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C-EN28/A2-11

NAVY DEPARTMENT  
BUREAU OF SHIPS  
WASHINGTON, D.C.

2 September 1943

~~CONFIDENTIAL~~

From: The Chief of the Bureau of Ships.  
To: The Commander-in-Chief, U.S. Fleet.  
The Vice Chief of Naval Operations.  
The Chairman, General Board.  
The Chief of the Bureau of Ordnance. (2 copies)  
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The Superintendent, U.S. Naval Academy.  
The Commander-in-Chief, U.S. Pacific Fleet.  
The Commander-in-Chief, U.S. Atlantic Fleet.  
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The Commanding Officers, All Battleships (BB). (2 copies)  
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The Commanding Officers, All Cruisers (CL, CA). (2 copies)  
The Commanding Officers, All Repair Ships (AR).  
The Officer in Charge, U.S. Naval Drydock, Hunters Point,  
San Francisco, Calif.  
The Commanding Officer, U.S. Naval Drydock, Roosevelt  
Base, Terminal Island, Calif.

SUBJECT: USS QUINCY, USS ASTORIA and USS VINCENNES -  
Report of Loss in Action.

Enclosure: (h.w.)

(A) Bureau of Ships War Damage Report No. 29, dated 12 June,  
1943 - one copy to each addressee except as indicated.

1. The report of loss in action of USS QUINCY, USS ASTORIA,  
and USS VINCENNES is forwarded herewith for your information.

L. A. Kniskern  
By direction

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By authority of Lt. B.L. Kubert

H. P. Fisher, Y 3/6

U.S.S. ASTORIA (CA34)

U.S.S. QUINCY (CA39)

U.S.S. VINCENNES (CA44)

Loss in Action

Battle of Savo Island

August 9, 1942

Class	ASTORIA Heavy Cruiser	QUINCY Heavy Cruiser	VINCENNES Heavy Cruiser
Launched	Dec. 1933	June 1935	May 1936
Displacement (Standard)	10,000 tons	10,000 tons	10,000 tons
Length (W.L.)	574'-0"	569'-0"	569'-0"
Beam (W.L.)	61'-10"	61'-10"	61'-10"
Draft (Designed)	21'-7"	21'-7"	21'-7"

References:

- (a) C.O. ASTORIA ltr. CA34/A9-16 dated 4 Sept. 1942 - (War Damage Report).
- (b) C.O. ASTORIA ltr. AP37/A16-3/(00500) dated 29 Aug. 1942 - (War Action Report).
- (c) Senior Surviving Officer, QUINCY ltr. CA39/A16-3/(004)/(HMC) dated 16 August 1942 - (War Action Report).
- (d) C.O. VINCENNES ltr. CA44/A16-3/(0021) dated 14 August, 1942 - (War Action Report).
- (e) Comcrupac ltr. S93/S88/S29/S3-1, Serial (01324A) dated Sept. 26, 1942 - (Type directive for improvement of offensive qualities of cruisers).

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IV	Outboard profile of QUINCY showing hits
V	Outboard profile of VINCENNES showing hits

## I. SUMMARY

1. This action of August 9, 1942 was the first action of this war in which one of our task forces was engaged in a night gunfire and torpedo attack. In a brief twenty-minute action we suffered the loss of three heavy cruisers. Both QUINCY and VINCENNES were so badly holed that they sank within one hour. ASTORIA burned throughout the night, and, despite valiant fire fighting by her crew, sank the next day at noon.

2. Numerous 8", 5" and 25mm hits were received by each ship; the exact number is unknown. ASTORIA received at least 65 known hits. QUINCY received at least 36 known hits as well as two torpedo hits on the port side, one in way of No. 3 and No. 4 firerooms and the other in way of the I.C. room. VINCENNES received 57 known hits as well as one torpedo hit (possibly two) on the port side in way of the forward magazine group.

3. Structural damage to ASTORIA, although extensive, was not such that loss of the vessel was inevitable. The fires which resulted, however, effectively prevented control of damage. Fires could not be controlled because of the initial lack of certain facilities, the destruction of some facilities initially available, and the fact that certain others were inoperable because of the lack of power. Thus, damage and uncontrolled fires resulted in the loss of ASTORIA.

4. Damage to QUINCY and VINCENNES was so extensive that loss of the vessels was inevitable. It is not possible for any lightly protected vessel to absorb such punishment and survive. Fires in both cases, however, were also a major contributing factor.

5. The action sharply emphasized the necessity for providing equipment which is reliable and adequate for the control of the major conflagrations resulting from present day naval warfare. The necessity for a vigorous program for the removal of unessential material presenting fire hazards was also clearly presented.

6. With respect to improvement and augmentation of fire fighting facilities, the Bureau inaugurated and is executing an extensive program on both existing vessels and new construction. This program involves the installation of additional pumps with independent sources of power, separation of fire mains into loops to reduce probability of a few hits placing the entire system out of operation, installation of fog nozzles and other mechanical aids and rearrangement of inflammable stowage in which essential inflammable materials are to be carried below the waterline and at the extremities of the vessel.

7. In connection with elimination of existing fire hazards aboard ship, the Bureau is actively cooperating with the forces afloat to accomplish this. For example, reference (e) is a directive issued by Comcrupac for the removal of many items of an inflammable nature aboard cruisers as well as emphasizing the necessity for early accomplishment of alterations listed in paragraph 6. It is based on the lessons learned from this and other actions. The Bureau is assisting in the program by the development of new non-inflammable materials and authorizing the replacement of inflammable materials with new materials. In this category fall such items as fibrous glass for insulation and flame resistant compounds for treating fabrics.

## II. NARRATIVE

(Plate I)

8. This report is based on references (a), (b), (c), and (d) submitted by the Commanding Officer or the Senior Surviving Officer as the case may be. These reports consist of the Commanding Officer's own summary, as well as reports made to him by various survivors of each ship. As a result, there is a great deal of information which, naturally, is contradictory in many instances. The times and even the sequence of events differ to such an extent in the various reports that it has been impossible to construct an account in which all the details agree with the basic elements. The narrative attempted here appears to be the most plausible and probable one even though all the referenced accounts do not agree with it in all respects. The Commanding Officer of ASTORIA produced a diagram of the battle which is the basis of most of the times stated in this report as well as the basis of Plate I.

9. U.S.S. VINCENNES, U.S.S. QUINCY and U.S.S. ASTORIA, plus two destroyers on the night of August 8-9, 1942 comprised Task Group 62.3. The cruisers of this task group, in a column led by VINCENNES, were patrolling the perimeter of a square five miles on a side in the area between Savo and Florida Islands. This group passed through the southern corner of this square at 0130 and took course 345° true, speed 10 knots. All the ships were in condition of Readiness II, material condition Zed. Each ship was steaming on four boilers in two firerooms. The remaining two firerooms were ready for immediate lighting off to supply additional power if necessary. The five airplanes on each ship except QUINCY had been drained of all gasoline. The night was dark and overcast with occasional light mists of rain. There were light breezes from the southwest with a ceiling of about 1500 ft. It has been estimated that the average visibility was about 10,000 yards. Heavy clouds surrounded Savo Island and the Guadalcanal area.

