 200kg of explosive in the full size. The last test, early in 1939, was conducted with a full scale model of YAMATO and provided with a 75mm (3 inch) D.S. internal armored bulkhead. It was attacked with 400kg (880 pounds of explosive). The holding (innermost) bulkhead did not remain watertight but was not split open. The principal weakness was at the bottom connection of the holding bulkhead to the shell. This section was redesigned for the YAMATO.

2. The model tests described above, plus some simple under-the-bottom tests, enabled the Japanese to formulate an empirical method of design of underwater protection systems. The variables were thickness of the internal armored bulkhead, distance of the bulkhead from the skin of the bulge (which was fitted on all large warships) and size of charge. YAMATO's system was designed to withstand a 400kg charge. As described in paragraph 1, the design was confirmed by a full scale test. As noted, a three inch bulkhead was to be used. Prior to construction, however, considerations of underwater trajectories of projectiles caused this bulkhead to be radically increased in thickness. As installed, it was eight inches thick at the top (the connection with the lower edge of the 16.1 inch main side belt) tapered to three inches at the bottom connection with the shell. The Japanese expected the armored bulkhead to leak after attack with a 400kg charge, but believed that the two inboard longitudinal bulkheads would remain tight.

3. Unfortunately, records of the tests described in paragraph 1 could not be located. The data given, however, have been checked with four different responsible technical officers, all of whom agreed in principle as to the results of the tests and the conclusions drawn from them.

4. The decision to use the heavy lower bulkhead brought with it the difficult design problem of joining the main side belt to the lower armored bulkhead. After considerable discussion and debate, the joint shown on Plate I was adopted. The design of the joint was based primarily on the ability of the steel makers to produce the special shapes required in a reasonable length of time. Several officers felt that a delay in construction should be accepted and a more efficient joint adopted, but they were over-ruled. The joint is of poor design, being entirely dependent for transverse strength on the shearing strength of tap rivets and three-ply rivets. In addition, the joint itself was not adequately supported in the transverse direction.

5. The two longitudinal bulkheads inboard of the armored bulkheads were rigidly connected to each other by closely spaced vertical and horizontal floors. Although an effort had been made to obtain elasticity in case of deflection of these two bulkheads (by offsetting the horizontal floors on opposite sides of the bulkhead inboard of the armor), it is apparent that they could suffer lit-

tle deflection without rupture, at least of butts and floor connections. This system is described in some detail in "Characteristics of Japanese Naval Vessels, Article 3 - Surface Warship Hull Design," NavTechJap Report Index No. S-01-3.

6. Summing up, it appears that poor detail design of the torpedo defense system prevented the attainment of the resistance naturally to be expected from the employment of such heavy material. The joint connection was particularly poor. As built, the total depth of the system was about 16.8 feet, with the armored bulkhead about 3 meters (9.8 feet) from the bulge at mid-draft.

7. A further serious error was made in tying together the two longitudinal bounding bulkheads of the outboard firerooms (transversely) by heavy beams, placed about at the upper operating level. The beams were reported to have been heavy H shapes. The reason given for this was to strengthen the inboard longitudinal bulkhead against the air pressure built up in the firerooms (they were closed firerooms). This bracing was not shown in the plans drawn for U.S. Naval Technical Mission, but is included on Plate III. The Japanese realizing the mistake, were reluctant to admit it, but the fact of the existence of the heavy ties was brought out in case of SHINANO, where inboard firerooms were flooded. The beams punched holes in the inboard bulkhead when the holding bulkhead deflected inboard (See Section V).

8. The Japanese attempted to give all their ships excellent stability characteristics. Elaborate damage stability calculations were made in the preliminary design stage. The following were reported to have been the design criteria established for the YAMATO Class and theoretically obtained:

a. With all unprotected structure flooded, the intact armored box was to have sufficient buoyancy for flotation and sufficient stability to impart a range of stability of 22°. The unprotected structure included both ends, all voids outboard of the side armor on both sides and the hul hull above the armored second deck.

b. With all outboard voids on one side flooded, the ship was not to incline more than 18° (roughly, the angle at which the main deck at the low side entered the water).

c. With either one or the other of the unprotected ends completely flooded, the ship was not to plunge by either the bow or the stern.

d. With the three outboard firerooms, the outboard engineroom and the voids in way of these four spaces on one side flooded, the ship was not to capsize.

9. There is some documentary proof that these conditions actually were calculated during the preliminary design stage (see Article 3, this report). It is added, however, that in making these calculations the Japanese designers included in the watertight envelope all volume up to the flying (U.S. forecastle) deck, despite the fact that this deck was not continuous for the full length of the ship. This is a dubious procedure at best and one which undoubtgave optimistic results.

10. Finally, from a series of small-scale, under-the-bottom experiments, the Japanese had arrived at the conclusion that outboard layers of the torpedo defense system should be carried void. They placed great importance on this point, believing that extent of physical damage to the shell and inner structure was much less than if the shell were liquid backed. As nearly as could be determined, the series of tests on which this principle was founded was very modest. The Japanese applied it faithfully to every vessel of cruiser size and larger. To limit initial list in case of underwater damage, they attempted to give their ships large GM, as well as large GZ. They also placed

great reliance in rapid counterflooding measures to remove initial list. Outboard voids and machinery spaces were provided with ten inch diameter sea valves, remotely operated. The outboard voids also were provided with air escapes; which, incidentally, were used to indicate flooding of outboard voids in the event of damage.

11. All in all, the resistance to underwater attack of YAMATO and her sisters is considered to have been below the standard which normally would be expected in such gigantic vessels. Nonetheless, the system was massive compared to those of other smaller capital ships of other navies designed during the same period.

12. Fortunately, for the purposes of this investigation, it was discovered that the system was tested once in service prior to the loss of YAMATO, MUSASHI, and SHINANO. YAMATO was hit on the starboard quarter by a single submarine torpedo on 25 December 1943, some 180 miles north of Truk. A dispatch report, made by the Commanding Officer to the Naval Ministry, describing the damage is quoted:

> On 25 December 1943,at 180 nautical miles north of Truk, at latitude 10°-5' N. and longitude 150°-32' E., one torpedo hit was received from a single enemy submarine. A hole about 5 meters (16 feet) depth, extending downward from the top of the bulge connection (at the armor) and 25 meters (82 feet) in length, between frames 151 and 173, was produced. Water flooded into the No. 3 (turret) upper magazine from a small hole in the longitudinal bulkhead caused by caving in of waterline armor. (Translation by U.S. Naval Japanese Language Officers).

13. It was found that the Fourth Section (Ship Construction) had made a careful inspection and analysis of the damage. Plate II has been traced from a drawing made by Japanese officers who inspected the damage. In turn, the Japanese drawing was made under close supervision of representatives of the U.S. Naval Technical Mission. Plate II is considered to be a reasonably accurate description of the damage.

14. This hit undoubtedly was made by a U.S. submarine torpedo. At that time the shift from TNT warheads to torpex virtually was complete. Therefore, it is believed that the charge was about 635 pounds of torpex (equivalent to between 900 and 1200 pounds of TNT in explosive power), although this is subject to verification by submarine war patrol reports.

15. Although the torpedo defense system of YAMATO in way of this hit is somewhat different from that in the middle one-half length (See Plate IV) and the torpedo struck quite shallow, (about four feet below the surface and in way of the main belt some distance above the joint between the upper and lower sections), it is possible to draw the following conclusions from this damage in case of torpedo hits by either U.S. aircraft or submarines (600 pound torpex warheads):

a. The connection joining the upper main belt to the lower section undoubtedly would be ruptured somewhat liberally, the seriousness of the rupture increasing with proximity to the joint. Thus, within reasonable limits, a deeper hit can be expected to cause a much more serious rupture of the joint than did this shallow hit.

b. The first bulkhead inboard of the armored bulkhead would be ruptured - the extent of the rupture depending on the distance inboard which either the top edge of the lower armor moves or the distance inboard which the bottom of the main belt moves.

16. The initial list after this damage was reported by several different officers to have been between 2° and 3°, which checks quite closely with a rough

calculation of the expected list, based on stability characteristics of the trial condition and reported quantity of water taken aboard.

17. As a result of the Japanese investigation of this damage, the Fourth Section (Ship Construction) authorized the installation of a 45° sloping plate across the corner of the upper void between the two inboard bulkheads. This plate is shown on Plate IV, in the midship section. It ran the full length of the machinery spaces. The avowed purpose was to maintain watertightness of the void between the two bulkheads, but this measure seems hopelessly inadequate, and the Chief of the Design Branch openly expressed the opinion that it could not have been of any possible value.

18. Summarizing, the above information indicates that:

a. A U.S. warhead with 600 pounds of torpex would rupture YAMATO's torpedo defense system. The amount of inboard flooding possibly might vary with the depth of the hit. Thus, if the point of impact was at or below the joint between the armored sections, inboard flooding probably could not be controlled. If the point of impact was in way of the main side a belt, inboard flooding might be controllable - but a hit in such a location certainly would be noticeable from within the space.

b. The angle of list from one torpedo hit is of the order of 2° to 3°, if the ship be reasonably near the upright condition and reasonably intact.

19. These conclusions in general were substantiated in the case of SHINANO (Section V), in which four submarine torpedoes struck the ship on the starboard side. Three of these were in way of the torpedo defense system, and each produced definite, immediate flooding of inboard spaces.

20. The conclusions in paragraph 18, substantiated by SHINANO's experience, are of importance in assessing the number of torpedoes which struck both YAMATO and MUSASHI. The loss of both of these ships is described in following sections of this report.

Section II - THE LOSS OF YAMATO

Plate III

YAMATO (BB) - Prototype of YAMATO Class

Length (O.A.)	263 meters (860 feet)
Length (W.L.)	256 meters (838 feet)
Beam (max.)	38.8 meters (127 feet)
Beam (W.L.)	36.9 meters (121 feet)
Displacement (full load)	72,809 tons
Displacement (trial)	69,100 tons
Draft (full load)	10.86 meters (35.5 feet)
Draft (trial)	10.4 meters (34 feet)
GM (trial)	2.93 meters (9.6 feet)
GZ (max.) (trial)	2.35 meters (7.7 feet) at 38°
Range of Stability (trial)	72°
Speed (trial)	27 knots (designed)

A. NARRATIVE

1. YAMATO was built at Kure Navy Yard. Construction was started in 1937, and she was completed and placed in commission on 16 December 1941.

2. She had a fairly active career, if not a particularly successful one. She was hit by a submarine torpedo 180 miles north of Truk on 25 December 1943, as described in Section I. Incident to the Battle for Leyte Gulf, 24-26 October 1944, she received three bomb hits forward of and in the vicinity of No. 1 turret. These did little damage and she was easily repaired.

3. Early in April 1945, she was designated as the major unit of a task group which was to attempt a disruption of U.S. landing operations at OKINAWA. The task group assembled at TOKUYAMA Bay, in the Inland Sea. The total force comprised YAMATO, YAHAGI (CL) and eight destroyers.

4. By 6 April YAMATO had fueled to 90 per cent capacity and had taken aboard a full supply of ammunition, including fuzed AA projectiles for the 46cm main battery guns. Her mean draft was about 35 feet, thus approaching that of the fully loaded condition.

5. Her crew was a veteran outfit, numbering about 2400 officers and men. Morale was reasonably high, despite the unfavorable war situation, chiefly because of the anticipation of action.

6. The force sortied at 1500 on 6 April, passing through BUNGO Strait about dusk. At 1800 YAMATO went to a material readiness condition in which one-third of the crew was at battle stations, with the remainder of the men sleeping in the vicinity of their battle stations. This condition was assumed because of the reported presence of U.S. submarines off BUNGO Strait. The night passed uneventfully, however - the group continuing south at 20 knots.

7. On the morning of 7 April, the crew had early revielle and breakfast was completed by 0700. At about 1000 uncertain radar contact was made with U.S. planes. At that time the order "Prepare to go to General Quarters" was issued to all ships of the group. A short time later U.S. aircraft were sighted and all ships went to General Quarters.

8. YAMATO was placed in a condition of complete closure, with all doors, hatches, ventilation closures, etc., tightly shut. Even the escape scuttles in the lower portion of vertical watertight doors (which the Japanese employed on all warships) were tightly dogged. Some five to seven minutes were required to set a condition of complete closure from the cruising condition. YAMATO was ready for action in every respect.

9. An attack did not develop for about two hours, although U.S. aircraft continuously shadowed the formation. The day was cloudy during the greater part of the morning, but a few clear patches of sky were visible by noon.

10. Shortly after 1200 (the Japanese were vague about times - those given in this account are the composite average from several reports and accounts, and may not check accurately with U.S. action reports), the Japanese sighted two large groups of U.S. carrier aircraft obviously preparing for an attack. YAMATO went to 24 knots, and the screen commenced the usual Japanese circling tactics.

11. Reference (B-3) reported this first action as two separate attacks, conducted almost simultaneously. For purposes of simplification, this report treats this first action as a single attack.

