

USS LISCOME BAY (CVE56)
Loss in Action
Gilbert Islands, Central Pacific
24 November, 1943

Class..Aircraft Carrier Escort (CVE56)	Length (W.L.).....490'-0"
Launched.....19 April,1943	Beam (W.L.).....65'-0"
Displacement.....10,200 tons (Designed Full Load)	Draft.....19'-8" (Designed Full Load)

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SECTION I - FOREWORD

1. LISCOME BAY sank some 23 minutes after being torpedoed. Approximately three-fourths of her complement were lost with her. Reports from vessels in company indicated that the explosion was of far greater violence than that which could be produced by enemy torpedoes alone - even if two or three had hit simultaneously. These exceptional circumstances made it mandatory that the cause of loss be clearly established.
2. The Vice Chief of Naval Operations accordingly made arrangements for the survivors to be interviewed upon their return to the mainland by representatives from the Commander-in-Chief, U.S. Fleet, Chief of Naval Operations, the Bureau of Aeronautics, Ships, and Ordnance, the Commander Fleet Aircraft, West Coast and the Maritime Commission. This report is based primarily on the report made to the Commander-in-Chief, U.S. Fleet by the representatives from the Navy Department. In addition, the records of the meetings of the representatives and the statements of survivors were turned over to this Bureau and have been used in the preparation of this report.

SECTION II - SUMMARY

3. On the morning of 24 November, 1943 Flight Quarters on LISCOME BAY was sounded at 0450. General Quarters followed at 0505. All hands had manned their stations when, at 0510, a tremendous explosion occurred.
4. Results of this explosion were disastrous. The ship's structure aft of the forward bulkhead of the after engine room was generally demolished and there were no survivors aft of this point. The hangar deck was destroyed aft of frame 110 and the flight deck was missing aft of frame 101. An intense fire was started almost immediately in the forward part of the hangar and a few planes remaining on the forward portion of the flight deck were ignited. In the forward machinery space the shock carried away steam lines and compressed air piping. As a result the main and auxiliary machinery in this space ceased operating. All services, including firemain pressure, to the remaining portion of the vessel were lost. Survivors attempted to extinguish the fires in the hangar but no water pressure was available, and it was immediately apparent that the situation was not only hopeless insofar as saving the ship was concerned, but that the abandonment would be extremely difficult. When the ship was abandoned it was noted that practically no structure aft of frame 118 remained. Survivors reported that the forward portion of LISCOME BAY finally went down with a heavy starboard list approximately 23 minutes after the explosion.
5. After a thorough study of reports from ships in company and statements from survivors, including personal interviews with about 25 of the latter, the Navy Department representatives concluded that the primary cause of the loss of the vessel was the mass detonation of aircraft bombs stowed in the hold, frames 152 to 168, as a result of heavy fragment

attack produced by a contact torpedo explosion on the starboard side in way of, or very near, this magazine. Further study by the Bureau corroborates this conclusion.

6. LISCOMB BAY, Maritime Commission Hull 1093, was one of a large class of ships designed as escort carriers by the Maritime Commission. She was built by the Vancouver Yards of the Kaiser Company, Inc. to the plans and specifications of the Maritime Commission and under the supervision of the Maritime Commission. Thus, hull design and construction followed merchant-type practice in contrast with combatant-type carriers built to Navy Department specifications. The main objective, of course, of this procedure was to provide a large number of small escort carriers in the shortest possible time by following mass production methods. The ships were originally intended, as their name indicates, for employment as convoy escorts, primarily to provide planes for anti-submarine work. It is well known that all classes of escort carriers, as well as other naval ships converted from merchant types, do not have armor protection against direct hits by bombs and projectiles, and do not have torpedo protection systems such as those provided in large carriers. In the class of escort carriers converted from oilers, however, good protection against fragments from torpedo hits is provided by a heavy layer of liquid in the wing tanks (originally oil tanks). In escort carriers converted from C-3 hulls, as in some other naval auxiliaries converted from merchant-type hulls, the Bureau of Ships required special protection against fragments from torpedo hits in way of torpedo and bomb stowage spaces. This protection took the form of a liquid layer or, in special cases, a heavy splinter protection bulkhead. In the CVE55 class, however, primarily because of the very limited space available for bombs and the urgent demands for early delivery of the ships, this protection was not provided.

7. It should be pointed out that in any case of this kind the statements by survivors are bound to vary over a wide range, and to be, to some extent, conflicting. As explained by the medical officer of LISCOMB BAY, this fact is due in large part to the shocked and dazed condition of survivors, particularly in the few moments immediately after the first explosion. Similar variations in survivors' observations were noted in interviewing survivors from LEXINGTON (CV3). This psychological factor has been taken fully into account in evaluating statements. Nevertheless, it is not possible to rule out entirely certain observations which do not appear plausible, yet which seem to be borne out by the statements of several witnesses. On this basis it is entirely possible that there were one or more large explosions after the first main explosion. The overwhelming majority of evidence, however, is that the first mass detonation - almost simultaneously with the torpedo hit - is the one which caused the complete demolition of the after part of the ship. Secondary explosions - which may have come from torpedoes or depth bombs in the hangar - or from the 5-inch ammunition aft - may have given the appearance of large and destructive explosions; but the principal damage had already been done by the mass detonation of the bomb magazine. The factual basis for the conclusion that a mass detonation occurred in the bomb stowage space is fully

discussed in a later part of this report. Some of the alternative theories concerning the disaster, as advanced by survivors and by other ships in company, are also discussed.