10. At 0155 the gunnery officer on ASTORIA sighted an enemy cruiser force bearing about 230° relative, range 5500 yards. Shortly thereafter the enemy searchlights were turned on this task group. Later, the Commanding Officer ASTORIA estimated this enemy force to be composed of at least three (probably four) heavy cruisers of NACHI class and about four destroyers.

11. The narrative of each ship will be taken up independently beginning at 0155 when enemy searchlights illuminated. In the case of all three ships the enemy commenced hitting on the fourth or fifth salvo. By this time the batteries of VINCENNES, QUINCY and ASTORIA had been trained out and commenced firing.

### A. ASTORIA

12. At 0155 when enemy searchlights illuminated ASTORIA, the main battery was trained out and fire was opened immediately upon order of the gunnery officer. About 0156 the fourth Japanese salvo landed near the bow. One 8" projectile passed through the

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paint locker and started a small fire. The next Japanese 8" salvo hit amidships setting afire the boats on the boat deck and the three planes in the hangar. One 8" projectile set ready-service ammunition at gun No.8 on fire and knocked out No.3 blower serving No.2 fireroom. This fireroom was then secured and later abandoned. The sixth 8" salvo hit the face plate and barbette of turret I putting it out of action and killing the personnel within the turret and the barbette. From then until 0200 the enemy was hitting with large and small caliber projectiles with increasing rapidity. At some time during this period an 8" projectile entered No.1 fireroom and killed all of the crew in this space. About 0200 ASTORIA had to turn right to clear QUINCY's line of fire. This brought the stern of ASTORIA through the enemy's line of fire resulting in hits on the starboard side from the foremast aft. By about 0200 the port and starboard secondary batteries, except gun No.1, were completely out of commission due to direct hits and to the fire amidships on the upper deck.

13. From 0200 to 0206 ASTORIA was under an extremely heavy concentration of fire. About 0202 the ~~forward~~ engine room was abandoned because a hit above this space filled the engine room with smoke. This reduced the speed to nine knots. About 0206 director II was hit and put out of action. During this period all fire main risers forward of frame 103 were ruptured; no water was available for fighting fires.

14. The enemy's fire gradually diminished from 0206 until 0215 when the enemy ceased firing and retired to the northwest. At 0208 course was changed to the left and the stern was again brought through the enemy's fire. About 0209, No.4 fireroom had to be abandoned due to the intense heat from the fire on the well deck. Two minutes later No.3 fireroom had to be abandoned. About this time ASTORIA had a near collision with the blazing QUINCY which was on an opposite course. Just as the collision was averted, steering control was lost on the bridge and transferred to central station. At 0215 when the enemy had ceased firing, the ~~After~~ engine room was abandoned due to intense smoke. This resulted in the loss of all power on the ship. The Commanding Officer immediately ordered bridge and foretop abandoned as 1"1 ammunition in the clipping room above the bridge was exploding, endangering surviving personnel. Some time during the action ASTORIA developed a 2-30° port list.

15. Survivors from the forward part of the ship collected on the forecastle with the Commanding Officer in charge. Survivors on the stern collected on the fantail with the Executive Officer in charge. Each party existed without the knowledge of the other as they were separated by the intense fire raging on the well deck and the upper deck amidships. Dense smoke and fires cut off fore-and-aft passage on the second deck. Bucket brigades were organized by both parties. About 0300, when smoke was reaching down into the lower deck spaces, the small arms magazine and one group of forward 8" magazines were flooded. A short time later the other forward 8" magazine was flooded. The forward 5" magazines were not flooded apparently because the hand operating station on the second platform deck could not be reached and power was not available for operation of the electrical controls on the second deck. About this time the stern group flooded the after 8" magazine. The fire by now had reached the lower 5" and 1"1 hoists as frequent explosions were heard below decks. At 0330 a rain squall passed over the ship. This reduced the intensity of the fires, but not

sufficiently to permit the bucket brigade to get the fires under control. A little later BAGLEY came alongside the starboard bow and took off all survivors forward. At this time the stern and bow groups realized the existence of each other, and at daylight BAGLEY took off the wounded from the stern group. After the transfer of the wounded, plans were made for salvaging the vessel. The fires had moderated except for a fire in the wardroom country. Both engine rooms and No.4 fireroom were accessible at this time. At 0700 HOPKINS came alongside and made arrangements for towing. Two attempts were made, - the latter successful. About 0900 WILSON came alongside and assisted in the fire fighting for one hour when both HOPKINS and WILSON were called away. Fire in the wardroom increased in intensity and frequent small explosions were heard below deck. As a result of these explosions the hull must have been ruptured, as a port list gradually developed. This list was 10° by about 1130 when a heavy explosion took place on the port side in way of the forward 5" magazines. The ship listed about 15° to port. BUCHANAN came alongside to help fight the fire but the list had increased to such a point that the shell holes on the second deck, port side, were shipping water. It was obvious that the ship was going to sink. By 1210, as the salvage party abandoned ship, the port waterways of the main deck were awash. ASTORIA capsized to port, settling by the stern and disappeared at 1215.

#### B. QUINCY

16. At 0155, as enemy searchlights were trained on QUINCY from abaft her port beam, the main battery was trained out and commenced firing. About this time the ship received her first hit in the 1"1 mounts on the main deck aft. One or two 9-gun salvos were fired when QUINCY's course was changed to the right, bringing her stern through the enemy's fire. While she was in this swing, she was raked fore and aft by large and small caliber hits. The planes in the hangar were set on fire, the bridge hit, 1"1 clipping room in the foremast hit, battle II hit, and turret III was hit and jammed in train. Turrets I and II were trained around to starboard and brought to bear upon the enemy.

17. While in the beginning of this turn QUINCY was 'struck on the port side by two torpedoes, probably from a submarine, one in way of firerooms III and IV and the other just forward of the I.C. room about frame 45. About two 6-gun salvos had been fired to starboard by the forward two turrets when turret II was struck, probably by an 8" A.P. projectile. This projectile probably detonated in the gun chamber where exposed projectiles were, in turn, detonated and powder was set on fire. The turret was completely gutted and left burning like a torch. At the same time, turret I was put out of action due to a fire in the upper powder room and a hit on the shell deck. Director I was jammed in train as the forestay had carried away due to damage, and caught around the radar antenna. During this period the bridge was hit again killing most of the personnel, including the Commanding Officer. Fragments from the hit also severed steering leads which resulted in the loss of steering control. The ship kept turning in a large circle to the right until power was lost at 0215.

18. At 0215, when out of control, all main battery firerooms out of action. The ship was listing upper deck to port, a list developed out the whole length that it was necessary to abandon ship. Rafts and life nets were put out on board, and the senior personnel to abandon ship. The last action occurred between 0235 and 0245, when the bow went under, and the ship disappeared.

19. Just as the ship was about to sink at 0155, the main battery was trained out. A minute later the first hits started fires in the carpenter shop, the hangar. From this time until he ceased firing.

20. Course was changed to the right, however, at no time was the main battery trained out. A minute later, direct hits started fires in the after end of the main deck. The main deck fenders were very damaged. At 0200, attempts were made to abandon ship. While in this turn, on the starboard side, probably from the sub No.1. No. 1 fireroom was struck. In this turn, the left turret was struck.