12. Of the survivors questioned, the Chief of Staff was on the upper combat bridge, eight levels above the flying (U.S. upper or forecastle) deck, the Executive Officer and Assistant Gunnery Officer were in the conning tower, and the Staff Gunnery Officer probably was at about the sixth level, where the OTC and staff usually were stationed. Both the Executive and Assistant Gunnery Officers received damage control reports by phone and messenger. An inclinometer was located in the conning tower so that angles of list reported by the two officers are believed to be generally accurate, even if not precisely so.

13. The first attack, starting about 1220, continued for several minutes. When it was over, YAMATO had received four bomb hits in the vicinity of No. 3 turret, and two or three torpedo hits on the port side. The initial list was 5° to 6° port.

14. Although the Staff Gunnery Officer reported only three bomb hits in USSBS Interrogation Report No. 133, testimony of the other three officers indicates conclusively that four bombs struck YAMATO. Two of these struck at about frame 150 on the starboard side of the flying deck, wrecking a 12.7cm (5 inch) mount at that location. Both detonated upon impact, blowing holes, reported to have been some 18 to 22 feet in diameter, in the flying deck. Many light AA weapons were knocked out. No fires were caused. The Assistant Gunnery Officer, on the basis of damage reports, estimated these two bombs at 250kg (corresponding to U.S. 500 pound bombs) of the "ordinary" (i.e. General Purpose) type.

15. The other two bombs followed the first two by about five minutes. These hit slightly to port of the centerline just forward of the after 15.5cm (6.1 inch) centerline mount*. One of them passed through the after secondary battery fire control station, wrecking the after director for the secondary battery. Both bombs penetrated the flying and upper (U.S. main) decks, and detonated above the second (armored) deck. These started a fire which never was extinguished. It burned until YAMATO sunk - at times dying down and at other times flaring up. The 15.5cm mount was gutted, only a single survivor of the gun crew escaping. This man a first-class petty officer had been interviewed by the Assistant Gunnery Officer and had given the latter much information concerning the bomb damage in that area.

16. Firefighting efforts were disorganized and ineffective. This fire may have been the cause of the magazine explosion which occurred as YAMATO capsized, some two hours and two attacks later.

17. The four officer survivors** did not agree on the number of torpedo hits in this first attack, although all did agree that there were no starboard hits. The Staff Gunnery Officer reported three in NavTechJap Report No. S-01-3, but gave no substantiating details. The Executive Officer reported four, but claimed that three hit forward in one location and still did not cause any flooding inboard of the torpedo defense system - a manifest absurdity. The Chief of Staff reported only two, one in way of the port outboard engineroom, and a second in way of No. 8 fireroom, and further that these two spaces started to flood slowly. The Assistant Gunnery Officer agreed with respect to these two hits and the slow flooding which they caused, but thought a third had hit on the port quarter, aft of the machinery spaces. He knew that magazines for No. 3 turret were not flooded because of damage however, at any time up to the last attack. Therefore, if a third did strike YAMATO, it must have been well aft, although no difficulty with steering was known to any of the officers.

18. The initial list of 5° to 6° after the hits, reported by the Executive and Assistant Gunnery Officers, is rather conclusive evidence of only two hits in the middle half-length. Substantiated by the flooding of inboard spaces, these two hits are assessed as certain, and are shown on Plate III as having struck at frames 125 and 150, although points of impact may well have been a few frames forward or aft of these locations. A third possible hit is shown

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*YAMATO and MUSASHI initially were intended to have four triple 20.3cm (8 inch) double purpose mounts, arranged in a diamond groupling, for a secondary battery. These were never installed. Instead two triple 15.5cm (6.1 inch) mounts taken from MOGAMI class cruisers were provided when those ships had their main batteries replaced with 20.3cm (8 inch) mounts.

**There were no officer survivors from machinery spaces.

on the port quarter aft of No. 3 turret at frame 190, although this hit is considered rather improbable in view of the small list (consistent with only two hits) and lack of knowledge of all officers as to any flooding from it.

19. Counterflooding of starboard outboard voids brought YAMATO up to a 1° port list. The Chief of Staff, the Executive Officer, and the Assistant Gunnery Officer all agreed that small reduction in speed occurred after the first attack, although flooding in the port outboard engineroom was controlled until the second attack. No. 8 fireroom was reported inoperable prior to the second attack.

20. The second series of attacks started some 40 to 45 minutes after the first - placing the time near 1300. The Staff Gunnery Officer, in USSBS Interrogation Report No. 133, reported two torpedo hits on the port quarter and two on the starboard side in the middle one-half length. He gave no substantiating details. This is a great variance with the stories of the three other officers, all of whom agreed that three of four torpedoes hit the port side and one hit the starboard side, all in the middle one-half length. There was no bomb hits.

21. The torpedoes striking on the port side caused immediate flooding of No. 8 and No. 12 firerooms, the port outboard engineroom and the port hydraulic machinery room. The Executive Officer reported that not more than 20 men (all enlisted ratings) escaped from these spaces at that time. This extent of flooding could indicate either three or four hits. The Assistant Gunnery Officer believed that the aftermost hit was close to the bulkhead at frame 143, which separated the port outboard engineroom and the port hydraulic machinery room, and thus caused flooding of the two spaces. Accordingly, three certain hits and one probable hit are shown on Plate III, as having occurred on the port side in this attack.

22. All three officers agreed that the starboard hit flooded No. 7 fireroom rather quickly, the torpedo having struck in the vicinity of frame 125. None of them knew of any other damage on the starboard side, although the Assistant Gunnery Officer vaguely recalled reports of a second starboard hit.

23. At the conclusion of the second attack, the list was about 15° to 16° port, all the officers agreed; speed was not more than 18 knots, and the fire aft was still burning. Additional counterflooding of starboard voids was done and YAMATO slowly returned to about a 5° port list. At that point all possible starboard voids had been flooded.

24. Some 30 minutes later, placing the time near 1345, the third and last attack developed. When it was concluded YAMATO had received two additional port hits and one more starboard hit, although agreement was not uniform. The Staff Gunnery Officer, in USSBS Interrogation Report No. 133, reported two or three port hits and one or two starboard hits. Again he gave no substantiating details. The Chief of Staff was positive that only one hit occurred on the starboard side, in way of the starboard outboard engineroom, causing leakage into that space. The Assistant Gunnery Officer verified the trouble in this space. He was also positive that two port hits occurred, one flooding inboard port fireroom No. 10, and the other starting leaks into the port inboard engineroom. The Executive Officer believed that three torpedoes had hit in the vicinity of the port outboard engineroom and No. 3 turret magazine spaces, possibly at or near frame 164. The Assistant Gunnery Officer could not verify this, however, on the basis of flooding of magazines.

25. The confusion which existed in the minds of the three officers interrogated as to the number of hits and the spaces flooded is understandable. Their memories were further confused by counterflooding efforts. The initial list was severe, some 16° to 18° port, and increasing rapidly. The Executive Officer, realizing the precariousness of the situation, ordered remaining starboard outboard firerooms (Nos. 3 and 11) and the starboard hydraulic ma-

chinery room flooded. This seems to have been done promptly, but had little effect other than temporarily to stop the ship from listing further. Soon the list again started to increase. As a last measure, the starboard outboard engineroom was ordered abandoned (the engineroom crew had been attempting to control flooding, with some success) and flooded. This was reported done, but the list was by now about 22° to 23° port.

26. In assessing the number of torpedo hits in this final attack, it seems certain that one starboard hit occurred (shown on Plate III at frame 150), and at least two, and possibly three, port hits, The two certain hits are shown on Plate III as having occurred at frames 135 and 154, although locations may well be somewhat in error. A third possible port hit is shown at frame 164, slightly abaft the port engineroom.

27. YAMATO's speed was sharply reduced. It was not more than 10 knots, with only the starboard inboard engineroom left in operation. The Commanding Officer ordered left rudder, hoping that a left turn with its consequent heel to starboard would assist in preventing further list. (This is in direct variance with the account given in USSBS Interrogation Report No. 133, by the Staff Gunnery Officer, who stated that a right turn was made - but the Executive Officer was positive and in a position to know, so his account is accepted.)

28. YAMATO was turning sluggishly when all power was lost, shortly after 1400. The Commanding Officer then ordered "Prepare to Abandon Ship". The list was increasing at an alarming rate. Within a very short period the order to "Abandon Ship" was given. YAMATO capsized very rapidly and before personnel from below deck spaces could make their escape. Only about 280 personnel survived, including 23 officers and warrants, and all of these were from topside stations. She is believed to have capsized at about 1420. As she reached an angle of about 120°, a large explosion occurred and she disappeared.

29. Final capsizing was so rapid that the Chief of Staff, on the eighth level in the tower, was trapped and carried under, where he lost consciousness. He was later picked up by a destroyer, where he was revived. Both the Executive Officer and Assistant Gunnery Officer left the conning tower. The Assistant Gunnery Officer climbed upward but was caught at the sixth level and swam off. The Executive Officer (the only one of the three to witness the explosion) said it occurred after YAMATO passed 90°. The explosion was photographed by U.S. aircraft and has been published by the press.

30. All survivors were in the water about 1½ hours, the majority being picked up by FUYUTSUKI (DD). The Commanding Officer of this ship had witnessed YAMATO's end at a distance of some 2000 to 3000 meters, and had told the Assistant Gunnery Officer that the explosion definitely was aft and that it occurred a small interval of time after YAMATO had rolled on her beam ends.

31. The Executive Officer reported that his impression was that a series of three explosions occurred about simultaneously in the vicinity of each of the three main magazines. He was injured internally and still suffering at the time of the interrogation (28 December 1945).

B. DISCUSSION

32. The aircraft torpedoes used against YAMATO employed warheads containing approximately 600 pounds of torpex. The majority of the torpedoes used in the attacks were reported to have had depth settings of 18 to 22 feet. As pointed out in Section I, there is every reason to believe that such a charge would have defeated YAMATO's torpedo defense system. The assessments in the narrative, and summarized below, are based partly on this conclusion, and partly on the angles of list reported, in connection with the spaces reported to have been flooded. In general, those hits regarded as certain had effects consistent with these criteria.

33. The following table lists all the hits reported. They are classed as "certain", "probable", and "possible", in accordance with the substantiating information given in the narrative.

	Certain		Probable		Possible	
	Port	Stbd	Port	Stbd	Port	Stbd
First Attack* 1220	Fr 150 Fr 125				Fr 190	
Second Attack** 1300	Fr 143 Fr 124 Fr 131	Fr 124	Fr 148			
Third Attack***	Fr 135 Fr 154	Fr 150			Fr 164	
TOTALS	7	2	1		2	

*Angle of port list about 5° - 6° reduced to 1° by counterflooding.
**Angle of port list about 16° reduced to 5° by counterflooding.
***Angle of port list about 16° increasing. Capsized 20 to 30 minutes after end of attack.

Plate III indicates the locations of the hits as given above. The frame numbers given are estimates, of course, for the purpose of showing points of impact. These might well have been some frames away from those listed. Overlapping of damage from hits on successive attacks seems to have occurred in two instances; i.e., in the vicinity of frame 150 port, and of frame 125 port, judging from the flooding of port inboard machinery spaces.

34. It will be noted that both possible hits were on the port side. It is considered doubtful, in view of the lack of information concerning them and the angles of list reported, that they occurred. The one probable hit in the second attack could well have occurred in the confusion of several torpedoes striking in the vicinity, more or less simultaneously.

35. The effect of the two starboard hits, despite the loss of buoyancy involved, was to make the counterflooding problem easier and to prolong YAMATO's period of sinking. The balancing effect of torpedoes striking both sides of a capital ship was even more pronounced in the case of MUSASHI (Section III), where the hits were almost equally divided.

36. There can be no doubt that YAMATO was sunk by torpedoes - the magazine explosion occurring after she had capsized. The cause of the explosion could not be ascertained definitely. Both the Assistant Gunnery Officer and the Chief of Staff expressed the opinion that the fire aft ignited the magazines for the after 15.5cm mount, passing to them via the hoists as the ship rolled over. Ammunition handling arrangements apparently were such as to permit this, although the detail study required to assess the probability of such an occurrence could not be made. The Executive Officer* disagreed with this theory. It was his opinion that 46cm H.C. and incendiary projectiles (used for both shore bombardment and AA barrage fire) in the shell rooms of all

*He formerly had been Gunnery Officer, rising to Executive Officer in February, 1945.

three main turrets were the cause. The projectiles were racked vertically around the shell room, and he believed that as YAMATO reached an angle of about 100° to 120°, they fell out of their fastenings - striking nose first on the deck. Detonation then occurred, setting off the powder magazines. All had fuzes installed, although they were set on "safe". The H.C. projectiles, of 3000 pounds total weight, each contained a bursting charge of 136 pounds of Trinitroanisole (TNA), while that of the incendiary projectiles was somewhat less. A study of the fuzes**, made by U.S. Bomb Disposal Officers, reveals that fuze initiation under such circumstances is virtually impossible. It is concluded that the fire aft was the more reasonable source of ignition of the explosion.