SECTION III - NARRATIVE

(Plates I, II and III)

8. The planes of LISCOME BAY were scheduled for flight operations at dawn on 24 November. Flight quarters sounded about 0450. Thirteen planes had been spotted on the flight deck, including one forward on the catapult. All were fueled and armed. In the hangar there were an additional seven planes, armed but not fueled. The operations were to have been the first for LISCOME BAY aircraft since the vessel had left Pearl Harbor and she thus had her complete allowance of aircraft bombs aboard in the bomb magazine except for some depth bombs actually in the planes. In the port side of the hangar aft were 12 torpex-loaded aircraft torpedoes.

9. At 0505 the crew went to General Quarters. It was still dark with little wind and sea. At 0508 LISCOME BAY, as guide of the formation, started to turn right. One destroyer of the screen had been detached at 0408 and another had left at 0434 to investigate a possible submarine contact. The remaining five destroyers had just been ordered to close the gap left in the screen.

10. At about 0510 an officer on LISCOME BAY stationed at the 40mm director on the gallery walkway at frame 160, starboard, reported over the telephone that he saw a torpedo headed for the ship. A violent explosion occurred almost immediately. An officer survivor stationed in Fly Control at the time described the explosion as a huge column of bright orange-colored flame, with some white spots in it like white hot metal, extending upward perhaps 1000 feet. Some ships in the formation witnessed this large column of flame and saw only a single explosion, while one vessel reported two explosions very close together. Considerable debris fell on NEW MEXICO, about 1500 yards distant from LISCOME BAY. Some survivors from the auxiliary and forward engine rooms reported one violent explosion followed by one or two less violent shocks.

11. The entire after half of the vessel was generally demolished and there were no survivors from any part of the vessel aft of frame 118. Some of the survivors from the forward portion, in swimming away from the hulk, reported that nothing remained of the hull above water aft of amidships while others reported seeing only a small amount of structure projecting above the water in the vicinity of the port quarter.

12. The after machinery space was in the portion of the hull which was demolished. The forward machinery space appears to have been a shambles of broken steam piping, compressed air lines and oil and water piping. It is certain that no machinery remained operable. All lights were out and most of the emergency relay-controlled hand lanterns did not function.

13. Intense fires were started in the hangar and several smaller fires were ignited on the flight deck. One aircraft,

spotted on the starboard side at the bow, was ignited simultaneously with being jarred or being knocked overboard and burned brightly on the surface of the water just off the stem. Still another was knocked into the forward starboard gun gallery and burned there. Oil was reported to have covered the flight deck forward and a portion of the island. Fires were burning on the surface almost completely around the hulk. These made it difficult to abandon the vessel. The gasoline tanks forward of the machinery spaces, however, apparently remained substantially intact and no evidence was reported which indicates that fires were fed from this source. It appears possible that the blast from the explosion threw oil up through the hangar and on the flight deck and that this oil was ignited by hot or burning fragments. The surface fires surrounding the ship apparently originated with oil which was released by the rupture of the after tanks in way of the explosion.

14. The plates represent the general situation in the forward portion of the vessel as reconstructed from survivors' accounts. They also indicate the locations of the principal groups of survivors and, where possible, the routes of escape followed in abandoning the vessel. The following brief accounts also are based on survivors' narratives and are given here to present a word picture of conditions as they existed in the forward portion of the vessel during the 23 minutes that she remained afloat.

15. With the ship at General Quarters the island structure was completely manned. A majority of personnel there were knocked down. Damage to light structure in the island appears to have been minor although such items as the bull horn and the radar antenna crashed down on the bridge doing considerable damage and pinning some personnel underneath the wreckage. When the personnel recovered their senses after the initial blast they found terrific waves of heat coming up from the flight and hangar decks and engulfing the island. These abated somewhat within a few moments and it was possible to observe the forward portion of the vessel. Nothing could be seen of the flight deck aft of amidships. The few planes remaining on the flight deck forward were knocked askew and were burning brightly. Ammunition in the wings of the planes was beginning to explode. The flight deck was on fire in several places and there were other fires on the surface of the water surrounding the bow. Most survivors noted considerable oil on the topside structure including the flight deck, although this escaped the notice of some few people. Personnel on and above the bridge level threw knotted lines over the railing on the inboard side of the island and clambered down them to the flight deck. Some individuals went aft on the starboard gallery walkway to the 20mm gun platform at frame 100. As they made their way aft they noted that the deck connection at the juncture of the flight deck with the starboard side of the hangar was split open for a considerable length forward of frame 110 and it was possible to look down and into the hangar. Numerous fires were seen burning in the planes, and in equipment stowed in various places and the bulkheads appeared to be on fire. Nothing remained of the vessel above the second deck aft of frame 110 and the flight deck was gone aft of frame 101. The vessel had a starboard list variously estimated as 5 or 10 degrees. The people who had gone aft then abandoned ship at frame 100 either by jumping into the water or by climbing down lines. Other personnel from the island made their way down via the internal ladders, although