21. About 0205, the main battery was trained out. Control was lost in the after steering station due to blowers either from the fires amidships and they supplied power to fire in local control. The action put out most of the main battery.

22. About 0209, an 8" shell which penetrated the starboard side and set the turrets and second deck on fire. The turrets were out of action, and the ship was listing.

23. At this time the main battery was trained out. The ship began to abandon ship. Searchlights and cease firing.

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18. At 0215, when the enemy ceased firing, the ship was out of control, all main and secondary guns out of action, and all firerooms out of commission. Both engine rooms were intact. The ship was listing rapidly to port, water was coming over the upper deck to port, and fires were blazing intermittently throughout the whole length of the ship. The surviving personnel realized that it was necessary to abandon ship as quickly as possible. Life rafts and life nets and other floatable objects were thrown overboard, and the senior surviving officers present directed personnel to abandon ship. As nearly as can be determined, this occurred between 0235 and 0240. The ship then capsized to port, the bow went under, the stern raised, and the ship slid from view.

C. VINCENNES

19. Just as the enemy searchlights were trained on VINCENNES at 0155, the main battery was directed to train out and fire. A minute later the first enemy salvo struck, hitting the bridge, the carpenter shop, the hangar, battle II and the antenna trunk. Fires were started in the carpenter shop and the airplanes in the hangar. From this time on the enemy was hitting continuously until he ceased firing at 0215.

20. Course was changed to the left and speed increased; however, at no time was it greater than 19.5 knots. About a minute later, direct hits were received on sky aft and sky forward, blowing the after director overboard. Attempts to extinguish fires failed as all fire main risers had been ruptured. Further hits started fires in the movie locker and the cane fender stowage in the after end of the searchlight platform. The fire in the cane fenders was very intense and could not be extinguished. About 0200, attempts were made to evade enemy fire by turning hard right. While in this turn, one torpedo hit (possibly two) was received probably from the submarine which was reported fired on by gun No.1. No. 1 fireroom was put out of action at this time. While in this turn, the left side range finder hoods of turrets I and II were struck.

21. About 0205, when beginning to make a left turn, steering control was lost in the pilot house. Control was shifted to the after steering station. About this time all steam power was lost due to blowers either being destroyed or drawing smoke and flames from the fires amidships into the firerooms. Diesels were started and they supplied power to turrets I and III. They were still able to fire in local control. Numerous hits during the early part of the action put out most of the guns of the secondary battery.

22. About 0209 turret II was struck on the face plate by an 8" shell which penetrated without exploding and set exposed powder on fire. Another projectile hit the barbette of turret No. I on the starboard side and jammed the turret in train. At this time all turrets and secondary battery except turret III and gun No.1 were out of action, and all power had been lost.

23. At this time, while still under heavy fire from the enemy, the ship began to list appreciably to port. The crew was about to abandon ship when all at once the enemy extinguished searchlights and ceased firing. During the next fifteen minutes

the list increased rapidly and it appeared that there was no possibility of saving the ship. The Commanding Officer then gave orders to abandon ship. About 0250 VINCENNES capsized to port and went down by the head in 500 fathoms of water.

### III. ASTORIA DAMAGE

(Plates II and III)

24. During the engagement described in paragraphs 12, 13, and 14, ASTORIA sustained an unknown number of hits from 8", 5", and 20mm projectiles of which about 63 were reported in references (a) and (b). The approximate locations of these hits are shown on Plate II. Plate III shows the paths and damage resulting from 35 of the most important of these hits. The hits are numbered for convenience from forward to aft without regard to time, size or source. The sizes of hits are all estimated. These estimates are made on the basis of those reported by the Commanding Officer and from the effects of the projectiles as compared with the performance of U.S. Navy projectiles on light plating.

25. The most extensive and serious damage was apparently done by the first few 8" salvos from the heavy cruisers. Turret No. 1 received three hits, one in the face plate (Hit No. 5) and two in the barbette (Hits Nos. 3 and 4), which put this turret out of action. An 8" projectile passed through the 25 lb. special treatment steel splinter shield around No. 8 5" gun. After penetrating the shield it hit one of the 5" ready-service boxes for this gun. This projectile apparently struck the box and then ranged upward and overboard. Some of the ammunition in the box was ignited as the result of direct impact by the 8" projectile. One result was the destruction of the forced draft blower to No. 3 fireroom. The detonation and ignition by fragments of 5" ammunition will be discussed further in paragraph 89. In addition, an intense fire was started which eventually forced the abandoning of all secondary guns on the upper deck. Two hits (Nos. 27 and 26, respectively), one in the hangar and the other through the boats on the boat deck, set aircraft and boats on fire.

26. A projectile (Hit No. 25), penetrated the kerosene tank under the starboard ladder leading from the well deck to the boat deck and passed through the main deck into the after mess hall, where it detonated. Kerosene from the tank spread over the well deck and contributed to the intensity of a fire that was already burning furiously. Some of the kerosene leaked through the hole in the main deck and started a fire in the mess hall near the after engine room uptakes. The heat from this fire forced the crew to abandon the after engine room.

27. The hits mentioned in the preceding two paragraphs, as well as others, caused the ship to become a raging inferno from the foremast to the after bulkhead of the hangar. These fires eventually necessitated the abandoning of the firerooms and engine rooms due to intense heat and dense smoke. An 8" hit (No. 20) penetrated the second deck amidships (90 lb. special treatment steel) passed down into No. 1 fireroom and wrecked it.

28. Numerous 5" into the fireroom. Th forward of bulkhead 10 bucket brigades and "h control the intense fi also sustained in the fires in the bedding, never brought under co been removed.

29. Various othe located on the foremas 1st clipping room on t. A fire was started whi ploding.

30. The structur serious nature except No. 1 fireroom and of room and engine room b apparently used, most little structural dama the light plating and structural damage. Th which they started.

31. Since the ac numerous minor caliber The material damage wa above the gun deck and reported riddled by fr caliber hits are estim on the enemy vessels.

32. Five hits, a waterline. One 8" pro armor a glancing blow. struck originally belo tiles (Nos. 6 and 30) s hull. The seams were back into place, and n three entered the hull to be holding well upo the 2-30 port list whi flooding of an off-cen underwater hit. The 8 5" magazines were not sea floods were inacce

33. After the ac room exploded ammuniti ruptured the hull or c causing the ship to li projectiles in the for hull. This permitted an increase in the lis deck, port side, were then rapidly increased

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28. Numerous 5" hits were received by the blowers leading into the fireroom. These 5" hits also cut all the fire mains forward of bulkhead 103, leaving only CO<sub>2</sub> fire extinguishers, bucket brigades and "handy billies" with which to attempt to control the intense fires raging amidships. Many 5" hits were also sustained in the wardroom country. These produced intense fires in the bedding, papers and clothing. These fires were never brought under control. The paint in this space had not been removed.

29. Various other hits were received in the control stations located on the foremast. One of these (Hit No. 16) struck the 1st clipping room on the battle lookout and machine gun platform. A fire was started which eventually led to this ammunition exploding.

30. The structural damage, though severe, was not of a serious nature except in the cases of the penetrative hit into No. 1 fireroom and of those hits on the turrets and on the fire-room and engine room blowers. Eight-inch A.P. projectiles were apparently used, most of which passed through the ship doing very little structural damage. The 5" H.E., which usually penetrated the light plating and then exploded, caused a moderate amount of structural damage. The seriousness of the hits lay in the fires which they started.