37. The reliance which the Japanese placed in counterflooding measures to control large angles of list was not substantiated in YAMATO's case. Although a moderate list could be removed quickly, as in MUSASHI's case, counterflooding capacity was limited to little more than required to right the ship when struck by three torpedoes on one side, if the torpedoes did not defeat the torpedo defense system. In YAMATO's case, if the two starboard hits had not occurred, the inability to control angles of list greater than about 10° undoubtedly would have become apparent much earlier in the action. Counterflooding of outboard engineering spaces is an extreme measure and inadvisable except under the most adverse circumstances. It can scarcely be classed as a routine operation.

38. With a sharp list, of the order of 16°, where the upper (U.S. main) deck takes the water, the outboard voids could be filled only to about 55 per cent capacity by flooding from the sea - a serious deficiency in attempting to control list, by virtue of the small righting moment thus available. This was an important factor in the capsizing of both YAMATO and SHINANO. There was no damage control pumping system of adequate capacity provided for completely filling the outboard voids in case of large angles of list. Thus, even though the ships were not seriously damaged, there was no ready means of removing lists as large as 16° - 18°, other than by flooding outboard engineering spaces. From the standpoint of resistance to damage, it is considered that carrying outboard layers filled with liquid (either salt water ballast or fuel oil) to limit initial angles of list would have been far preferable. A damage control pumping system of large capacity also would have been a distinct asset on the ships of the YAMATO Class.

Section III - THE LOSS OF MUSASHI (BB)

Plate IV

MUSASHI (BB) - A sister of YAMATO

Length (C.A.)	263 meters (860 feet)
Length (W.L.)	256 meters (838 feet)
Beam (max.)	38.8 meters (127 feet)
Beam (W.L.)	36.9 meters (121 feet)
Displacement (full load)	72,800 tons (approx.)
Displacement (trial)	69,100 tons (approx.)
Draft (full load)	10.86 meters (35.5 feet - approx.)
Draft (trial)	10.40 meters (34 feet - approx.)
GM (trial)	2.93 meters (9.6 feet - approx.)
GZ (max.) (trial)	2.35 meters (7.7 feet - approx.) at 38°
Range of Stability (trial)	72° (approx.)
Speed (trial)	27 knots (designed)

**The fuzes on such projectiles are the usual Japanese timed fuzes, with delays up to 55 seconds, listed as Type 91 in U.S. reference manuals of Japanese fuzes.

A. NARRATIVE

1. MUSASHI was YAMATO's sister, built to the same plans and specifications. Her main side belt was 400mm (15.8 inches) in thickness compared with YAMATO's of 410mm (16.1 inches) - a negligible difference. MUSASHI was built at the Mitsubishi Dockyard at NAGASAKI. She was completed in August 1942 and entered active service shortly thereafter.

2. Her war record apparently was not distinguished, as little information concerning her activities has been found. She was reported to have been with the Japanese Fleet during the Battle of the Philippine Sea in June 1944, but escaped damage. So far as is known she had not been damaged prior to 24 October 1944 - the day she was sunk.

3. When this investigation was started, there was very little data available. That which was available was fantastic and completely out of proportion with the characteristics of the ship, the events which caused YAMATO's loss, and those involved in the loss of SHINANO. For example the Chief of Staff to the OTC in command reported in USSBS Interrogation Report No. 149 that she had been hit with 18 torpedoes and 40 bombs - deriving his information, he said, from survivors. Again, the action report briefed in Article, this report, lists 21 torpedo hits. Yet MUSASHI did not sink until about four hours after the end of the last and most vicious attack made against her. It appeared that the well-known Japanese trait of magnifying disaster had had full rein, with no questions asked by any office of the Naval Ministry.

4. Fortunately, the Executive Officer and the Chief Engineer were made available for interrogation. Both had personal notebooks filled with many details of MUSASHI's loss. Both had interviewed many other survivors. Both officers also reported 21 torpedo hits, but it turned out that the Executive Officer had assisted in the preparation of the action report referred to in paragraph 3. Nonetheless, both officers appeared unusually intelligent and well-informed. Concerning ten of the hits, they were able to furnish a comparatively large amount of detailed information. Of the other eleven they could give absolutely no details, despite the facts that the Executive Officer had received almost all damage control reports and kept notes of the reports, and that the Engineering Officer was in the machinery spaces almost the entire period of action.

5. MUSASHI departed LINGGA, not far from Singapore, at midnight during the night of 21-22 October 1944. Upon departure she was fully loaded, drawing almost 36 feet. She was a unit of the Japanese Second Fleet which proceeded directly to an operating area in the central Philippines. During this passage MUSASHI burned about 1000 tons of fuel oil, and transferred another 800 tons to accompanying destroyers. On the morning of her last day her draft was about 34.5 feet.

6. Her crew was exceptionally well-trained by Japanese standards. Her regular routine included two daily drills for the purpose of instructing the crew how to set a proper and complete condition of closure. Special counterflooding drills also were held in which actual lists of 1° had to be removed. During these drills it had been found that four or five outboard voids were required to remove a list of 1°. This is about one-half to one-third of the list which occurred when YAMATO received one torpedo in December 1943 (See Section I).

7. At 0600 on 24 October, the crew went to General Quarters and the ship was made ready for action. A condition of complete closure was reported set. Speed was 20 knots. Heavy air attacks were expected during the day. The Executive Officer was at his battle station on the third level, behind the conning tower. The Chief Engineer was in the port inboard engineroom control booth - the control engineroom.

8. Shortly after 1000, the first U.S. aircraft were sighted. Speed of the formation was increased to 22 knots. The first attack started about 1030 and continued for four or five minutes. MUSASHI was bracketed by near miss bombs*, but received no bomb hits. Two small forward peak tanks in the vicinity of frame 20 were flooded. Three torpedoes were reported by both captains to have struck her on the starboard side. The first was in the vicinity of frame 130, in way of No. 11 fireroom. There was considerable leakage into this space which was controlled for a time. This hit was classed as certain. The second torpedo was reported to have struck at about frame 140, in way of the starboard hydraulic machinery room, just forward of the outboard starboard engineroom. The third torpedo was reported to have hit about frame 150, in way of the starboard outboard engineroom. But no flooding in either space was known to either officer. Furthermore, the initial list after this attack was reported by both officers to have been small, not more than 3° starboard, as read from inclinometers. If three torpedoes had hit one side, even without penetration of the torpedo defense system, the list certainly would have been of the order of 8° to 10° starboard. Accordingly, only the hit at frame 130 is assessed as certain - the other two seem hardly worth classifying even as possible.

9. Speed was not affected. Counterflooding of port voids reduced the list to 1° starboard. In this condition, with a slight trim by the bow, MUSASHI received the second attack.

10. About 1140, an hour or so after the first attack, the second developed, lasting for four or five minutes. Near miss bombs did no damage. Two bombs did strike the ship, however. The first was a dud, striking the flying (U.S. forecastle) deck at frame 15 port and passing down and out through the port shell above the waterline. There was no flooding. The second bomb struck the 01 level at frame 138, some six or eight feet to port of the smokepipe. It pierced two decks before detonating. There was no sustained fire, but there was considerable damage. The port inboard engineroom filled with steam, forcing its abandonment. It never again was manned. The Chief Engineer moved to the starboard inboard engineroom.

11. Three torpedo hits again were reported, this time all on the port side. The first struck near frame 143, close to the bulkhead separating the port outboard engineroom and the port hydraulic machinery room. The latter space started to flood at a rate somewhat beyond control, but not instantly. Minor leakage into the engineroom occurred, but this was not serious. This undoubtedly was a hit.

12. The points of impact of the other two torpedoes were reported at about frame 80 (in way of No. 1 turret), and about frame 110 (at the forward bulkhead of the forward port outboard fireroom). There was no damage or inboard flooding insofar as the two officers were aware. The list after this attack was negligible to port (it had been 1° starboard). It is considered that three torpedoes could not have struck the ship on the port side without causing a most noticeable port list. Counterflooding of a few starboard voids removed the small port list.

13. At the conclusion of the second attack the most serious matter aboard MUSASHI was the loss of the port inboard engineroom. R.P.M. on the other three shafts were increased, and formation speed was maintained with little effort.

14. About 30 minutes later, at 1215, the third attack developed and continued for four or five minutes. No bombs hit the ship, but fragments from a close near miss astern damaged the airplane crane. One torpedo hit at about frame

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*Near miss bombs are not shown on Plate IV, but damage and flooding from them is labeled.

60, starboard, forward of the torpedo defense system, flooded several large storerooms. The beam was relatively narrow this far forward, and only a negligible starboard list developed. She changed trim by the bow more than 2 meters (6.5 feet), however, according to both officers. This is considered a certain hit.

15. MUSASHI thus escaped serious damage in the third attack. Up to this time it is considered that only three torpedoes had struck her, one on each side in the middle one-half length and one well forward. She was not seriously damaged.

16. The fourth attack developed at 1250, about 30 minutes after the third. Four bombs hit the ship. The first, at frame 45 port, penetrated three decks prior to detonating in a crew's space. There was no fire, and no damage which permitted any flooding. The second struck at frame 65 port, somewhat forward of the armored citadel. It penetrated two decks and detonated in a living space. Again there was no fire. The third hit at frame 70 port, penetrated two decks and detonated slightly forward of the sloping armored bulkhead, doing minor damage. The fourth struck at frame 134 starboard on the flying deck, well outboard of the smokepipe and detonated upon impact. It knocked out some light AA weapons. None of these bombs did sinking damage. Each was well identified and located by the Executive Officer.

17. During the fourth attack, four torpedoes were reported to have struck MUSASHI. The first was at about frame 70 port, in way of storerooms, many of which were flooded. The second also hit at about frame 70, but on the starboard side. As a result of these two torpedoes, plus the one at frame 60 starboard from the third attack, MUSASHI was almost completely flooded across the ship from bulkhead 54 back to the armored citadel.

18. The third torpedo hit at about frame 138 starboard, instantly flooding the starboard hydraulic machinery room. The Executive Officer expressed the opinion that this torpedo hit in the same location as did one in the first attack. As pointed out in the description of the first attack, it is problematical, to say the least, if a torpedo struck in this location during the first attack. The fourth torpedo was thought by the two officers to have hit in way of the starboard forward outboard fireroom near frame 110, but again there was no inboard flooding. List at the conclusion of this attack was only about 2° starboard, indicative of not more than one unbalanced hit to starboard in the middle one-half length. Therefore, it is concluded that only the torpedo at or near frame 138 actually struck in the middle half-length. This, plus the two forward at frame 70, gives a total of only three torpedo hits for the fourth attack.

19. Trim by the bow, however, was a most serious matter. The waterline at the stem was almost to the upper (U.S. main) deck. Speed was reduced to about 16 knots and MUSASHI dropped out of formation. Port voids were counterflooded and the small starboard list was removed.

20. Some 20 minutes after the end of the fourth attack, making the time about 1315, a fifth attack occurred, but no damage was inflicted. MUSASHI limped northward. Three enginerooms and nine firerooms (No. 11, due to damage from underwater attack, and two inboard firerooms, because of blocked access from bomb damage, were not steaming) were in operation. Speed was further cut to 12 knots as a safety precaution made necessary by the heavy trim forward. There was little list or progressive flooding. However, no attempt was made to remove water from the voids which had been flooded for list correction purposes, although each was fitted with a connection to steam eductors with rated capacity of 200 tons of water per hour. This failure to gain buoyancy was a fatal error.

21. At this time she had received six certain bomb hits, none of which had caused any flooding damage. Six certain torpedo hits had been received.

Three of these were in the middle one-half length, two to starboard and one to port. The other three were all in the unprotected bow structure, two to starboard and one to port. MUSASHI was not fatally damaged or necessarily in jeopardy unless additional damage was received. Almost all outboard voids on both sides had been flooded, however, and there was little freeboard remaining at the bow. Much of the AA battery also was dead.

22. The sixth and most vicious attack came two hours after the futile fifth attack, at about 1520. It was completed in a matter of minutes. In this attack ten certain bomb hits were received which made a shambles of some upper areas. None caused any damage below the armored deck, however, or punctured the sides above the waterline to any great extent. For the sake of brevity these are catalogued below:

Frame 75, starboard	Hit top of No. 1 turret. Did not penetrate.
Frame 62, port	Added to damage of main and forecastle decks caused in fourth attack.
Frame 79, starboard	Detonated in wardroom on main deck.
Frame 115, starboard Frame 115, starboard	These two bombs fell close together, detonating on impact with the flying deck and extensively damaging topside structure.
Frame 108, port Frame 115, port	These two bombs, detonating in main deck spaces, destroyed all radio rooms in the vicinity.
Frame 120, port	This struck the 08 level of the forward tower, detonating on impact with the port side.
Frame 120, centerline	This struck the top of the forward tower, detonating with very short delay. It gravely wounded the commanding officer.
Frame 127, centerline	This struck the after part of the tower structure, close to the 02 level. It did little damage.

23. Fatal damage was done by torpedoes. Both captains reported ten hits. Two of these were reported as duds, striking at frame 140 port. While identifying a dud torpedo hit in the midst of a heavy air attack offers grounds for speculation, the matter was not pressed beyond determining that they had been reported presumably by eyewitnesses. No flooding inboard of the holding bulkhead was reported, in any event.