some of these were twisted, and forward to the starboard gun gallery and entered the water using lines from that point. Still others, who had found difficulty in leaving the island by virtue of falling debris or who were awaiting orders, were trapped by heat and flames and forced to jump into the water from the bridge. Some of these did not survive, probably because of injuries received in jumping overboard, which might have caused drowning.

16. In the auxiliary machinery spaces below the second deck, between frames 100 and 118, personnel were at their General Quarters stations. There were a total of ten men in the various rooms in this area, all of whom escaped. These were the aftermost survivors. On the upper, or first platform level, 2 men were in the generator room (frames 111 to 118 port), one man was in the gyro room (frames 100 to 104), one man was in the starboard passageway (frames 104 to 111) and one man was in the electrical workshop (frames 100-106 starboard) and the other five men were in the machine shop on the lower level. Most of these men felt a single violent shock followed after an appreciable but brief interval by a second jolt. Most of the men were knocked to their knees but 2 were not. All lights went out. The men in the machine shop left by going up the port ladder and across through the athwartship passage between the fuel oil tanks and the fresh water tanks to the starboard ladder. At the starboard ladder they were joined by the men from the upper level. Going through the athwartship passageway they noted that the passage was only about 12 inches wide (initially it had been 30 inches) and that the deck of the passage had been pushed sharply upward. When the men were assembled by the Chief Petty Officer in charge, they went up the starboard ladder to the second deck. They had considerable difficulty in passing through the second deck hatch because of debris piled on and around the hatch, and effort was required to push a small hole in this debris so that they could escape. This hatch was in the passageway between the wardroom and the CPO mess room. They walked into the wardroom and made their way aft near the centerline. The bulkhead at frame 118 above the second deck was apparently demolished inasmuch as they reported that prior to reaching the location of this bulkhead they stepped down a few feet to a level which was apparently the tank tops of the fresh water tanks located between frames 110 and 118. The tank tops were initially some 30 inches below the second deck. While standing on the tank tops they did not remember seeing either the hangar or flight deck overhead. From the tank tops some of the men climbed over to the starboard side and out of the wreckage at a point slightly abaft frame 118 and swam away from the ship. Three men of this party, however, climbed up some hanging cables, apparently at about frame 101 and continued all the way up to the gallery level, the last portion of their journey being to starboard along the deep girder under the flight deck at frame 101 where they left the vessel by jumping overboard from the platform of 20mm gun No. 7. At the time they left the vessel she was still making headway. The aftermost structure which they definitely remembered was a portion of a frame at about frame 122. This web seemed to be sheared off about 5 to 6 feet above the second deck. Their impression was that the starboard side of the shell in this vicinity had been blown inboard and horizontal and that they had walked over a portion of this shell in leaving the vessel. Some of these men had a definite recollection that oil and water, possibly a foot in depth, had collected on the deck of the upper auxiliary machinery spaces before these were evacuated. When

these men had collected at the break at frame 118 the water level was noted to be over the top of the tank tops and was lapping over the top of bulkhead 118 on the second deck and running down into the auxiliary machinery spaces via the hatches from the second deck.

17. The forward engine and boiler room was completely manned. The total number of personnel on watch could not be determined but there were eleven survivors from this space. Immediately after the initial shock all lights were extinguished. Many steam and air lines were ruptured and the spaces filled immediately with steam and escaping air. The failure of pipe lines by shock appears to have been general and unquestionably was extensive enough to cause almost all of the main and auxiliary machinery to stop. In addition, it seems probable that some of the auxiliary machinery, at least, was also directly damaged by shock. Inasmuch as the after machinery space was obliterated and the auxiliary machinery spaces were flooded, as noted in paragraph 16, this explains the general failure of all service throughout the remaining portion of the vessel including the lack of pressure on the fire main noted by topside survivors. The initial shock knocked everyone from their feet, but the second jolt seems to have been quite light. Nine survivors collected on the lower level and, finding the normal access blocked by fallen piping and other debris, went up the escape trunk between frames 99 and 100, starboard, and, after considerable difficulty in undogging the door at the top of the trunk, emerged onto the second deck in the starboard passageway inboard of the chaplain's office. All light partition bulkheads in this area were wrecked and there were piles of debris. They clambered over the debris and crossed to the starboard ladder leading to the hangar at frame 95. Looking up they saw a fire in the hangar and the ladder was also damaged, so they returned to the escape trunk. Back at the escape trunk one man returned to the engine room but could see nothing and heard only the noise of escaping steam. He returned to the second deck and rejoined the other survivors. They then heard three men inside the trunk (the normal access to the engine room) forward of bulkhead 95 on the starboard side and went over to the door in the bulkhead. Here they managed to extricate two of these men through the flame-tight door (dogged shut) although it could only be opened about 12 inches because of debris and distortion of the bulkhead and door. The group then passed aft through the remains of bulkhead 100 into the wardroom. Continuing aft they clambered down to the tank tops, about on the centerline, went over to starboard, meeting the party from the auxiliary engine room, and left the vessel. Prior to abandoning the engine room they noted no flooding. None of the relay hand-operated lanterns in the machinery spaces operated and their only light was from hand flashlights. When they left the vessel they also noted that the waterline seemed to be nearly at the second deck level. They noted that apparently nothing of the ship remained aft of frame 118 except a small strip of port quarter shell plating projecting a few feet above the water.