31. Since the action was fought at such close range, numerous minor caliber or machine gun hits were also received. The material damage was restricted to the superstructure surfaces above the gun deck and in the hangar. Both smoke stacks were reported riddled by fragments and minor caliber hits. These minor caliber hits are estimated to have come from the 25mm batteries on the enemy vessels.

32. Five hits, all estimated to be 5", struck below the waterline. One 8" projectile (Hit No. 19) struck the port side armor a glancing blow. These six are the only hits reported which struck originally below the second deck. Two of the 5" projectiles (Nos. 6 and 30) struck doubling plates but did not enter the hull. The seams were opened and bulged inward but were forced back into place, and no appreciable leakage resulted. The other three entered the hull, but the holes were plugged and were found to be holding well upon inspection a few hours later. Probably the 2-3<sup>o</sup> port list which developed during the action was due to flooding of an off-center tank or compartment from an unreported underwater hit. The 8" magazines were completely flooded. The 5" magazines were not flooded probably because the valves to the sea floods were inaccessible.

33. After the action, the heat from the fires on the wardroom exploded ammunition in the hoists. These explosions either ruptured the hull or opened seams, which permitted water to enter causing the ship to list to port. Eventually, the powder or the projectiles in the forward 5" magazine exploded, rupturing the hull. This permitted additional water to enter the ship causing an increase in the list such that the shell holes on the second deck, port side, were brought below the waterline. The list then rapidly increased until the vessel capsized.

34. Personnel casualties were heavy during the twenty-minute action. Men manning the secondary battery and anti-aircraft stations on the foremast suffered especially heavy casualties due to fragments from 5" projectiles. Midship repair parties also suffered a large number of casualties due to 8" and 5" hits.

#### IV. QUINCY DAMAGE

(Plate IV)

35. The information submitted by the Commanding Officer or the Senior Surviving Officer of QUINCY and VINCENNES in references (c) and (d) gave only the general vicinity of the hits. Therefore, important control spaces and areas within the vicinity will be listed with a description of the damage resulting to that station or space. As in ASTORIA, hits received in this engagement are numbered for convenience from forward to aft without regard to time, size, or source.

#### Bridge

36. The bridge was struck at least twice, once early in the action (Hit No. 16) and again about five minutes later (Hit No. 11). All communications were destroyed and steering control was lost due to the fragments from the last hit. A fire was started in the flag bags immediately behind the bridge, probably from hot fragments. The bridge was engulfed by flames in the middle of the action from No. II turret and the 20mm clipping room located immediately below the bridge.

#### Battle II

37. Battle II was struck at least once (Hit No. 33), and a fire was started in this space. Early in the action, battle II and the main battery control aft were rendered untenable due to the flame and smoke from the boat deck where the boats and the 20mm clipping room burned fiercely. The boats and the 20mm clipping room were set on fire by Hit No. 32.

#### Radio I

38. Radio I was struck at least once (Hit No. 14). There was also a hit (No. 13) in the communication office.

39. Numer radio II. As a dead. Later, a corner close to the work bench,

40. A large mess hall by one was fought successfully until the aft No. 2 mess hits mentioned fires, wrecked with smoke.

41. The fire on the starboard side was followed by room (Hit No. 2) to secondary battery hits or fragments eventually forced Surviving Officer vicinity of the material were no 'grape nuts' and they came in contact

42. This space quarters (frames 8, 9, and 18). which filled the communications were result of torpedo on the second deck port side as sur

43. There were on deck and two in removed because the preceding day planes secured the midship port pult. The fire

Radio II, Mess Hall and  
After Repair Station

39. Numerous hits were received in the vicinity above radio II. As a result of these hits the telephone circuits went dead. Later, a projectile (Hit No. 34) entered the port after corner close to the barbette of turret III and detonated damaging the work bench, test instruments and TAQ transmitter.

40. A large fire was started early in the action in No. 2 mess hall by one or more direct hits (Hit No. 31). This fire was fought successfully with water by both main and after repair parties until the fire main pressure failed. Crew's quarters abaft No. 2 mess hall were hit repeatedly, apparently the same hits mentioned in the preceding paragraph. These hits started fires, wrecked bunks and lockers and filled the compartment with smoke.

Midship Repair and Second Deck  
5" Ammunition Train

41. The first hit (No. 19) in this space was received on the starboard side in the First Lieutenant's Office. This hit was followed by others in the supply office (Hit No. 22), log room (Hit No. 21) and library (Hit No. 20). Ammunition hoists to secondary battery were put out of operation by either direct hits or fragments. Fires filled these spaces with smoke and eventually forced the crew to abandon this area. The Senior Surviving Officer, in reference (c), reported that "in the vicinity of these hits small granular particles of incendiary material were noted. These particles were about the size of 'grape nuts' and were glowing and burning everything with which they came in contact".

Forward Repair Station

42. This station, composed of compartments forward of Marine quarters (frame 53) was struck at least six times (Hits 1, 4, 6, 8, 9, and 18). These hits cut fire main risers and started fires which filled the compartments with smoke. All lighting and communications were destroyed. Due to sinkage and port list as the result of torpedo explosions forward, most of these compartments on the second deck were flooding through the shell holes in the port side as surviving personnel were abandoning this area.

Well Deck, Upper Deck and Hangar

43. There was one plane on each catapult, one on the well deck and two in the hangar. The hangar curtain had been previously removed because of blast damage received during the bombardment the preceding day. A shell hit (No. 30) on the well deck set the planes secured there on fire, sprayed gasoline on the well deck, the midship portion of the upper deck and the planes on the catapult. The fire spread very rapidly on the well deck. The plane

on the port catapult was set afire and shortly thereafter, was knocked off the catapult inboard onto the well deck by a hit from port (Hit No. 29). Flame and smoke made sky aft and control aft untenable.

#### Main Battery

44. Turret No. I was hit (No. 3) in the barbette in way of the shell deck. Another hit (No. 5) was received in the turret officer's booth putting this station out of action. A fire was started in the upper powder handling room, but the turret sprinkling system was turned on and prevented a serious fire or explosion. Turret II was struck (Hit No. 7) probably near the top of the barbette. Ammunition within exploded with such violence that the Commanding Officer ASTORIA reported in reference (a) that "QUINCY had blown up". This explosion rendered the forward control spaces untenable. Turret III was jammed in train by a hit (No. 35) on the face plate which dislodged a large piece of armor. All three of these turrets undoubtedly suffered other minor caliber hits which did not penetrate. About the time turrets I and II were put out of action, director I was jammed in train. The forestay had been cut by a hit (No. 2) and had caught around the radio antenna and the right end of the spotting glass. The spotter was unable to clear this.

#### Port 5" Secondary Battery

45. Guns No. 6 and No. 8 received hits (Nos. 26 and 28, respectively) which were reported to have exploded the ready-service boxes starting intense fires. This will be discussed in paragraph 90. The shells in the fuse pot of gun No. 4 were struck (Hit No. 23), cutting off the cartridge case bases and causing them to burn like "Roman Candles". Gun No. 2, although not hit, was out of action because of the explosion and fire in turret II and the fire in forward 20mm clipping room.