24. Of the remaining eight torpedoes, four were quite well identified by flooding reported by the Chief Engineer and Executive Officer. The first was at frame 75 port, in way of turret No. 1 magazines. Magazines on the two lower levels were flooded. This hit was reported by the Executive Officer to have hit in the same area as a hit in the fourth attack (which was not assessed as a hit because no flooding was known to either officer). The second certain hit was near frame 125 port, flooding No. 8 fireroom immediately. No. 12 fireroom was flooded more slowly. The third certain hit was near frame 145 port, flooding the port outboard engineroom quite rapidly, although personnel escaped. Again the Executive Officer believed this hit to be in the way of a previous hit from the second attack (which was not assessed as a hit because no inboard signs of damage were recalled by the Chief Engineer). The fourth certain hit was near frame 105 starboard, in way of AA magazines immediately forward of the machinery spaces. Magazines on two levels were reported to have flooded.

25. Neither officer could recall any specific damage or flooding from the other four torpedo hits from this attack, although the Executive Officer had the locations entered in his notebook. This lack of information is understandable, perhaps, although it is pointed out that about four hours elapsed between the end of the attack and MUSASHI's sinking. Nonetheless, they are assessed as possible hits in the following location:

About frame 40 port
About frame 60 port
About frame 80 starboard
About frame 165 port

26. At the end of this attack MUSASHI had a noticeable list to port, estimated by both officers as about 10° to 12°. The trim forward was serious, with the waterline at the stem in the vicinity of the flying (U.S. forecastle) deck. Three certain torpedo hits were on the port side and one on the starboard side. The reported list thus is reasonably consistent with the number of hits assessed as certain. It is difficult to assess the possible hits in terms of either trim or list, inasmuch as the certain hits are consistent with conditions and the possible hits, had they occurred, could reasonably be expected to have produced a much heavier list (three possiblies were well forward). Actually trim by the bow increased only one deck height. It is considered doubtful that they occurred.

27. Speed was down to six knots, not sufficient for steerageway. Only the two starboard enginerooms and seven firerooms were still in operation.

28. To attempt to improve trim and list simultaneously, large storerooms on the starboard quarter were ordered flooded. These were not equipped with sea valves, however, and not enough fire pumps remained in operation to flood them from the firemain. The attempt was given up. On his own initiative, the Chief Engineer flooded the remaining outboard starboard firerooms (it is not clear if No. 11 fireroom had flooded completely following the first attack, but it had not been steaming for some time). This checked the list at about 12° port, but did not right the ship.

29. The bow continued to settle, indicative of progressive flooding forward, despite damage control efforts to establish flooding boundaries. The list continued to increase slowly. By 1800 all power was lost, and by 1900 the situation was hopeless. Although list still was not more than 12° to 15° port, the flying (forecastle) deck forward was submerged back to No. 1 turret,

30. "Abandon Ship" was ordered and removal of the crew by destroyers was begun. At about 1920 the list began increasing at an alarming rate. At 1930 it was greater than 30°, and the rate was increasing. At 1935 a sharp lurch to port occurred and MUSASHI turned bottom-side up. She slid under, bow first.

31. The Executive Officer swam off from one of the upper levels in the tower. He saw the propellers as MUSASHI disappeared. The Chief Engineer climbed over the side amidships as MUSASHI lurched to port. He walked and scrambled arcund the girth against the roll, climbing over the bilge keel. Finally, he was thrown off into the water and swam away to port. There were no explosions.

B. DISCUSSION

32. Aircraft torpedoes with warheads containing 600 pounds of torpex were employed against MUSASHI. The depth settings employed are largely unknown but a few were set quite shallow. It is doubtful if any were more shallow than the submarine torpedo which struck YAMATO in December 1943 (from Section I it will be recalled that the depth of this hit, located by the puddled area on the armor, was about four feet). Therefore, all hits other than duds should have caused some inboard flooding.

33. Using the criteria of initial list and inboard flooding in way of the torpedo defense system, the following summation of certain torpedo hits is presented:

	Location	Spaces Flooded
First Attack* 1030	Starboard, Fr. 130	No. 11 fireroom - leakage
Second Attack** 1140	Port, Fr. 143	Port hydraulic machinery room. Rapid flooding.
Third Attack# 1215	Starboard, Fr. 60	Storerooms - open to sea.
Fourth Attack## 1250	Port, Fr. 70 Starboard, Fr. 70 Starboard, Fr. 138	Storerooms - open to sea. Storerooms - open to sea. Stbd. hydraulic machinery room - instant flooding.
Fifth Attack 1315	No hits	
Sixth Attack 1520	Port, Fr. 75 Port, Fr. 125 Port, Fr. 145 Starboard, Fr. 105	Turret #1 magazines, rapid flooding No. 8 fireroom, slow flooding. No. 12 fireroom, slow flooding. Port outboard engineroom rapid flooding. AA magazines - rapid flooding.

*3° stbd. list, corrected to 1° stbd.
**Minor Port list, corrected to 0°.
#List not perceptible - trim by the bow.
##2° stbd. list, corrected to 0° - heavy trim by the bow.

34. Thus there were five starboard and five port certain hits, possibly augmented by one or more of the four purported hits received in the last attack, although these possible hits are considered improbable. The equal distribution, port and starboard, and the interval between attacks undoubtedly were responsible for MUSASHI's lingering death throes. Granting all lethal hits reported by the Japanese, the total distribution becomes ten port and nine starboard. The four hours required for MUSASHI to sink after the last attack was a much longer interval than the 20 to 30 minutes required for YAMATO to capsize. The difference is considered to be due almost entirely to the balanced location of hits on MUSASHI.

35. The two cases considered together emphasize the necessity of obtaining multiple hits on one side of capital ships if torpedoes are to cause rapid capsizing.

36. The 16 bomb hits on MUSASHI, none of which penetrated deeply, again demonstrate the fact that bombs, even in large numbers, can not do sinking damage unless they are capable of penetrating below the waterline in case of hits, or well below the surface in case of close near misses, prior to detonation.

37. The absence of fire is noteworthy. This apparently was due to carrying outboard voids empty. The absence of fire following the bomb hits is difficult to understand, inasmuch as MUSASHI, in common with all other Japanese

warships, carried much material usually considered to be inflamable. Wooden furniture, wood deck boards in crews spaces, wooden sheathing for insulation purposes, and untreated beddings were common throughout the ship. Other evidence of the conspicuous absence of fire on Japanese ships following bombing attacks will be found in Reference (B-7).

Section IV - THE LOSS OF TAIHO (CV)

Plate V

TAIHO (CV) - A single ship

Length (O.A.)	260 meters (851 feet)
Length (W.L.)	253 meters (828 feet)
Beam (W.L.)	27.7 meters (90.5 feet)
Displacement (full load)	36,809 tons
Displacement (trial)	34,200 tons
Draft (full load)	10.15 meters (33.1 feet)
Draft (trial)	9.6 meters (31.3 feet)
GM (trial)	2.13 meters (7 feet)
GZ (max.) (trial)	1.95 meters (6.3 feet) at 40°
Range of Stability	86°
Speed (trial)	33.3 knots
Flight Deck Armor	75mm (3 in.) C.N.C. over 20mm (0.8 in.) D.S.
Number of aircraft	52

A. NARRATIVE

1. TAHIO was the last large Japanese carrier to be designed and built as a carrier. She was built at the Kawasaki Dockyard, KOBE, being completed on 7 March 1944. On that day she entered active service.

2. Her active career was short-lived. She never came under enemy air attack, although her own aircraft did participate in the air action of 19 June 1944, incident to the Battle of the Philippine Sea. On that date she was sunk by a single submarine torpedo.

3. Her Navigator was interrogated. He supplied sufficient verification of the account given by officers of the Fourth Section (Ship Construction) of the Technical Department to make further interrogation of survivors unnecessary. The loss of TAIHO from such modest damage was a cause of great concern, both to the operating forces and to the naval designers. As a result, her loss was analyzed exhaustively by a Special Committee composed of representatives from all sections of the Naval Ministry. The report of this committee was reported to have been destroyed when the Ministry was burned in May 1945, but enough members from the Fourth Section were available for interrogation to obtain a complete account of the events which caused her loss.

4. After completion, TAIHO moved to the SINGAPORE area for training, arriving there early in April 1944. Gunnery, damage control, engineering, and air operation exercises were held for training of the crew. Although rated by her designers as adequate to operate only 52 planes, her squadron actually totaled 64 aircraft. Her training was reported as quite thorough, although brief. Her damage control performance on 19 June, however, was extemely poor.

5. She moved to TAWI-TAWI about 15 May and remained there until about 14 June, when she moved to the central PHILIPPINES to prepare for her first action. On 16 June, as a unit of the Japanese Task Force under the command of Vice Admiral OZAWA, she moved eastward. Dawn of 19 June found her about 400 miles west of SAIPAN, where U.S. landing operations were in progress.

6. About 0800 she launched her aircraft. Her entire squadron was committed, except for 16 aircraft retained aboard for CAP purposes. She was fully closed, with the crew at General Quarters. The force had been alerted against submarines the previous day, when contact reports indicated they were in the vicinity.

7. After launching aircraft, the formation cruised north at 26 knots. At about 0830 a single torpedo struck TAIHO on the starboard side in the vicinity of the forward gasoline tanks. Various accounts place the center of impact at about frame 54, although the exact location is of little importance.

8. The damage was considered minor. The forward elevator, in the up position at the time, fell about two meters (6.5 feet) and jammed. The deck of the elevator pit (the top of the compartment containing the forwardmost set of tanks; see Plate V) was ruptured over a large area. As TAIHO changed trim, going down by the bow about 1.5 meters (4.9 feet), the elevator pit flooded with liquid gasoline, water, and fuel oil. TAIHO reduced speed only one knot, however, continuing with the formation as it moved north. There was no fire.

9. The crew decked over the forward elevator opening, and the remaining 16 aircraft were launched prior to 0900.

10. Gasoline fumes permeated both the upper and lower hangars, which had large openings to the elevator well. Recognizing the danger, efforts were made by damage control personnel to rid the ship of fumes. At first, all possible doors and hatches were opened in the hope that natural draft, due to TAIHO's speed, would remove the fumes. The effect was to spread the fumes to spaces not prviously exposed. The fact that hangars were completely enclosed was a major obstacle to gas-freeing them. Efforts to pump the free gasoline overboard from the elevator pit were bungled.

11. Finally, it was decided to operate every ventilation set on the ship, both supply and exhaust. This was done. This had the effect of spreading fumes even more widely. The ship literally was reeking with gasoline.

12. At 1330 a gigantic vapor explosion occurred. The Navigator, on the top of the pilot house at the time, stated that the explosion appeared to be centered in the vicinity of the forward elevator opening. The armored flight deck was split down the center, and both side bulkheads of the hangar were blown out. The heavy flight deck seemed to deflect the force of the blast downward, according to the Navigator. In any event, the only survivors from the engineering spaces were from No. 2 fireroom. These few men escaped by crawling straight up over masses of tangled wreckage. Some survivors from the crews spaces on the orlop deck (the next deck below the lower hangar deck) escaped by crawling through holes in the side of the ship. Much below-waterline damage was done. TAIHO started to settle and list to port.

13. The whole ship was engulfed in flames. This fire never died down. It apparently was fed by gasoline from the ruptured tanks.

14. Further damage control efforts were useless. TAIHO was abandoned, with all engineering spaces dead and the fire raging unabated. About 1500 she lurched to port, capsized and plunged by the stern (the Navigator was certain she did not go down by the bow). More than 1000 of her crew perished, survivors totaling less than 500. Almost all survivors were from topside spaces.

B. DISCUSSION

15. The location of the gasoline tanks was a serious design error. They were forward of the torpedo defense system (which extended only the length of the machinery spaces), and surrounded only by a thin layer of fuel oil tanks, as shown on Plate V. Again, the failure to provide at least one intervening space between the top of the tanks and the deck of the elevator pit had seri-

ous consequences. Finally, the deck of the elevator pit actually was below the waterline when the ship was fully loaded. In the event of flooding, causing an increase in draft, the pit would be well below the waterline, as actually occurred. In short, the forward gasoline tanks could scarcely have been located in a worse position.

16. The Japanese designed no more carriers. It is interesting, however, to record the action which was taken on remaining carriers as the result of this catastrophe. The alterations accomplished are listed below:

a. Gasoline capacity on remaining carriers was drastically reduced.

b. All gasoline tanks were to be surrounded by a three-foot layer of reinforced concrete. The purpose was to absorb fumes, or act as a seal, in case of inadvertent leakage. The Japanese did not use water replacement systems because of the objections of aviators.

c. Large supply fans were installed in the forward bulkheads of all hangars to assist in gas-freeing them.

d. Portable canvas screens were provided all carriers. These were to be rigged on the flight deck forward of the forward elevator opening to form large wind scoops to force air into the hangars.

17. The investigating committee found the TAIHO's crew guilty of poor damage control practice on three counts:

a. Failure to create a foam blanket over the forward elevator pit. In this connection, all Japanese carriers were provided with large capacity fog foam systems (NavTechJap Report No. S-01-3).

b. Opening up spaces throughout the ship.

c. Turning on all ventilation fans. This not only served to spread fumes, but provided innumerable sources of ignition.