18. In the sick bay spaces there were five men, two of whom were in the office, frames 67 to 78 along the starboard shell, and three in the sick bay on the centerline, one of whom was a patient. A heavy shock threw personnel to the deck even though some were sitting in chairs. A second lighter jolt knocked some men down again. The five men, including the

doctor, collected in the sick bay area where they were joined by other personnel, including some from the first platform below. The party then numbered between ten and fifteen people. Light bulkheads were extensively ripped and torn and sick bay equipment was a jumble in the various spaces. Bulkhead 82 seemed intact although oil was reported on the second deck transverse passageway just forward of this bulkhead. This was diesel oil from a line which apparently was leaking through the fittings. The men checked both the port and starboard ladders up to the hangar at frame 79 and found them blocked by fire in the hangar. Most of the party went forward along the starboard passageway, passing outboard of the elevator pit until they reached berthing space A-203-L. Here, several men from Repair II, who had led out and connected fire hoses but found no pressure on the plugs, joined the party. During this part of the trip little difficulty was encountered as the structure, although distorted, was intact. The automatic hand lanterns in the sick bay areas had functioned and some of them were used by this party. They then went up the ladder, frames 43 to 45 starboard, and continued up the trunk from the hangar deck to the gallery deck. In passing up this trunk they noted that the bulkheads were badly distorted and wrinkled but substantially intact. The ladder was shaky but in a useable condition. On the gallery deck they went forward and around the Captain's bath and passed through the starboard archway in bulkhead 38 and through the door into the catapult machinery room. To this point the trip had been complicated chiefly by dense smoke. The catapult machinery room, at this time, was free of smoke. The party crossed to the port side and passed through the light lock onto the port gallery walkway. There, the party left the vessel via lines from No. 4 40mm and No. 2 20mm gun platforms. There were some other officers and men on the port gallery walkway who abandoned ship by the same method. The port gallery walkway was wrinkled and distorted and was generally pushed upward as though distorted by a blast from below.

19. In the wardroom country on the first platform between bulkheads 66 and 82, several pilots, scheduled for late flights, remained in their bunks when Flight Quarters was sounded. When the explosion occurred most of them were knocked from their bunks. Furniture was toppled over and partition bulkheads collapsed. This made escape difficult, in the darkness (the automatic lanterns did not function), but there were no reports which indicated that any personnel were actually trapped. All of these officers, probably numbering about ten, went up to the second deck via the starboard ladder at frame 80. Some had attempted the port ladder at frame 80 but found it blocked. On the second deck most of them joined the sick bay party and escaped with them, as described in paragraph 18. Two officers, however, went up the port ladder at frame 80 from the second deck to the hangar, making their way through debris and fire at the hangar level. Looking aft along the hangar deck they saw no structure along the port side aft of amidships. They walked aft from frame 80 a few feet and jumped overboard from the port side at the hangar deck level. There appears to have been a hole in the shell plating at the hangar deck level at this point although this hole was not reported by other survivors. It was established, however, that the gallery walkway above this location was extensively damaged and the presence of the hole in the side plating in the vicinity of frame 85 is not unreasonable. The

water level did not seem far below the hangar deck at this point. Another officer and two enlisted men who had become separated from the party in the sick bay area proceeded forward on the port side and opened the door to the elevator pit at frame 63. They climbed up the port side of the elevator pit to the hangar deck level and crawled aft over debris to the port sponson where they went overboard. The fire in the elevator pit at this time was burning only on the starboard side. The hangar aft of the elevator pit was a mass of flames. Statements of these 3 survivors gave the impression that the burning material in the forward part of the hangar had been swept there by the blast from the explosion.

20. In the officers' country on the upper deck, frames 20 to 65, there were a few pilots asleep in their bunks. How many officers were in this vicinity is unknown but at least two escaped from starboard staterooms, frames 32 to 42, by going to the centerline passage, thence forward to the ladder at frame 28 and up to the gallery deck which they crossed to the port walkway where they entered the water with other personnel. One other officer, asleep in a stateroom under the island, frames 50 to 60, escaped aft through the lobby, frames 60 to 65 starboard, and up the ladder to the gallery level. From there he went to starboard, apparently via Radar plot, and aft to a 20mm gun platform from which he jumped overboard. These three officers were all in agreement that partition bulkheads were collapsed throughout the starboard half of the officers' country on the upper deck. They all reported seeing fire coming up the elevator pit and other fires on the starboard forward gallery walkway. The various rooms were a jumble of smashed furniture and equipment. These officers felt but one shock. They also noted that upper bunks carried away and fell on the occupants of lower bunks.