#### Starboard 5" Secondary Battery

46. Guns Nos. 1, 5 and 7 were put out of action, after three star shell salvos were fired to starboard, from a series of hits (Nos. 17, 25 and 27). The ready-service boxes serving guns No. 1 and No. 5 exploded. Gun No. 3, although not hit, was unable to fire due to the fire and smoke from the forward superstructure, turret II and the well deck.

#### 1"1 Batteries

47. The first hit (No. 36) received by the ship was in mount No. 3 of the after 1"1 battery. A fire was started on the fantail and was fought successfully until the fire main pressure failed. Structural fragments from the No. 3 mount put No. 4 mount out of action.

48. The clip struck (Hit No. 1) enveloped the forward

49. There was in the action as above. A second caused all fires tubes in No. 2 located on the ceiling, was blown off from the torpedo generator room.

50. A hit in the fireroom rendered it full with smoke and The after bulkhead torpedo explosion to the gradual fire rooms were, of course, torpedo explosion

51. No hits supports for the loose from the one which exploded and

52. At least above. Undoubtedly other spaces which action until the The most extensive make her turn to deck were set on her whole length enemy. Turret I salvos. Turrets put out of action were to starboard and other hits in battery. As a result minutes after collision

53. Numerous started fires which inferno from turret Nearly all of the hits or fragments the fires except exhausted.

48. The clipping room to the forward 171 battery was struck (Hit No. 15) and the ammunition set on fire. The flames enveloped the forward control station.

#### Firerooms

49. There was a minor flareback in No. 1 fireroom early in the action as a result of a hit (No. 19) in the space immediately above. A second hit (possibly No. 20), about seven minutes later, caused all fires to go out and fuel suction to be lost. A few tubes in No. 2 boiler were ruptured. The emergency feed pump, located on the centerline against the forward bulkhead at frame 53, was blown off by the effects of an explosion forward - probably from the torpedo explosion at frame 45 in way of the diesel generator room.

50. A hit (No. 24) in No. 3 blower leading into the No. 2 fireroom rendered the blower inoperable. The fireroom started to fill with smoke and the feed lines were leaking at all flanges. The after bulkhead of the fireroom was apparently weakened by the torpedo explosion in way of No. 3 and No. 4 firerooms. This led to the gradual flooding of this fireroom. No. 3 and No. 4 firerooms were, of course, completely flooded as a result of the torpedo explosion.

#### Engine Rooms

51. No hits were received in either engine room. All supports for the steam line in the after engine room had broken loose from the overhead apparently from the shock of projectiles which exploded above.

#### Summary

52. At least 36 hits were received in the spaces discussed above. Undoubtedly, there were many other hits in these and other spaces which were not reported. The short time after the action until the ship capsized precluded any survey of damage. The most extensive and serious damage came while QUINCY began to make her turn to starboard. During this turn, planes on the well deck were set on fire and the ship was repeatedly hit throughout her whole length while unable to bring her guns to bear on the enemy. Turret III was put out of action after firing only two salvos. Turrets I and II fared very little better as they were put out of action after firing only four salvos, two of which were to starboard. The explosion of ready-service ammunition and other hits early in the action decommissioned the secondary battery. As a result, QUINCY was without fire power about eight minutes after contact with the enemy.

53. Numerous hits on the main and second deck amidships started fires which soon resulted in the ship becoming a blazing inferno from turret II to the after bulkhead of the hangar. Nearly all of the fire main risers were cut by either direct hits or fragments. This rendered the ship incapable of fighting the fires except by a few CO<sub>2</sub> extinguishers which were soon exhausted.

54. Besides the damage from the projectiles, two torpedo hits were received. The exact locations of these hits are, of course, unknown, but it appears from the damage reported that one struck on the port side about frame 45 and the other struck on the port side about frame 74. The hit forward was believed to have exploded forward of the I.C. room and central station as the last message from central station indicated that this space was filling rapidly with water. Undoubtedly, the I.C. room, diesel generator room, bomb stowage, and the 5" A.A. handling room were immediately flooded. Crew's spaces on the first platform deck immediately above the compartments mentioned in the preceding sentence were flooded. The other hit at frame 74 in way of No. 3 and No. 4 firerooms undoubtedly resulted in immediate flooding of these two compartments. This is borne out by a statement of a survivor. He reported that he noted fire and smoke in No. 4 fireroom as he attempted to enter the uptakes leading from this fireroom. Apparently, when the torpedo exploded, fuel oil in the side tanks was blown into the fireroom and this floated to the surface where it ignited and resulted in the dense smoke which he observed.

55. The flooding from these two torpedo hits was undoubtedly the cause of the rapid sinking of the vessel. The increased draft and port list which resulted, brought the projectile holes in the skin of the ship below the water line. This resulted in the flooding of most of the second deck.

56. Personnel casualties suffered by QUINCY were by far the heaviest sustained on any of the three ships in this action. Topside exposed personnel received the greatest number.

#### V. VINCENNES DAMAGE

(Plate V)

##### Control Spaces in Foremast

57. All control spaces in the foremast, except radio I, were struck at least once. A hit (No. 17) on the machine gun platform passed through the 1"1 clipping room setting the ammunition located there on fire. It then struck the fire control tube cutting the cables and setting them on fire. On the platform below the signal bridge the fire control tube was struck again probably by an 8" projectile (Hit No. 20) and an intense fire was started. The radio room on the communication platform was struck at least once (Hit No. 19).

58. Early in the action, two hits (No. 15 and No. 18) were received in the chart house. Steering control was lost at this time - probably due to severing of the steering leads by a fragment from one of these hits. A hit (No. 21) was received in the signal shack which demolished all confidential publications and started a fire in the flag bags. The fire was extinguished by throwing the flags overboard. Fragments from hits received in this vicinity damaged the ladders leading to and from the bridge, but not sufficiently to prevent the crew from escaping.

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59. Besides the hits enumerated above, the 5" director forward and sky control were each hit at least once. Main battery control forward was hit by a projectile which did not detonate. On Plate V these are Hits Nos. 16, 12 and 14, respectively.

#### Battle II

60. At least three hits (Nos. 49, 50 and 51) were received in this station and other control stations in the immediate vicinity. The main battery control aft was struck at least once, destroying this station. The 5" director aft was struck, apparently by an 8" A.P. projectile, and blown overboard. Fires from the hangar and the boat deck necessitated the abandoning of this space early in the action.

#### Forward Repair Station

61. Many 8" and 5" hits were received forward on the upper, main and second decks:

- 3 or 4 in forecastle (Hits Nos. 1, 2 and 3)
- 1 in warrant officers' country (Hit No. 6)
- 1 in wardroom (Hit No. 9)
- 2 in sick bay (Hits Nos. 11 and 23)
- 2 or more in navigator's stateroom (Hits Nos. 22 and 26)
- 1 below radio I in Captain's cabin (Hit No. 24)
- 1 in the Marine compartment (Hit No. 25)
- 1 in the officers' galley (Hit No. 27)

Most of these hits, probably 5", detonated in the above spaces starting large fires which were never brought under control, partially because existing fire fighting facilities had been destroyed and partially because such facilities were inadequate. Many casualties were sustained by this repair party.