Section V - THE LOSS OF SHINANO (CV)

Plate VI

SHINANO (CV) - Built on a YAMATO Class hull.

Length (O.A.)	266 meters (872 feet)
Length (W.L.)	256 meters (838 feet)
Beam (W.L.)	36.9 meters (121 feet)
Displacement (full load)	71,890 tons
Displacement (trial)	68,059 tons
Draft (full load)	10.8 meters (35.4 feet)
Draft (trial)	10.3 meters (33.7 feet)
GM (trial)	3.5 meters (11.4 feet)
GZ (max.) (trial)	2.9 meters (9.5 feet) at 40° (approx.)
Range of Stability	79°
Speed (trial)	27 knots (designed)
Flight Deck Armor	75mm (3 in.) C.N.C. over 20mm (0.8 in.) D.S.
Number of Aircraft	47

A. NARRATIVE

1. Of all naval catastrophes, from the Japanese point of view, the loss of SHINANO was the most depressing. The third and last of the super-warships, she was sunk on the second day of her maiden cruise, by only four submarine torpedoes. The shock which went through the Japanese Naval Ministry is better imagined than described. In any event, a special committee was formed to in-

vestigate the tragedy. While the record of the investigation was reported to have been destroyed in the destruction of the Naval Ministry in the fire raids of May 1945, a brief of its findings will be found in NavTechJap Report No. S-01-3. In addition, members of the committee representing both the Fourth Section (Ship Construction) and the General Affairs Department were interrogated. Finally, the Damage Control Officer and the Assistant Damage Control Officer were interrogated to verify the accounts given by members of the committee. All accounts checked closely, and the basic facts are considered to have been established beyond conjecture.

2. The construction of SHINANO was started in late 1940 in the Yokosuka Navy Yard. The loss of four carriers at the Battle of Midway in 1942 was responsible for the decision to convert her to a carrier. Except for the fact that her main belt was only 6.4 inches in thickness (compared to 16.1 inches on YAMATO), her underwater hull was identical with YAMATO's. The second deck armor was only four inches in thickness compared to 8.1 inches on YAMATO, but SHINANO had a three-inch armored flight deck.

3. In November 1944 she was approaching completion. The majority of the officers and crew had reported aboard by 1 October. The threat of the early fall raids on the TOKYO area led the Japanese to decide to move her to the Inland Sea. Although the younger officers and the enlisted men had had no training aboard SHINANO (actually about 75 percent had had some previous seagoing experience), she sailed on 28 November. Substantially complete, there were, nonetheless, two major uncompleted items of work. Final completion air tests of compartments had not been conducted, and many holes in bulkheads and decks, for pulling cables, running pipelines, etc. had not been sealed. The firemain and drainage systems were not in complete operation because of nondelivery of the majority of the pumps. In addition, the committee gave as one of its opinions that quality of workmanship, as a whole, had been poor because of the speed-up in building.

4. She had been commissioned on 18 November. The next ten days were utilized in taking aboard stores and ammunition in limited quantities. The complement totaled about 1900 officers and men. She sailed during the day of 28 November.

5. That night she steamed at 18 - 20 knots, escorted by three destroyers. Six firerooms were steaming. Watertight doors on and above the armored deck were open. Many hatches in the deck below the armored deck were open for access to machinery spaces. The Damage Control Officer had the mid-watch in the second (below decks) station, located on the deck below the armored deck, starboard side, frames 104 - 112. The Assistant Damage Control Officer had just finished an inspection of the ship and was loafing in the first damage control station in the island.

6. About 0320 four torpedoes from a single salvo hit the starboard side. SHINANO immediately assumed a 9° or 10° starboard list. The second damage control station started to flood. Although it did not flood completely until SHINANO capsized, efforts to control flooding were in vain, and it was abandoned by the Damage Control Officer. Other reports of flooding arrived. The starboard air compressor room, frames 89 - 103, on the orlop deck (first platform) was flooded. AA magazines below also were flooded. These spaces locate the forwardmost hit in the vicinity of bulkhead 104 (See Plate VI).

7. The starboard forward outboard fireroom (No. 3) flooded instantly. It was reported that there were no survivors from this space. No. 1 fireroom (inboard of No. 3) flooded slowly through leaks in the outboard bulkhead, in way of the heavy H beams tying the holding bulkhead in No. 3 fireroom to it. No. 7 fireroom, immediately aft of No. 3, also began to flood slowly, indicating that this hit was not far forward of bulkhead 120 which separated the two firerooms.

8. Further aft, the starboard outboard engineroom was flooding rapidly through copious leaks around the shaft bulkhead stuffing gland in bulkhead 160, and less severely through the holding bulkhead at the after corner. All personnel escaped. This torpedo was believed by the Damage Control Officer to have hit in way of the stuffing box compartment, frames 160 - 162.

9. The fourth torpedo hit in way of the after gasoline tanks (fortunately empty), aft of the torpedo defense system. Refrigerated storerooms on the first platform, frames 188 - 201, above the gasoline tanks, were flooded. The third deck above the refrigerated spaces was ruptured badly, killing many personnel asleep in that location.

10. Port outboard voids were flooded, checking the list temporarily at about 11° or 12°. Progressive flooding was continuing, however. Spaces aft on the third and first platform decks, including some magazines within the armored citadel, were flooding slowly. There were no drainage facilities. Gasoline handy billies were available but no one knew how to operate them. The Japanese did not have portable submersible pumps. Some portable hand pumps, of limited capacity, were placed in use, but these were not effective. A few bucket brigades were organized, but the men drifted away.

11. Civilian technical personnel aboard, dressed similarly to officers and enlisted men, added to the confusion by refusing to obey orders. These individuals assembled in upper spaces adjacent to the hangar and refused to go below.

12. The list continued to increase slowly. SHINANO was still underway at slow speed. About 1½ hours after the hits (near 0500), the Chief Engineer flooded the three port outboard firerooms. This checked the list for a short time, but had no permanent effect. At about 0600 all power was lost. Boiler feed water for the inboard firerooms had been exhausted and the fireroom crews did not know how to steam on salt water, according to members of the committee. In any event, mal-operation of some degree occurred.

13. Dawn was breaking at this time. All discipline had been lost and members of the crew were abandoning ship. About 0700 the Assistant Damage Control Officer procured the Emperor's photo from the bridge, and, with the Commanding Officer's approval, wrapped it and transferred it by line to a destroyer alongside.

14. By 0800 the list was heavy and transfer of the crew to destroyers alongside was started. Time passed and list continued to increase slowly. Shortly before 1100 SHINANO capsized to starboard, rolling bottom up, and slid under stern first. About 75 percent of her crew was saved.

15. The Damage Control Officer, who had been on the bridge with the Commanding Officer, swam off as she rolled over. The Assistant Damage Control Officer went out a port hangar door, walked around the girth to the keel, climbing over the large bilge keel in passing, and swam away.

B. DISCUSSION

16. Although SHINANO was lost as the result of progressive flooding, it is certain that the three forward hits liberally defeated her torpedo defense system. The U.S. submarine torpedoes involved undoubtedly were equipped with torpex warheads, with about 600 pounds of explosive.

17. The findings of the committee, as reported orally and briefed in Reference B.-2. are listed below:

a. Counterflooding measures were undertaken too late. When done, they were ineffective because of the large angle of list then existing.

b. The torpedoes were shallow - hitting at a depth of not more than three meters (14 feet). This opinion was based on the shallow flooding from the hits forward and aft of the machinery spaces.

c. The joint between the upper and lower sections of the armor was weak.

d. The unfinished condition of the ship and the poor quality of workmanship were contributing factors.

e. Based on survivors' reports from engineering spaces, there was no doubt but that the torpedo defense system had been defeated.

f. The officers and crew were undertrained and over-confident in the ability of SHINANO to resist the effects of four torpedoes. Hence, there was little effort on their own part.

18. As noted in Section I, the joint between the upper and lower sections of the armor is considered to have been of very poor design. Despite the thinner main belt on SHINANO, the joint was of the same design as on YAMATO.

19. The depth setting of the torpedoes is subject to verification from U.S. submarine war patrol reports. It is considered that within reasonable limits, depth of impact was not an important factor in the defeat of the torpedo defense system.

20. In connection with the performance of the crew, other cases, particularly those of TAIHO (section IV) and of the ships destroyed at KURE in July 1945 (see Article 1, this report), certainly paralleled SHINANO's experience, if not to such a degree. In general, Japanese damage control technique and equipment were far below both U.S. and British standards.