21. The gallery deck spaces outboard of the elevator on both sides, between bulkheads 48 and 66, were all completely manned. There were many survivors from this area but very few coherent stories which permit analysis. The shock was heavy and blast, traveling forward through the hangar, completely demolished bulkhead 72 and collapsed practically all light bulkheads forward to bulkhead 48. The latter was distorted, as was bulkhead 46, and the light cover plates over the lightening holes in the bulkhead panels were reported to have been blown off. Light partition bulkheads forward of bulkhead 46 were also collapsed. There were few, if any, survivors from the radio and radar spaces between frames 66 and 72. Other personnel reported these spaces to be completely demolished with the deck fallen into the hangar and flames burning throughout the area shortly after the explosion. There were several survivors from Air and Radar plotting rooms, most of whom made their way to the forward starboard gallery walkway and went overboard from there. There also were several officers and men who escaped from the communication room by picking their way forward through and over debris to the athwartship passageway, frames 46 to 48. From here some made their way to the port gallery walkway through the 20mm clipping room and others crossed to the starboard light lock and went forward to the starboard gun platforms where they jumped overboard.

22. The shipfitters' shop, hangar deck, frames 37 to 47 port, was completely manned with a repair party. After the initial shock at least one man escaped by opening the cargo port and

jumping overboard. Others worked their way aft on the port side to the after end of the forward elevator pit where they found the hangar untenable. They then climbed upward via twisted ladders, frames 62 to 65 port, to the gallery deck level inboard of the communication room. They climbed through the wreckage of what had been Radio I, passing many dead caught in the tangled debris and passed out to the port walkway via a hole in the port shell apparently in the vicinity of the coding room.

23. All guns were fully manned. There were no reports of survivors from stations aft of frame 100. Forward of this point there were survivors from practically all gun crews. Almost all of these officers and men led out and hooked up fire hoses but found no pressure at the plugs. They then cut loose the liferafts and secured knotted lines to the gun bulwarks and assisted other personnel in abandoning ship. A plane fell and caught on the starboard forward 40mm platform where it burned. All of the port forward walkways were damaged and pushed upward, but it was possible to move along them. Some of these people saw the flame of a single explosion which was followed by what felt like one or two lesser jolts but which were not accompanied by flames. These men also noted the list and estimated it as of the order of 5 to 10 degrees starboard. Some of the guns were noted to be missing, apparently blown overboard.

24. There were few survivors from the flight deck stations. Some individuals, however, did cross the forward portion of the flight deck. These noted a large hole amidships, aft of which nothing could be seen. The deck seemed to be covered with oil although one or two did not observe this. All agreed that only three or four planes remained and that these were on fire. The wood deck also seemed to be on fire in many places possibly from pools of oil or gasoline or from the pitch in the seams and flames were coming up from the hangar around the elevator and through splits in the deck aft of the island.

25. There were, of course, approximately forty to fifty other survivors whose escape is not described above. In general, however, these individuals followed the routes described above and shown on the plates. These were from isolated spaces in the interior of the island, the damage control office, the junior officers' quarters well forward on the gallery deck and from the flight deck.

26. There were many minor explosions of ready service ammunition in the 40mm and 20mm clipping rooms and of ammunition in the planes. Two moderate explosions were reported to have occurred about 0530, either in the hangar or on the flight deck, which would indicate that possibly some aircraft depth bombs in the TBM's detonated from heat. Some depth bombs unquestionably also burned. Many survivors noted and agreed that the fires forward gave no evidence of being fed by gasoline from the tanks below the forward elevator pit. There were no reports of internal vapor explosions such as on LEXINGTON* and WASP**. The fire in the elevator pit seems definitely to have been the result of ignition of lumber stowed there and possibly of lubricating oil on the deck. It will be recalled from paragraph 19

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*Buships War Damage Report No. 16.
**Buships War Damage Report No. 39.

that at least three survivors escaped through the elevator pit in the immediate vicinity of the hatch from the gasoline pump room.

27. All survivors agreed that LISCOME BAY, listing heavily to starboard, went down by the after end of what remained of the hull. She was burning furiously. Some 23 minutes after the explosion, as logged by other vessels in the formation, LISCOME BAY had disappeared. Screening destroyers picked up survivors. The total loss of life has been placed at 648 men and 54 officers.