#### Midship Repair Station and Second Deck Ammunition Hoists

62. This area also received an unknown number of hits. At least two (Nos. 38 and 40) detonated in the laundry, starting fires. At least two more projectiles (Nos. 35 and 39) passed through the laundry and detonated in the uptakes. Five-inch A.A. ammunition in the port passageway was set on fire by at least three hits (Nos. 31, 32 and 33). These fires were never brought under control. This area was finally abandoned due to intense heat and smoke.

#### Mess Halls and After Repair Station

63. One 8" projectile (Hit No. 45) entered the forward mess hall but did not explode. The after mess hall was hit at least once (Hit No. 48). No fires were reported in this area. These spaces were abandoned because of flooding.

### Well Deck, Boat Deck and Hangar

64. This general area, as on the other two ships, was hit early in the action. This is unfortunate in that the highly inflammable airplanes were in the hangar and on the well deck. Both the port and starboard catapult towers were struck by 5" projectiles (Hits Nos. 43 and 44) which did not detonate. The well deck was struck at least once (Hit No. 46). At least one projectile (Hit No. 47) passed directly through the hangar setting the planes located there on fire. The galley just forward of the well deck was hit from both starboard and port sides (Hits Nos. 41 and 42). Hit No. 42 set films in the movie lockers on fire. This fire was not extinguished. The carpenter shop just aft of the hangar was hit three or four times (Hits Nos. 52, 53 and 54) and fires were started in this compartment.

### Main Battery

65. Turret No. I was struck at least twice, first in the barbette (Hit No. 4) early in the action which jammed the turret in train and later in the left range finder hood (Hit No. 5). No fragments entered into the turret. A powder fire was reported in this turret as a result of the hit in the barbette. It is reported that the fire was put out by immersing the powder bags in the water tanks.

66. Turret II was struck at least three times, once in the face plate by an 8" A.P. projectile (Hit No. 7) which penetrated without exploding. Exposed powder was set on fire, apparently from hot fragments. Another hit (No. 8) was received on top of the turret but did not penetrate. This turret, like No. I, was also hit in the left range finder hood (Hit No. 10). Fragments in this case entered into the turret officer's booth, wounding the turret officer.

67. Turret III was hit three or more times on the side and on the face plate by minor caliber hits which either did not penetrate or did not detonate (Hits Nos. 55, 56 and 57). These were probably 5" H.E. projectiles.

### Secondary Battery

68. Numerous hits were received in both the port and starboard batteries early in the action. It is definitely known that guns No. 4 and No. 7 were hit (Hits Nos. 28 and 36, respectively). A hit (No. 30) in the vicinity of gun No. 3 set the hawser reel on fire. This reel was located near No. 2 ready-service locker, and it appears that it contributed to the explosion of this ammunition. Other hits received (Hits Nos. 34 and 37) exploded ammunition in ready-service lockers and set fire to the cane fenders stowed aft of the searchlight platform. These explosions and fires completely devastated this area, and after the action only No. 1 gun remained serviceable. The casualties in this area were very great.

69. No. 1 a projectile or from this space explosion was explosion forward (apparently from intakes and breeches) were received the blowers by with smoke.

70. No. 1 in reference to of flooding which result of a propeller was flooded to

71. No hits. Although not reported in the forward compartment carried away and It is improbable that a torpedo hit forward

72. At 1 above. Undoubtedly these and surrounding the most extensive first few 8" shells battle II, set on fire, and Two hits (Nos. the cane fenders of the fire means no pressure in few CO<sub>2</sub> extinguishers that existed.

73. Best though one torpedo VINCENNES. On way of the lower The deck in starboard This torpedo magazines on and the crew's and 40.

74. Since it appears as torpedo or another a torpedo struck

## Firerooms

69. No. 1 fireroom is believed to have been hit by either a projectile or torpedo as there were no surviving personnel from this space. No. 2 fireroom was never hit; however, a heavy explosion was felt forward which probably came from the torpedo explosion forward. Heavy explosions were also felt overhead (apparently from Hits Nos. 31, 32 and 33) wrecking the blower intakes and bringing smoke and debris into this space. No hits were received in No. 3 fireroom; however, the destruction of the blowers by Hits Nos. 35, 38, 39 and 40 filled this space with smoke.

70. No. 4 fireroom was reported by the Commanding Officer, in reference (d), to have been hit by a torpedo. The slow degree of flooding which was reported was more apt to have been the result of a projectile hit below the water line. This space was flooded to the floor plates in a period of seven minutes.

## Engine Rooms

71. No hits were received in the after engine room. Although not reported, it appears as though a hit was received in the forward engine room because the exhaust steam line carried away and a flange on main steam line began leaking badly. It is improbable that this resulted from the shock of the torpedo hit forward.

## Summary

72. At least 57 hits were received in the spaces discussed above. Undoubtedly, as in QUINCY, there were many other hits in these and surrounding spaces which were not reported. Again the most extensive and serious damage from gunfire was from the first few 8" salvos which struck the bridge, carpenter shop, battle II, secondary battery, and the hangar where planes were set on fire, presenting the enemy with a well-illuminated target. Two hits (Nos. 34 and 42) early in the action started fires in the cane fender stowage and the movie locker. Apparently, many of the fire main risers were ruptured by fragments as there was no pressure in the fire main to fight any of the fires. The few CO<sub>2</sub> extinguishers were entirely inadequate for the fires that existed.

73. Besides the damage suffered by gunfire, it appears as though one torpedo (possibly two) struck the port side of VINCENNES. One torpedo probably struck under the sick bay in way of the lower handling room of No. II turret about frame 38. The deck in sick bay was reported ruptured and blown upward. This torpedo hit probably resulted in the flooding of all of the magazines on the second platform deck between frames 30 and 45 and the crew's spaces on the first platform between frames 30 and 40.

74. Since there were no survivors from the No. 1 boiler room it appears as though this compartment was struck by either a torpedo or an 8" projectile. The Commanding Officer reported that a torpedo struck in way of this compartment. He also reported

that No. 2 boiler room was structurally intact and that personnel escaped from the plotting room and central station which are located immediately forward of No. 1 boiler room. The I.C. room, which is also adjacent to No. 1 boiler room, must have remained intact because it was reported that some telephones remained in service until the ship was abandoned. Previous torpedo damage to cruisers in way of boiler rooms has usually resulted in damage to more than one boiler room. Therefore it seems as though one of two events occurred: (a) A torpedo struck in way of this boiler room and detonated with a low order detonation. Although not impossible this is an unusual occurrence. (b) Or an 8" projectile, which was short in range, penetrated the skin and inner hull below the water line, probably detonating upon penetrating the inner hull, killing all personnel and rupturing the hull sufficiently to permit rapid flooding.

75. The magazine group of No. I turret was flooded to prevent an explosion which might have resulted from the fires in the near vicinity of this magazine. According to reference (d), this was accomplished a few minutes after the torpedo hit in way of No. II turret.

76. The personnel casualties, as on the other two ships, were very heavy. Topside personnel accounted for the majority of the casualties.