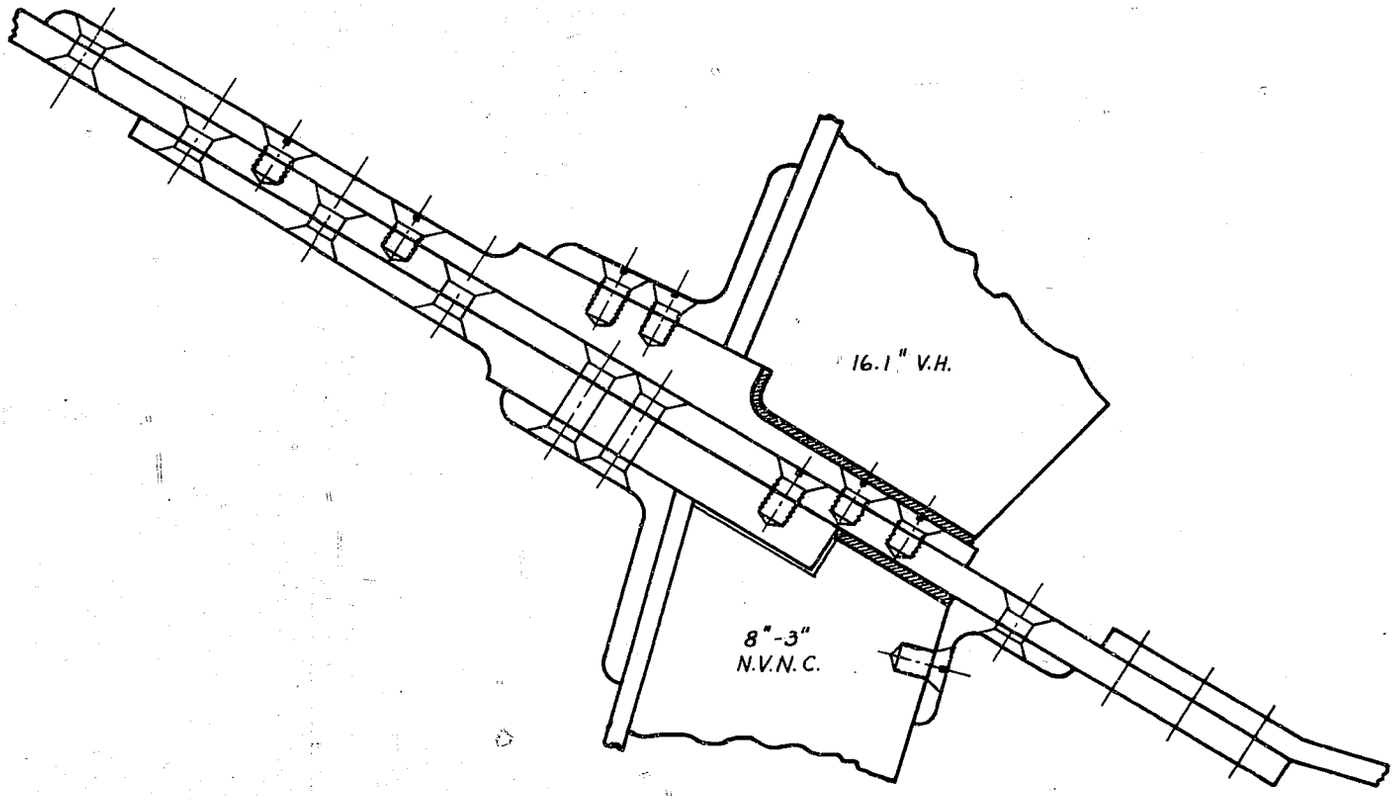


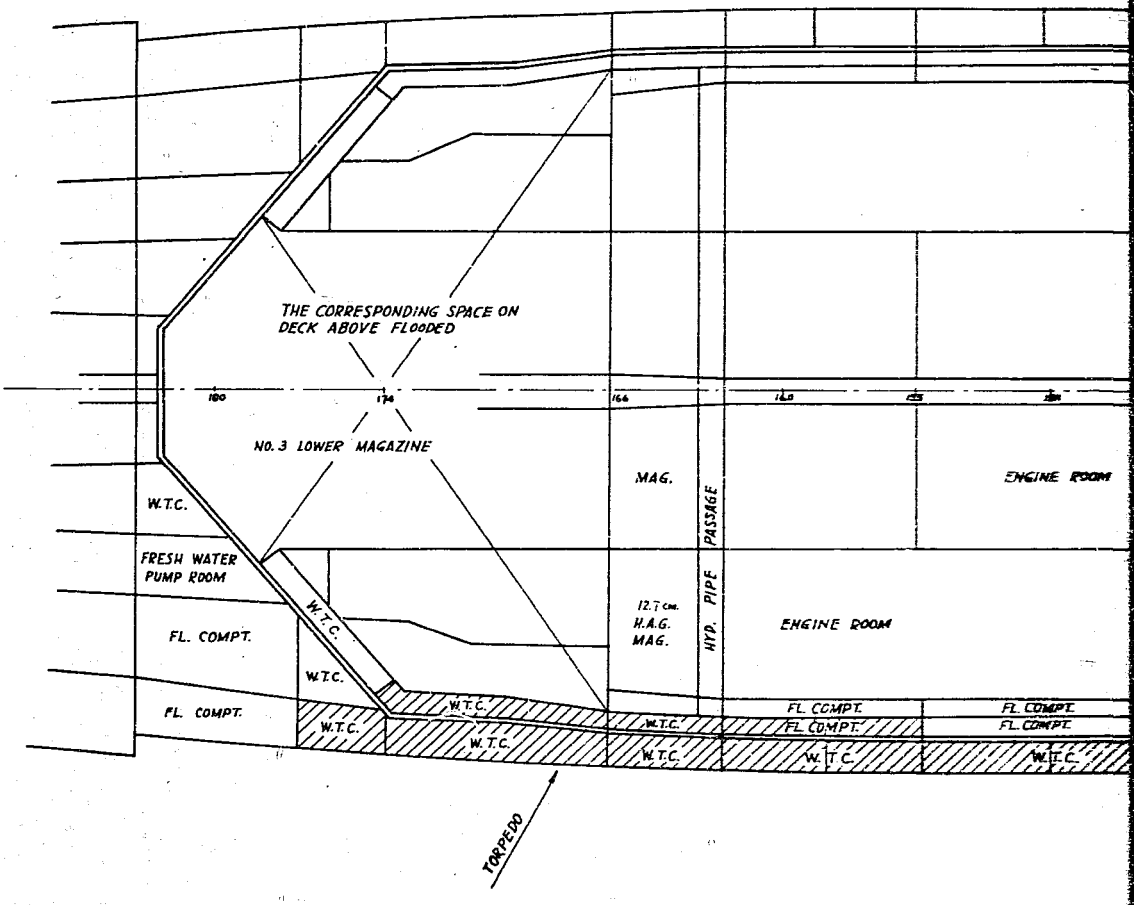
PLATE I 1 JAN. 1946

ARMOR BELT CONNECTION,
YAMATO CLASS

NAV TECH JAP
TOKYO

APPROVED
C. C. H.

2ND HOLD DECK PLAN



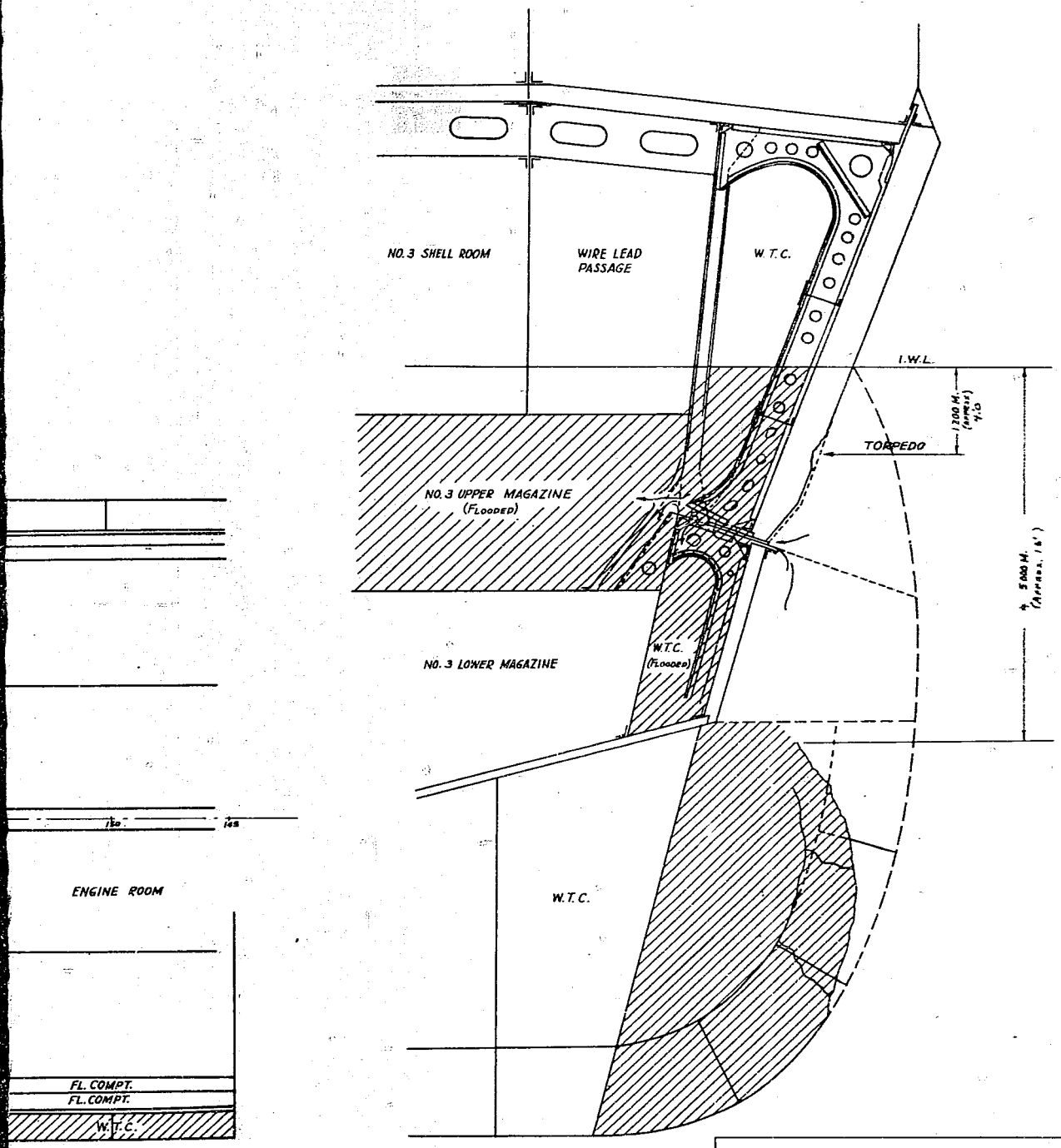
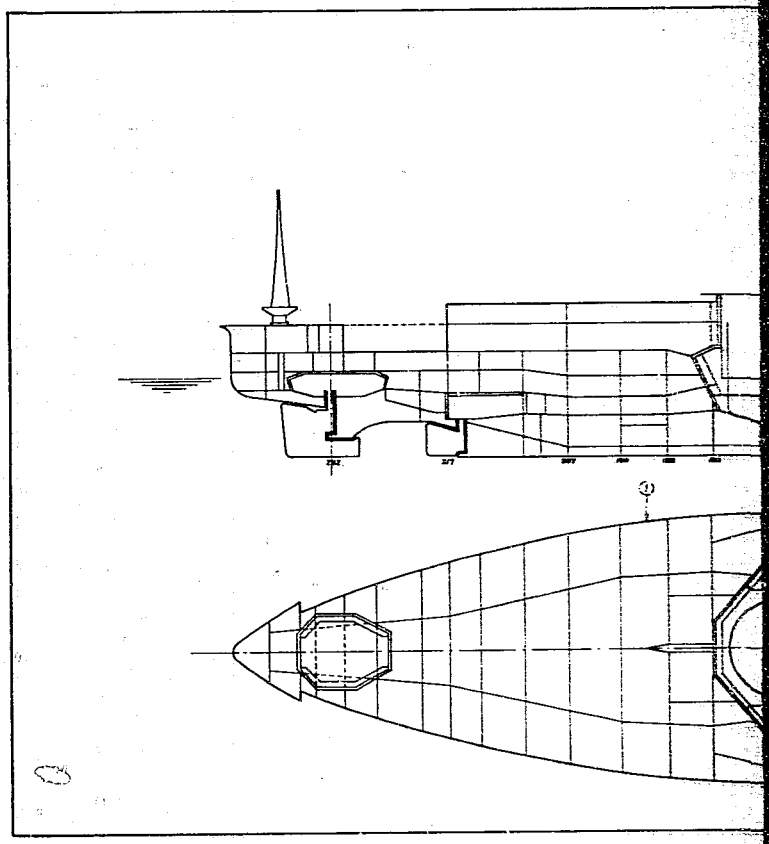