SECTION IV - DISCUSSION

28. As stated in paragraph 5 of the Summary, the representatives of the Navy Department concluded that the primary cause of the loss of LISCOME BAY was the mass detonation of aircraft bombs stowed in the hold, frames 152 to 168 (outlined in red on the plates), as a result of heavy fragment attack produced by a contact torpedo explosion on the starboard side in way of, or very near, this magazine. The evidence and considerations on which this conclusion was based may be summarized as follows:

(a) An enemy submarine had been suspected in the vicinity (actually an accompanying destroyer reported seeing torpedo wakes about an hour after the catastrophe) and just prior to the explosion an officer stationed at the 40mm director on the gallery walkway, frame 160 starboard, reported over the telephone that he saw a torpedo headed for the ship.

(b) One of the senior surviving officers reported that, from his station in Fly Control, he saw a column of bright orange-colored flame, with some white spots in it like white-hot metal, extending upward perhaps 1000 feet. Other ships in formation witnessed this large column of flame. Considerable debris fell on NEW MEXICO, 1500 yards from LISCOME BAY.

(c) There were no survivors from any part of the ship aft of frame 118. This, considered with the routes of escape of those individuals who did survive, establishes clearly that almost the entire after half of the ship was generally demolished.

(d) Comparison of this damage with other cases of war damage shows definitely that such an effect could not be produced by enemy submarine torpedoes alone - even if 2 or 3 had hit simultaneously - but must have been caused by a mass detonation of a large amount of explosive, such as was contained in the bomb stowage space. In the case of NEW ORLEANS* it was established beyond any doubt that the bow was blown off by the mass detonation of aircraft bombs stowed next to the skin of the ship, the detonation resulting from a torpedo hit in the vicinity. In the case of HMS AVENGER, lost on 15 November, 1942, the British authorities concluded that that ship was struck by a torpedo and that this caused the bomb room to explode. HMS AVENGER was a CVE converted from a Maritime Commission C-3 type hull and was somewhat larger than LISCOME BAY (CVE55 Class). Both classes are of merchant type construction, in contrast with combatant type carriers, and have practically no protection against

*Buships War Damage Report No. 38.

torpedoes, bombs or gunfire (although some fragment protection against torpedo hits has been provided in C-3 types since the AVENGER disaster). In AVENGER the bombs were located near amidships and their detonation broke the ship in two causing it to sink within three minutes of the explosion. In LISCOME BAY, on the other hand, the bomb stowage was far enough aft so that sufficient structure remained to keep the forward part afloat for 23 minutes. LISCOME BAY finally sank by flooding of these forward compartments. Part of this flooding is accounted for by the fact that water was seen to be lapping over the top of bulkhead 118 on the second deck and down into the auxiliary machinery spaces. Thus, the case of LISCOME BAY was much more serious than that of NEW ORLEANS because more aircraft bombs were involved, but somewhat less serious than the case of AVENGER. The general character of the structural damage is comparable in the 3 cases, however, in that it was much more extensive than possibly could be produced by enemy torpedoes alone.

(e) LISCOME BAY carried almost her complete allowance of bombs. The records available to the Bureau of Ordnance and the statement of the gunnery officer indicate that these included the following: nine 2000-pound GP bombs, nine 1600-pound AP bombs, twenty-four 1000-pound AP bombs, thirty-six 1000-pound SAP bombs, eighteen 1000-pound GP bombs, ninety-six 500-pound GP bombs, one hundred and twenty 100-pound GP bombs and ninety-six 350-pound depth bombs. Because of their small size the 100-pound GP and 350-pound depth bombs were stowed in the outboard space next to the starboard side of the ship (see plate II). The depth bombs have a wall thickness of approximately 0.062 of an inch and the 100-pound GP bombs have a wall thickness of approximately 0.16 of an inch and are unquestionably subject to mass detonation from fragment attack, whether they be filled with TNT or Torpex. It will be recalled that the bombs involved in the NEW ORLEANS case were 100-pound GP and 325-pound depth bombs filled with TNT. The fact that the depth bombs, in the case of LISCOME BAY, were filled with Torpex, therefore, does not appear significant.

29. Additional conclusions reached by the Navy Department representatives are stated below:

(a) An intense fire was started almost immediately in the hangar, probably as a result of burning objects being thrown directly into the hangar by the explosion. This fire seemed to be more intense in the forward part of the hangar and particularly in the elevator pit, and the impression was given that the blast from the explosion had tended to sweep a large amount of burning material to the forward end of the hangar. Although planes in the hangar had been defueled they were armed and contained sufficient inflammables to contribute to the fire. Some lumber stored in the elevator pit burned, but it is clear that gasoline from the main stowage tanks did not contribute to this fire because one officer and two men escaped through the elevator pit in the immediate vicinity of the hatch from the gasoline pump room. What else may have burned in the hangar is not clearly established, but it seems probable that some oil from the ship's fuel oil tanks and elsewhere was thrown into the hangar and onto the flight deck and was burning on the decks and bulkheads. The hangar fire inflicted severe burns on some of the personnel and contributed considerably to the difficulty of abandoning ship, as did burning oil on the water, particularly on the starboard side.