#### IV. DISCUSSION

##### A. Types of Projectiles

77. From an analysis of the damage it appears that 8" A.P. and 5" H.E. projectiles were used by the enemy. The use of 8" A.P. projectiles is definitely established in that the gunnery officer of ASTORIA found part of the base of an 8" A.P. projectile in the forward messing compartment. The fragment consisted of about half of the base ring into which the base plug screws. He was unable to take the fragment with him when he abandoned ship. No 5" projectiles were found intact on any of the three ships, although some of the 5" enemy projectiles were duds as the references definitely report various 5" projectile hits which did not detonate. This is undoubtedly due to the fact that the intense heat from the fires later detonated these duds. The fact that these projectiles usually detonated upon contact or just after penetrating the skin indicates that quite probably they were 5" H.E. projectiles, that is, of a type with an unusually light case as compared with 5" A.A. common. Special incendiary projectiles may have been fired by the Japanese, but the burning "grape-nut" fragments referred to in paragraph 41 might have been fragments of explosive from a low-order detonation. The intensely hot fragments from an H.E. projectile inside a ship have few if any equals in setting fires within confined spaces.

78. Hits were received from automatic A.A. weapons. These hits were confined to the superstructure above the upper deck and to the hangar; however, this damage was negligible in comparison to the material damage caused by the detonation of the

5" projectiles. of these projectiles ing ship. His comparison with definitely established impact nose type has three copper

79. In A.P. of 8" A.P. projectile face plate of through the 8" angle which joined It is noted that different from was approximately 8" A.P. projectile to the following

(a) Class tends to break projectiles.

(b) The projectile with a windshield effective against 1/2 caliber in

80. The experiences of the effectiveness against naval projectile hits on fact that one from about 3,000 barrette or put six of the nine put out of action. The average range

81. The action undoubtedly the loss of the due primarily to up the ships to targets despite also presented ting in the near had the following

(a) Heat

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5" projectiles. The gunnery officer of ASTORIA recovered one of these projectiles but unfortunately lost it as he was abandoning ship. His description of the projectile, however, in comparison with material in the records of the Bureau of Ordnance definitely establishes it as a 25mm A.A. H.E. projectile of impact nose type fuze. This projectile, which is boat-tailed, has three copper rotating bands and is 4.3 inches long.

79. In ASTORIA action, it is interesting to note the effect of 8" A.P. projectiles upon class "B" armor. The hit on the face plate of turret I made a clean hole 11 inches in diameter through the 8" class "B" face plate and the 51 lb. medium steel angle which joined together the face plate and the side plate. It is noted that performance of armor on ASTORIA was considerably different from that on BOISE\*, although range in both cases was approximately the same. On BOISE, 6" Class "A" armor rejected 8" A.P. projectiles. The difference in performance is attributed to the following:

(a) Class "B" armor does not have the hard surface which tends to break up all except unusually high quality A.P. projectiles.

(b) The projectiles used against BOISE had a flat nose with a windshield. This type projectile which is unusually effective against light armor is poor against anything over 1/2 caliber in thickness.

80. The experiences of ASTORIA in comparison with the experiences of SAN FRANCISCO\*\* afford an excellent contrast of the effectiveness of A.P. projectiles and bombardment projectiles against naval targets. SAN FRANCISCO received two 14" projectile hits on the barbette of No. II turret. Despite the fact that one was fired from about 17,000 yards and the other from about 3,000 yards, neither one of these penetrated the barbette or put the turret out of action. On the other hand, six of the nine turrets on ASTORIA, QUINCY and VINCENNES were put out of action due to direct hits by 8" A.P. projectiles. The average range of these was about 5,000 yards.

B. Fires

81. The fires amidships which were started early in the action undoubtedly contributed more in an indirect fashion to the loss of these three ships than any other factor. This was due primarily to the fact that the fires so completely lighted up the ships that the enemy had no trouble in remaining on the targets despite the evasive maneuvers used. The flaming ships also presented perfect targets to the enemy submarine(s) operating in the near vicinity. Besides these effects the fires had the following concomitant effects:

(a) Heat made control spaces physically untenable.

\* Buships War Damage Report No. 24  
\*\* Buships War Damage Report No. 26

(b) Smoke and glare rendered directors, range finders and spotting instruments useless even when personnel were physically capable of remaining at their stations. In all three ships these fires were fed by topside paint, life jackets, signal flags, airplanes, airplane spare tails, wings, parachutes, ships' boats, lubricating oil and kerosene which made the area between the bridge and the after bulkhead of the hangar an inferno beyond human endurance.

82. Fires (particularly the one in the wardroom country) were the direct cause of the loss of ASTORIA. Excess equipment, paint on bulkheads, records, and so forth in officers' spaces and in ship's offices provided fuel for a fire which gradually worked downward exploding ammunition in the 5" hoists. From there the heat of the fire eventually reached and exploded the unflooded 5" magazine. This blew a hole in the ship's side below the waterline. The flooding which resulted caused the ship to capsize 45 minutes later.

83. This action emphasizes again the absolute necessity of permanently removing inflammables and leaving ashore clothes, records, paint, and other materials that are not essential for the war-time operation of the ship. Those inflammable materials which are classed essential should be stowed below in compartments well forward and below the waterline and which are provided with a CO<sub>2</sub> smothering system.

84. The Commanding Officer or the Senior Surviving Officer in all three of these ships strongly recommended the removal of aircraft from cruisers. It is interesting to note that the decision was made to retain them aboard despite the fire hazard. Cincpac directed, however, that Commanding Officers, at their own discretion, have the planes flown off or dropped overboard if action appears imminent.

85. There is no evidence of gasoline fires or explosions near gasoline stowage tanks in any of these ships, probably because no hits were near enough to cause leakage of gasoline from these tanks.

#### C. Explosion of Ready-Service Ammunition

86. Attention is invited to paragraphs 25 and 45 in which the 5"/25 caliber ready-service ammunition exploded as a result of projectile hits. This matter has been given very close attention by this Bureau and the Bureau of Ordnance because of the menace inherent in the presence of ready-service ammunition in considerable quantity in exposed locations.

87. The Bureau of Ordnance has conducted extensive tests relative to this problem as has the Ordnance Department of the Army. The two agencies are in agreement that under certain conditions the impact of high velocity fragments is quite capable of igniting 5"/25 caliber charges stowed as in ready-service boxes. When so ignited, cartridge cases may be expected to jump out by rocket action in a flaming condition, and to burn on deck or to roast other charges so that they too ignite in succession. Some, but probably not all, of the projectiles may be expected to give "low order" bursts.

88. The Bureau of Ordnance expected. The hazard which may spread, hazardous to attempt the immediate vicinity.

89. In regard to paragraph 25, it is stated that charges were detonated with some above. This is believed to have been a very large hole in the side of the ship. This hole was the result of a 5"/25 caliber projectile which struck the average enemy 8" projectile to point of impact in the splinter shield. The ready-service ammunition is believed to have exploded in the ready-service explosion carried. This blower was positioned to protect one or more.

90. With reference to (c) stated to guns No. 6 and tests described as a severe powder charges which was explosion.

91. These in question of ready and the Senior Surgeon recommended the reduction based on their experience. Other sources have to reduce fire and however, by the needs of the service the Bureau of Ordnance service is sound without excessive

92. Although were ineffective the time the fire the flood valve

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88. The Bureau of Ordnance tests indicate that detonation of 5"/25 caliber A.A. common projectiles en masse is not to be expected. The hazard, therefore, is one of a violent powder fire which may spread, which is difficult to extinguish and rather hazardous to attempt to approach too closely. It will thus make the immediate vicinity temporarily untenable.