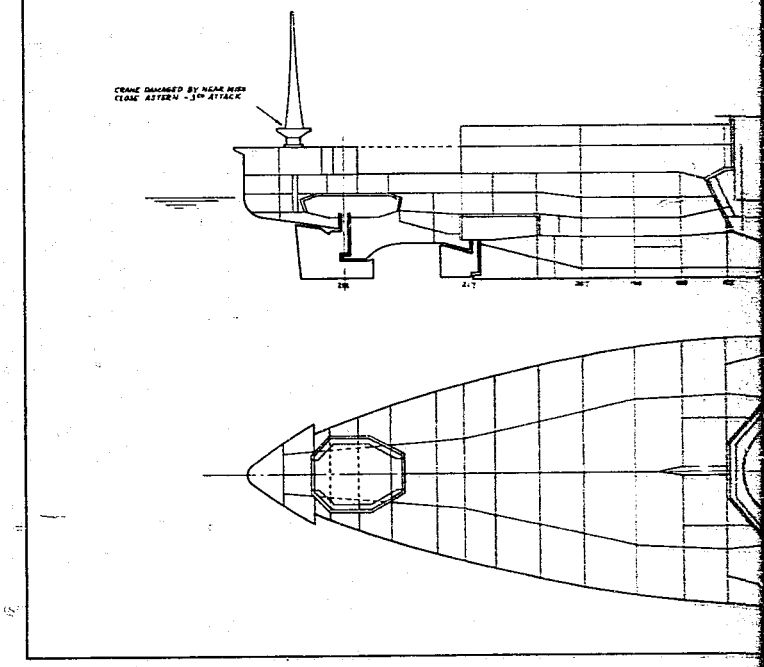
PLATE II 1 JAN. 1946

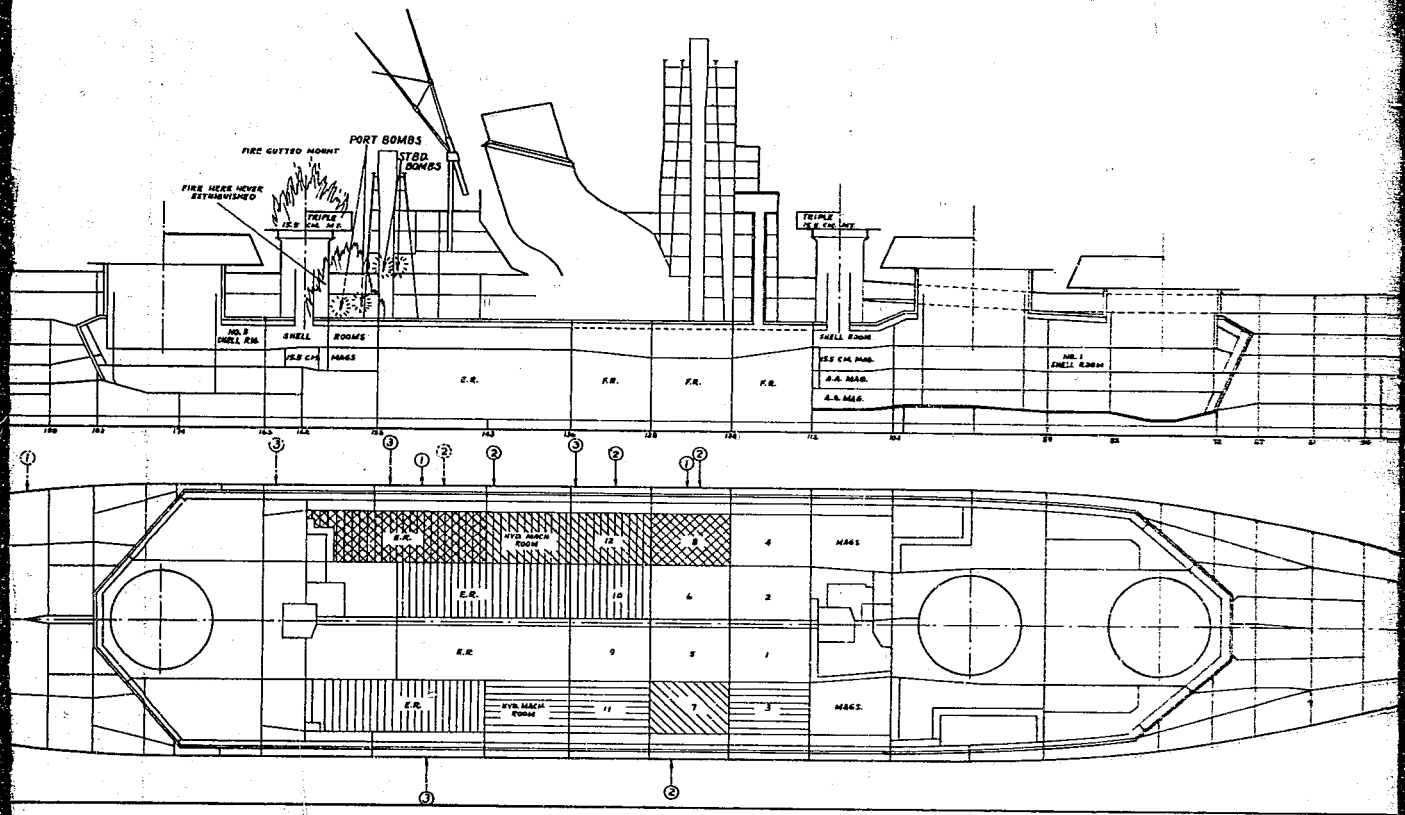
YAMATO (BB) DAMAGE

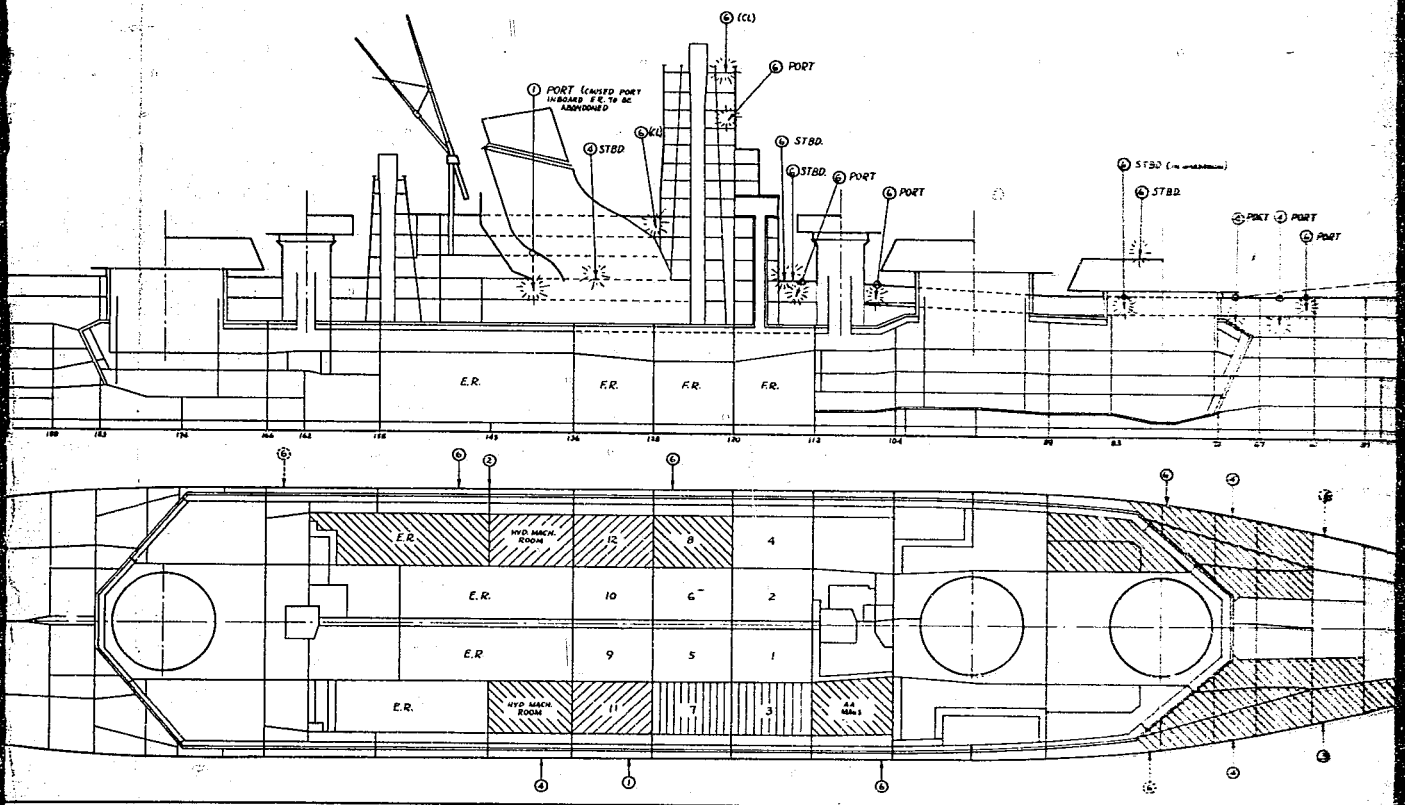
NAV TECH JAP
TOKYO

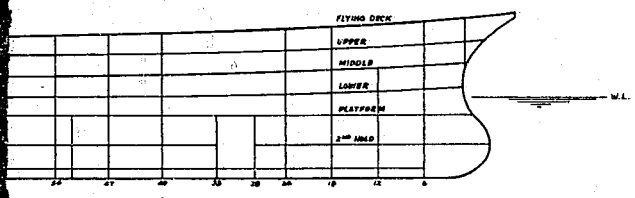
APPROVED
C.C.K.

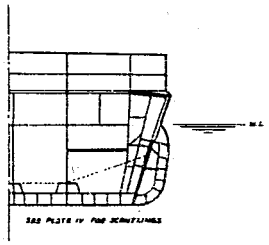


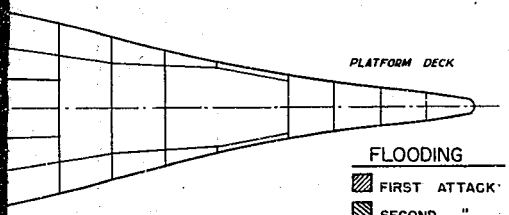

CRANE DAMAGED BY NEAR MISS
CLOSE ASTERN - 3RD ATTACK


PORT BOMBS
STBD. BOMBS
FIRE GUTTED MOUNT
FIRE NEVER EXTINGUISHED
TRIPLE
SHELL ROOMS
MAGS
E.R.
F.R.
HYD. MACH. ROOM
MAGS.


PORT (CUTTD. PORT INBOARD F.E. TO BE ABANDONED
STBD.
PORT
E.R.
F.R.
HYD. MACH. ROOM
MAGS.







FLOODING

- FIRST ATTACK
- SECOND "
- THIRD "
- COUNTERFLOODING

LEGEND FOR TORPEDOES

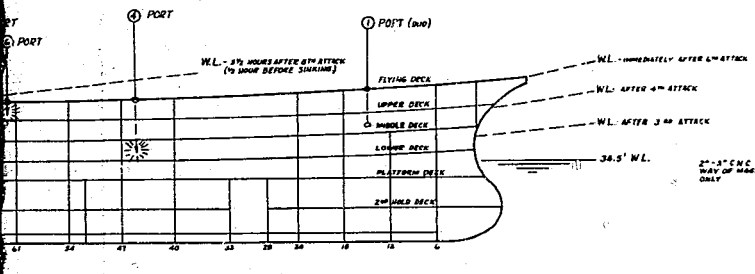
- ① CERTAIN HITS - FIRST ATTACK
- ② " " - SECOND "
- ③ " " - THIRD "
- (2) PROBABLE HIT - SECOND "
- (1) POSSIBLE HIT - FIRST "
- (3) " " THIRD "

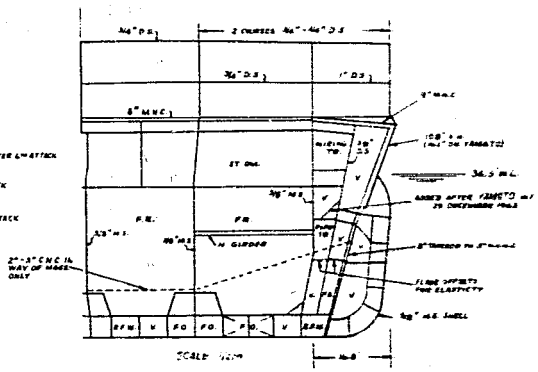
PLATE III 1 JAN. 1946

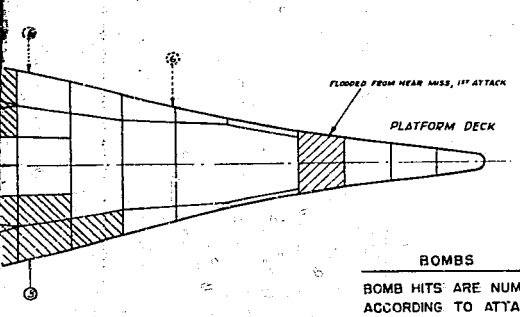
HITS ON YAMATO (BB)

7 APRIL 1945

NAV TECH JAP TOKYO APPROVED CC K







KNOWN FLOODING

- SLOW FLOODING
- QUICK "
- COUNTERFLOODING AFTER SIXTH ATTACK

LEGEND FOR TORPEDOES

- ① CERTAIN HITS - FIRST ATTACK
- ② " " - SECOND "
- ③ " " - THIRD "
- ④ " " - FOURTH "
- ⑥ " " - SIXTH "
- (6) POSSIBLE " - SIXTH "

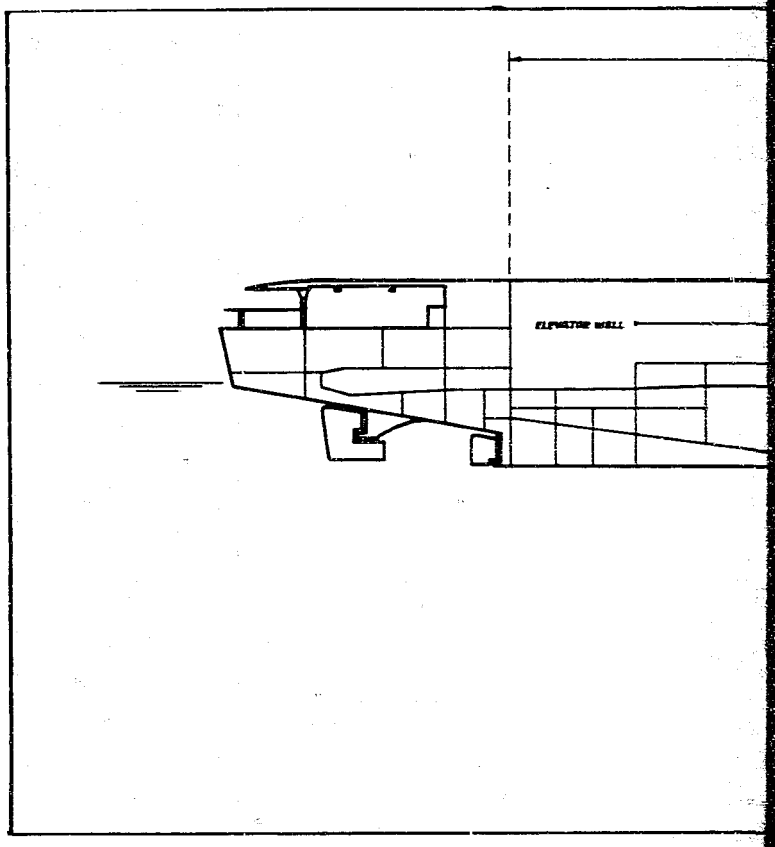
BOMBS

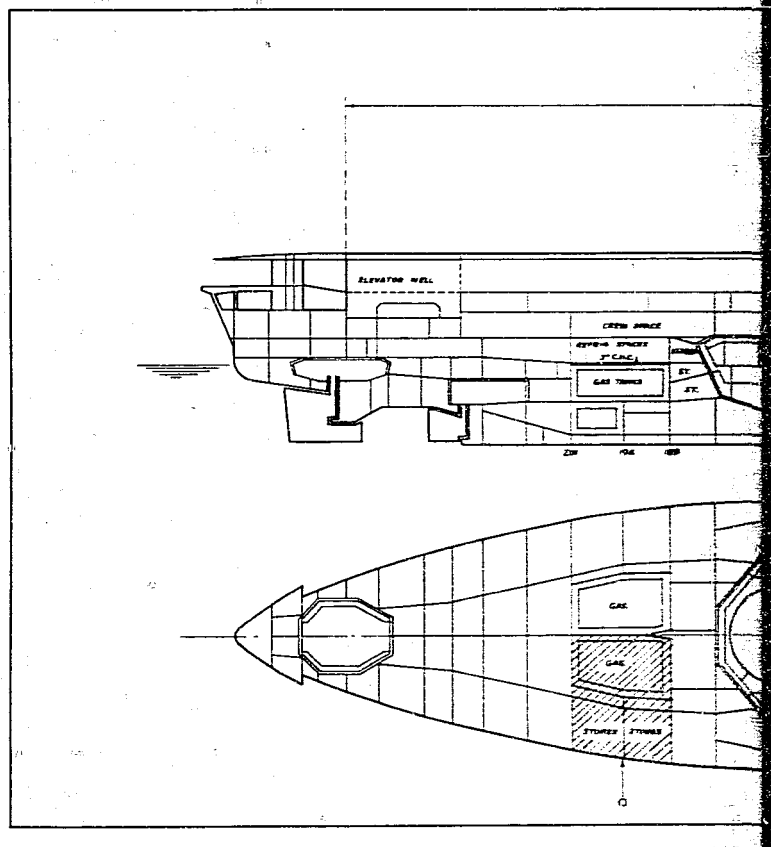
BOMB HITS ARE NUMBERED ACCORDING TO ATTACK, AND SHOWN ON PROFILE ONLY.