(b) Numerous explosions of machine gun ammunition occurred before the ship sank and at about 0530 two moderate explosions were reported. The latter possibly may have been depth bombs in planes blown to the forward end of the hangar. No direct evidence was produced to indicate that the torpedoes stowed on the port side of the hangar deck or the depth bombs in planes on the hangar or flight decks contributed to the primary explosion. It is quite probable that most of these torpedoes and bombs were blown clear when the after part of the vessel was destroyed. In any event, the later explosions were minor in comparison to the initial explosion and are not considered to have appreciably affected the ultimate result.

(c) The force of the principal explosion passed upward and forward and aft, generally destroying the ship's structure in the hold from the stern forward to the forward bulkhead of the after engine room, frame 118; on the second deck from the stern forward to about frame 118; on the hangar deck from the stern forward to about frame 110; and on the flight deck from the stern forward to about frame 101, at which point an expansion joint was located. The general impression from survivors' accounts was that structure aft of frame 118 was completely gone on the starboard side, but that there were some remnants of it on the port side. This may be accounted for by the fact that the aircraft bombs were stowed in a centerline space, and an outboard space to starboard, whereas the corresponding outboard space on the port side was filled with small arms ammunition (see plate III), thus placing the center of the mass detonation somewhat to starboard of the centerline.

(d) Survivors escaped from the hold and platform as far aft as frame 118; from the second deck as far aft as frame 101; from the hangar and upper deck forward of frame 48; from the gallery deck forward of frame 66; from the gallery walkways and flight deck forward of frame 60 and from the island structure. There were no survivors from any part of the ship aft of frame 118, nor from the upper levels aft of the frames indicated above in each case. Since the ship had gone to Flight Quarters at 0450 preparatory to launching aircraft and to General Quarters at 0505 a majority of the crew were stationed in exposed portions of the flight deck and gallery walkways and in other stations aft which were destroyed. The fact that so many of the crew were located in the after part of the ship made the loss of life higher than it would have been otherwise.

(e) The blast wave carried forward along the hangar deck and passed through open hatches into the second deck spaces and through access openings without closures into the upper and gallery deck spaces forward. It also penetrated into the gallery deck spaces forward by blowing off coverplates welded over lightening holes in transverse bulkheads 48 and 46.

(f) The longitudinal girder strength of the ship is an indeterminate factor in a case of this kind. Whether any structure which could reasonably be built into a ship of this size and characteristics could withstand such a violent explosion to any better degree than this structure did is extremely doubtful and not subject to proof. Insofar as the integrity of the main structure is concerned there is no evidence that there was serious failure of any main structural members forward of the spaces listed in sub-paragraph (c).

(g) Partition bulkheads and joiner doors in the intact part of the ship on the second deck and above were generally knocked down or badly distorted by shock or blast or both. Furniture and equipment were also knocked down and contributed to the general wreckage forward. This wreckage impeded passage of personnel escaping, but no personnel were reported as actually trapped by such wreckage. On the other hand there were numerous cases reported of persons injured by the collapse of partition bulkheads or other light material including joiner doors*.

(h) The gasoline in main stowage tanks did not contribute to the fire or to the loss of the vessel.

30. It will be noted in the above that certain conclusions stand out as being quite definitely established, mainly by the fact that survivors escaped from certain areas or by certain routes. Thus, the fact that a major gasoline explosion did not occur is established by the evidence that survivors passed through the elevator pit very close to the hatch from the gasoline pump room. To illustrate the difficulty of evaluating testimony without evidence of this kind it is noteworthy that several observers on nearby ships were convinced that the major explosion on LISCOME BAY was forward and hence that it was a gasoline explosion. There are a number of points concerning this disaster on which testimony is conflicting, and material evidence is meager; thus, conclusions on these points will never be definitely established. The principal doubtful points are discussed below:

(a) The nature and cause of secondary explosions. Several ships in the formation reported more than one explosion and many survivors from below-deck spaces felt more than one shock. The times reported at which various secondary explosions and shocks occurred vary widely and cannot be reconciled. These might have been the Torpex-loaded torpedoes or the depth bombs with which planes in the hangar were armed. These might also have been the detonation of the 5-inch ammunition in the magazine on the first platform considerably aft of the bomb magazine. Pyrotechnics may also have exploded. One or a combination of any of these items could have been set off at indeterminate times by the heat of the general conflagration. It is probable that such items would have given the appearance of a major detonation when viewed from other ships in the formation and some may have gone off with sufficient violence to have caused survivors aboard to have felt minor shocks.

(b) The amount of structure left aft of frame 118. Survivors' statements include reports of a little structure remaining at the stern, some few fragments of frames projecting above the water along the port quarter and some strips of plating along the port side forward of the quarter. Thus, the majority of the

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Note: *The aftermost spaces of the forward gallery deck, frames 66 to 72, were generally demolished and personnel in these spaces were caught and mangled in the general wreckage of beams and girders. This must also have happened in the squadron ready room and other midship gallery deck spaces, frames 94 to 118, but such casualties cannot be attributed solely to collapse of partition bulkheads. Rather, they were caused by general destruction resulting from blast, in which primary strength members, as well as partition bulkheads, were destroyed.

reports do indicate that some structure was left on the port side, although not much, and this is consistent with a bomb magazine detonation on the starboard side.