89. In regard to the incident discussed on ASTORIA in paragraph 25, it appears probable that the 5"/25 caliber ammunition charges were ignited by direct impact of the 8" projectile. It also seems probable that one or more of the projectiles detonated with some degree of "low order" detonation as described above. This is based on reference (a) which reported that there was a very large hole in the upper deck near the ready-service box. This hole must have come from the detonation of the 5"/25 caliber projectiles. It appears improbable that this hole resulted from the detonation of the 8" projectile because the average enemy 8" projectile traveled about 60 feet from point of impact to point of detonation whereas the distance from the hole in the splinter shield to the hole in the upper deck adjacent to the ready-service boxes was only 22 feet. Further, this projectile is believed to have ranged upward and overboard after striking the ready-service locker. Reference (a) also reported that "the explosion carried away the forced draft blower in No. 3 fireroom". This blower was probably destroyed by fragments from the detonation of one or more of these ready-service projectiles.

90. With respect to the incident reported in paragraph 45, reference (c) stated that hits "exploded" ready-service boxes to guns No. 6 and No. 8. From results of the Bureau of Ordnance tests described above, it appears rather that this "explosion" was a severe powder fire from the 5"/25 caliber ammunition charges which was so intense as to be of the nature of an explosion.

91. These incidents are of interest as they bring up the question of ready-service allowances. The Commanding Officer and the Senior Surviving Officer of ASTORIA and QUINCY, respectively, recommended the reduction of ready-service ammunition, apparently based on their experiences as mentioned in paragraphs 25 and 45. Other sources have also made this same recommendation in order to reduce fire and explosion hazards. The decision has been made, however, by the Vice Chief of Naval Operations that, based on the needs of the service and the results of the tests conducted by the Bureau of Ordnance, the present policy with respect to ready-service is sound and provides adequate ready-service ammunition without excessive hazards.

#### D. Magazine Flooding

92. Although sea floods were provided in these ships, they were ineffective in the case of ASTORIA 5" magazines because by the time the fire was serious enough to threaten these magazines the flood valve controls were inoperable. The Bureau's policy

for the past few years has been to provide magazine sprinkling systems in lieu of flooding-from-sea. Every effort is being made to insure that water will be available for magazine sprinkling. In cases of damage as severe as that incurred by ASTORIA, however, it cannot be assured that controls for either flooding or sprinkling will remain operable.

#### E. Notes and Recommendations by Commanding Officers

93. The Commanding Officers and Senior Surviving Officer furnished some notes and recommendations. Some of these are briefly discussed below.

- (a) "There should be a diesel generator set from 50 to 75 kw located in the end of the ship independent of the central power plant."

This recommendation has been approved by the Bureau. Two diesel generator units each of 100 kw capacity are being installed in all heavy cruisers, one of which is located forward and the other aft. Sixty kw units similar to those described above are being installed in light cruisers of the CL4 class. New cruisers of the CL55 class are equipped with two 100 kw units.

- (b) "There should be a hand-operated fuel oil service pump located in each fireroom."

This recommendation, which has been discussed in reference (e), has also been approved. These pumps are being installed.

- (c) "Required combustible materials should be well separated."

In a letter to Cincpac, the Bureau has designated an inflammable stowage which is well forward and below the waterline. This space is to be fitted with a CO<sub>2</sub> smothering system. This recommendation was also discussed in reference (e). This storeroom will carry paint, grease, alcohol and lubricating oil.

- (d) "Present fire-fighting equipment, depending on the central power plant of the ship, proved unsatisfactory. At least two fire mains, well separated from each other, should be run the entire length of the ship and installed in such a manner that they may be operated singly or jointly."

In accordance with reference (e), a vertical loop fire main in the forward and after living spaces, separated by at least one deck is being installed in all heavy cruisers in commission. There are various cross connections between the loop. This permits the fire main loop to be damaged in two or three places without loss of fire main pressure. Various risers are led to the upper decks from the fire main. In addition to this, as a standby in the event of the loss of all steam, one 1,000-gallon-per-minute diesel driven fire pump forward of the machinery spaces is being installed in existing heavy cruisers. Two of these pumps, one forward and one aft, are being installed on light cruisers of the CL40 class.

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The arrangement of fire mains on the new cruisers under construction, both light and heavy, is such as to possess greater flexibility under damaged conditions. The lessons of the present war, however, have resulted in alterations being made to extend the fire main loops forward and aft of their original designed positions, and to install two 300-gallon-per-minute electrically driven fire pumps - one forward and one aft. Electrically driven fire pumps were chosen instead of diesel-driven pumps because of the greater diversity and distribution of auxiliary electrical power on these new cruisers. The CA68 class are better in this respect than the CL55 class, so that, on this latter class, there are also installed two 60 kw emergency diesel generators for use with the casualty power system. One of these generators is installed forward on the second deck and one aft. Each is capable of starting an electrically driven fire pump, and is available for other uses such as the 40mm battery, ship's lighting, etc. Besides this, all heavy cruisers, both those in service and new construction, carry six gasoline "handy billies" and twelve electrical submersible pumps.

(e) "It is recommended that the forestay, and if possible, the afterstay be removed whenever practicable from QUINCY class CAs to prevent the fouling of topside directors."

In accordance with this and recommendations from more recent actions, the long forestay and afterstay are to be removed from the existing heavy cruisers of the SAN FRANCISCO (QUINCY) class as opportunity permits. The mainmast is in the process of being redesigned. It will be placed about ten feet forward of the present mast and will be designed to carry radar antennas. In the interim, the long forestay from the stem to the foremast will be removed and short stays installed to give a larger factor of safety and reduce the whip.

In new construction the foremast and mainmast are designed to carry the weight of the radar antennas without the use of forestays and backstays. Short stays are being added, however, to give a larger factor of safety, help support the mast in the event of action damage and reduce vibration. These stays are located well clear of all batteries and fire control instruments.

#### E. Conclusions

94. It will be noted in the narrative that all three of these ships sank by capsizing. In ASTORIA the initial heel was caused by the flooding of port side compartments due to the explosion of the 5" magazine. In QUINCY and VINCENNES the initial heel was caused by the flooding of the port wiring passage and port side compartments damaged by the torpedo explosions. On all three of these ships, as the compartments flooded, the vessels trimmed down by the head putting the second deck under water. With the heel and trim by the bow, free flooding fore and aft through the riddled bulkheads on the second deck occurred, destroying a large portion of the water plane area with the result that the stability of the ship was reduced and finally eliminated completely.

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95. In the case of ASTORIA, although damaged very extensively, it is possible that the ship might have been saved if the fires could have been brought under control before they reached the ammunition in the 5" hoists. Damage to QUINCY and VINCENNES was so extensive that loss of the vessels was inevitable. It is not possible for any lightly protected vessel to absorb such punishment and survive. This action, however, again emphasizes the necessity of having fire fighting equipment which is adequate for the control of conflagrations resulting from present warfare. It also emphasizes the importance of reducing fire hazards aboard ship to the absolute minimum.

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