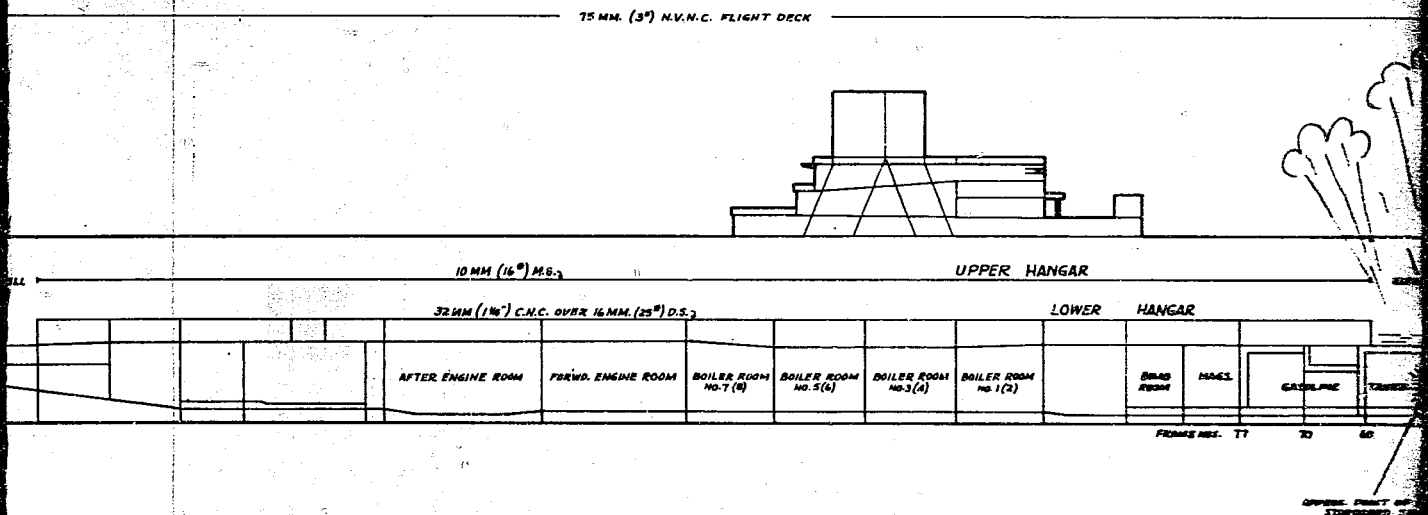
PLATE IV 1 JAN. 1946

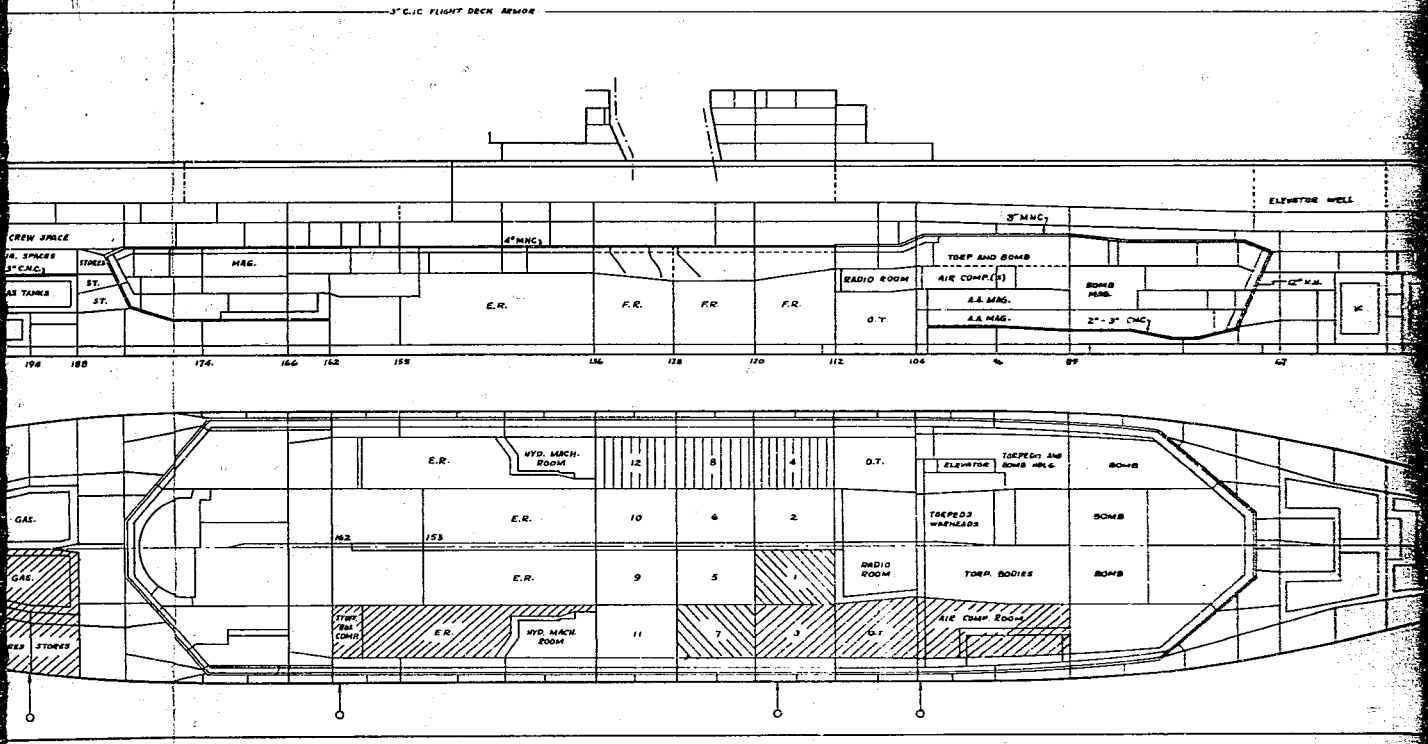
HITS ON MUSASHI (BB)

NAV TECH JAP TOKYO APPROVED CC K


ELEVATOR WELL


ELEVATOR WELL
GAS TANKS
GAS
GAS
STORES
STORES


75 MM. (3") N.V.N.C. FLIGHT DECK
10 MM (16") M.S.
UPPER HANGAR
32 MM (1 1/4") C.N.C. OVER 16 MM. (25") D.S.
LOWER HANGAR
AFTER ENGINE ROOM
FORWD. ENGINE ROOM
BOILER ROOM NO.7 (8)
BOILER ROOM NO.5 (6)
BOILER ROOM NO.3 (4)
BOILER ROOM NO.1 (2)
BRIDGE
MASTS
GASOLINE
FRAMES NOS. 77 70 60


3" C.I.C FLIGHT DECK ARMOR
CREW SPACE
STORES
ST.
MAG.
E.R.
F.R.
RADIO ROOM
O.T.
TORP AND BOMB
AIR COMP. (3)
A.A. MAG.
BOMB MAG.
ELEVATOR WELL
E.R.
HYD. MACH. ROOM
GAS.
TORPEDO WARHEADS
TORP. BODIES
BOMB
AIR COMP. ROOM
STOFF. / BAT. COMP.

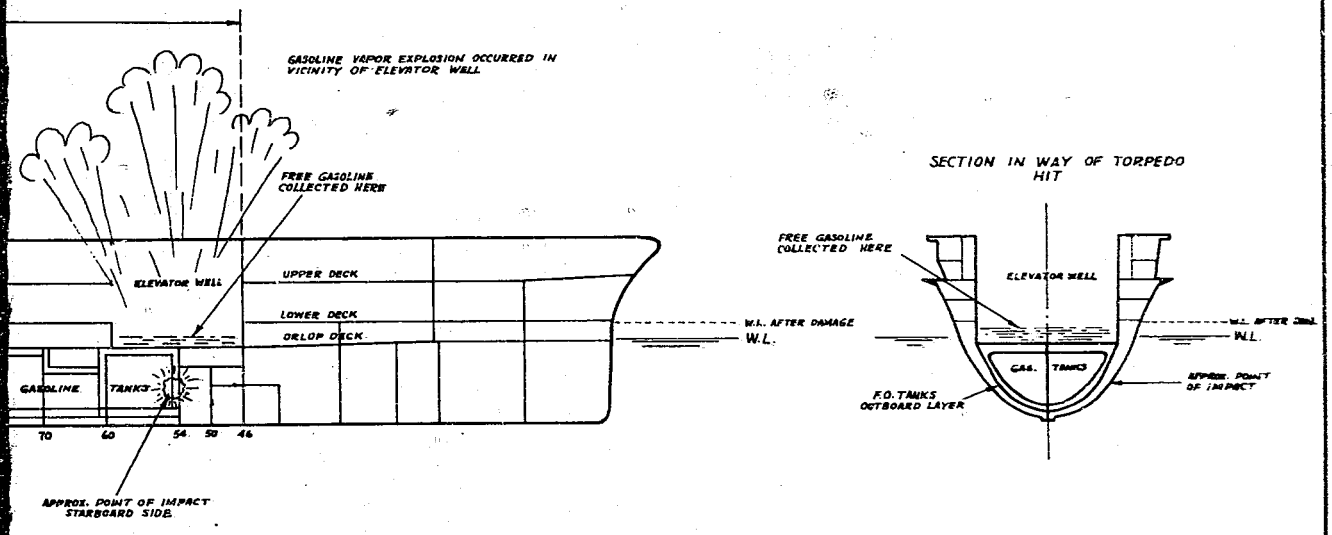
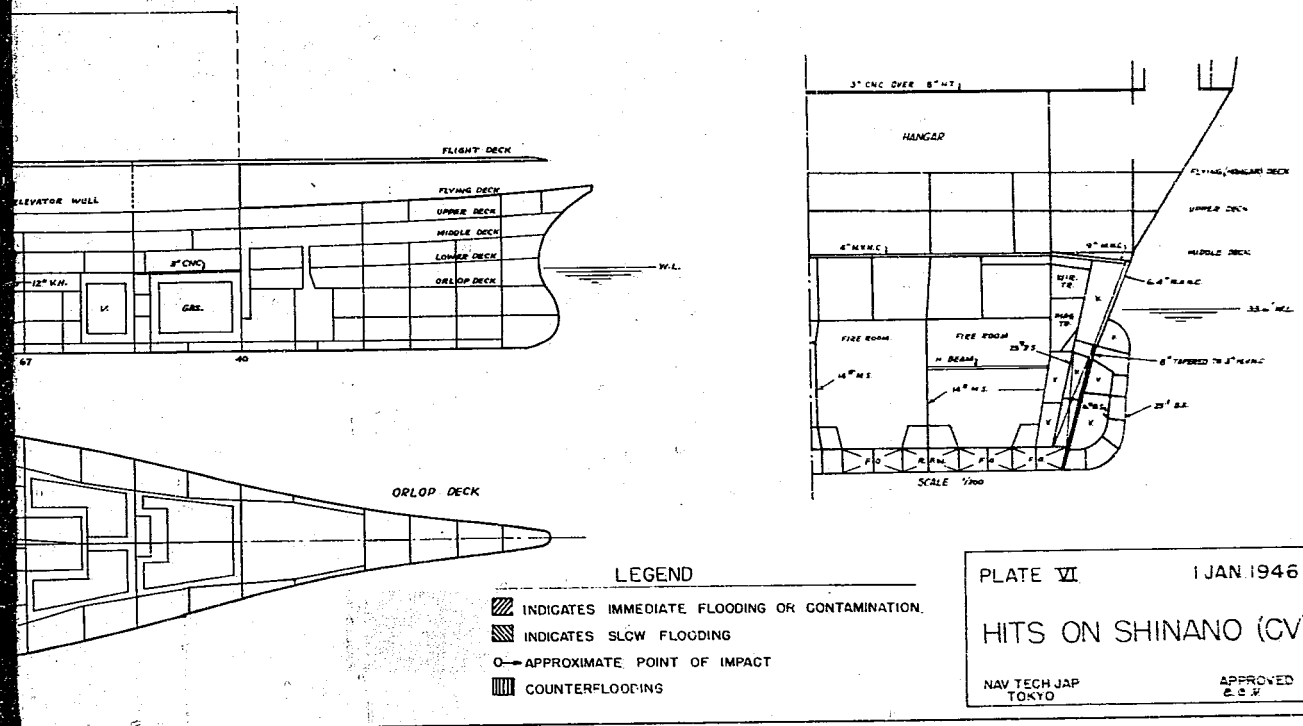


PLATE V — 1 JAN. 1946

HIT ON TAIHO (CV)

NAV TECH JAP TOKYO — APPROVED E C A



LEGEND

- INDICATES IMMEDIATE FLOODING OR CONTAMINATION.
- INDICATES SLOW FLOODING
- O— APPROXIMATE POINT OF IMPACT
- COUNTERFLOODING

PLATE VI — 1 JAN. 1946

HITS ON SHINANO (CV)

NAV TECH JAP TOKYO — APPROVED E C A