31. Some observers have advanced the theory that the major mass detonation was from the Torpex-loaded torpedoes in the hangar which might have detonated either from the shock of the explosion of the torpedo or from fragments. Although Torpex is somewhat more unstable than TNT, it is not considered to be particularly vulnerable to shock. There has been one recent case where Torpex-loaded torpedoes were located within a radius of 30 feet of the point of detonation of a torpedo against the hull directly below the torpedo stowage in which the Torpex-loaded warheads were not disturbed. Fragment attack against the warheads of these torpedoes appears most improbable. It will be noted from plate II that the 12 torpedoes in question were stowed aft on the port bulkhead of the hangar. For fragments to reach these torpedoes from a torpedo explosion in way of the bomb magazines, it would have been necessary for the fragments to have passed through the bomb magazines, two decks, one light longitudinal bulkhead and across the ship. Had a torpedo struck just forward or aft of the bomb magazine approximately the same distance would have had to be traversed and an equal amount of structure would have had to be penetrated in order to reach the torpedo stowage. The chance that some fragments would penetrate into the bomb magazine, which would have been very much closer to the point of detonation, would have been much greater than that fragments would penetrate first to the torpedo stowage in the hangar. Finally, as noted in paragraph 30, most survivors reported that some structure was left on the port side but that none remained on the starboard side. Plate III, a section of the vessel in way of the bomb magazine and the torpedo stowage in the hangar, shows the distances and structures involved in this discussion. These considerations indicate that a major mass detonation of Torpex-loaded warheads in the hangar was most improbable when compared to the probability of a mass detonation of aircraft and depth bombs in the bomb magazine.

32. Immediately after the return of the interviewing party to the Navy Department, steps were taken by the Bureau of Ships to provide protection against fragments from a torpedo hit in way of the bomb stowage at the expense of some reduction of bomb capacity. Because of the shape of the hull in this vicinity, the liquid layer provided for this purpose necessarily is not complete protection. It should, however, reduce the target area for torpedo fragments to a very small percentage of its original value, and hence reduce the probability of a magazine explosion from this cause to a very small figure.

33. Joiner doors in this case constituted a hazard to personnel from distortion by blast which caused some of them to jam shut, making it difficult to open them. Such doors will be eliminated wherever possible, particularly in lightly constructed vessels.

34. The doors in the escape trunks from main machinery spaces are of heavy watertight construction with 8 dogs although the second deck, following merchant practice, is not watertight in this region. As noted in paragraph 17, one of these doors proved very difficult to undog and was a serious obstacle to the escape of personnel from the forward machinery space. Such doors will be replaced or modified on other vessels

of the class. Pending the accomplishment of this alteration, these doors should not be dogged with more than one dog at any time, in order to insure a reasonable chance of escaping.

35. Lightening holes in transverse bulkheads 48 and 46 on the gallery deck level and in other longitudinal and transverse structural bulkheads bounding the elevator pit were covered by sheet metal tack-welded in place. These covers blew off and this apparently permitted blast to penetrate upper and gallery deck spaces forward of the elevator pit. In addition, the open hatches, frames 60 to 65, on both sides of the elevator pit which lead upward from the hangar deck, also seem to have permitted blast to enter the upper and gallery deck levels outboard of the elevator pit. The lightening holes will be blanked off by covers with continuous welding of 100% efficiency. Consideration was given to the provision of hatch covers for the open hatches between frames 60 and 65 in order to establish a more complete fire and blast boundary for these upper spaces. In view of the facts, however, that these hatches are the primary means of access to and from the upper levels and that they probably would have to be left open at all times, even when at General Quarters, the Bureau considers that these hatch covers would not be effective for the purpose intended, and has not authorized their installation.

36. When the power failed and all lights went out, it appears that but a few of the emergency relay-controlled lanterns functioned. Among the few that did function were those in the sick bay area. These lanterns apparently failed because the shock jarred loose the plug connection in the base. These lanterns will not operate automatically unless the connection from the relay to the lantern is intact. The plug connection at the base had been recognized as a point of weakness inasmuch as the two prongs are of the split type. In service, continued use of these lanterns tends to reduce the tension in the split prongs, making the plug connection loose. This type of plug connection has been modified and the new lanterns are now in production. There are still a large number of the old type in use and current instructions provide that prongs be checked periodically to insure that the plug connections remain tight.

37. The flame-proof hatch covers now provided for hangar deck hatches should be kept closed at General Quarters to the maximum extent practicable in order to protect spaces along the second deck from blast effects or fire originating in the hangar.

38. The thorough analysis of this case made by the representatives from the Navy Department and their recommendations, upon which the action noted in paragraphs 32 to 35 above was taken, are considered to have demonstrated that the procedure of interviewing survivors from vessels lost in exceptional circumstances by representatives from the technical Bureaus is not only sound but may offer the only possible means of actually determining the technical matters involved.