

PRELIMINARY REPORT

U.S.S. LEXINGTONLOSS IN ACTION

May 8, 1942

CORAL SEA

Class. . . . Aircraft Carrier (CV2)	Full Load:
Launched . . . Oct., 1925	Displacement. . . .41000 tons
Length (BP). 850'	Draft29'1½"
Breadth (LWL) . 106'	Draft (departure Pearl Harbor)
	. . .32'9"(mean)

NARRATIVE

This preliminary report is based on information obtained in interviews with the Commanding Officer and other officers and men of LEXINGTON after their arrival in San Diego on June 2, 1942.

The interviewing party, acting under the authority of the Commander-in-Chief, U.S. Fleet, obtained information on certain operational and aeronautical features, as well as on matters included in this report. This party was composed of the following officers:-

Captain G. L. Schuyler, U.S.N.	Bureau of Ordnance
Commander J. R. Sullivan, U.S.N.	Staff, Commander-in-Chief, U.S. Fleet.
Lieut.Comdr. C.H. Lyman, U.S.N.	Staff, Commander-in-Chief, U.S. Fleet.
Commander T. C. Lonquest, U.S.N.	Bureau of Aeronautics
Commander C. M. Bolster, U.S.N.	Bureau of Aeronautics
Commander Wm. L. Rees, U.S.N.	Bureau of Aeronautics
Lieut.Comdr. Dale Harris, U.S.N.	Bureau of Aeronautics
Commander L. A. Kniskern, U.S.N.	Bureau of Ships
Lieut.Comdr. R. K. James, U.S.N.	Bureau of Ships

LEXINGTON was operating in the Coral Sea (exact position not stated) on May 8, 1942. At dawn LEXINGTON searched 360° and at 0830 found 2 Japanese aircraft carriers 175 miles away. At 0832 intercepted Japanese message to own carrier reporting presence of our task force.

At 1113 Jap planes attacked. Condition Zed had been set and all hands were at General Quarters stations in anticipation of attack. Radar picked up Japanese planes 70 miles away. Our protective fighters were in air at 10,000 feet altitude and 10 SBD's were up for anti-torpedo patrol, spotted at 3000 feet altitude and 3000 yards distance. Japanese force consisted of 18 dive bombers, 18 fighter planes and 18 torpedo planes. Our Radar gave no accurate information about altitude of attacking planes. When observed dive bombers were at 18,000 feet, fighters at 20,000 feet, and torpedo planes at 6,000 feet.

At 1113 Japanese torpedo planes and dive bombers launched an almost simultaneous attack. The latter launched attack from

"push over point" about 17,000 feet. It was estimated by the ship's officers that they carried 1000 lb. bombs. (Later details of damage indicate that the bombs were much smaller).

Ship shot down one VTB, screen (SBDs) shot down 8 (4 after attack launched) and escorting CA (MINNEAPOLIS) reported shooting down four. Torpedo planes launched attack at high speed from 5000 feet altitude and diving in at about 700 yards distance and about 250 feet altitude where torpedoes were launched after leveling off.

At the time of the attack the LEXINGTON was making 25 knots speed which was immediately increased to 30 knots. The ship's course was changed 30° to left to meet the initial attack on the port side and then was changed to the right to meet the attack of two Japanese torpedo planes which appeared on the starboard bow.

Eleven torpedo tracks were observed. Two of the torpedoes passed under the ship; at least two hit on the port side while the ship was turning to starboard. The ship turned again and two passed, one on either side of the ship. All others passed ahead. As torpedo detonations on port side occurred almost simultaneously, it was difficult to determine the exact number of hits, but there were opinions expressed that more than two hits occurred in the general area of the port gasoline stowage and the three forward port boiler rooms.

BOMB ATTACK AND DAMAGE

Dive bombers attacked simultaneously and scored two direct hits and at least five near-misses as follows:

(A) The first direct hit landed in the 5-inch ready service locker which had been converted from Admiral's stateroom, port side of main deck, frames 55 to 58. This was reported to be a 1000 lb. bomb, but the extent of damage indicates a much smaller bomb - probably a bomb weighing from 100 to 200 pounds. Such bombs were used by the Japanese at Pearl Harbor and in later attacks against ENTERPRISE and CHESTER. This bomb has an instantaneous fuse and probably penetrated the light side plating just under the flight deck where it detonated. The 250 Kg general purpose bomb used by the Japanese at Pearl Harbor had a delay-action fuse resulting in detonation after a travel of about 36 feet from the first point hit. The 250 Kg bomb also caused much greater damage than did the bombs which struck LEXINGTON. The Gunnery Officer stated that the powder in the 5-inch cartridges in this space was ignited and burned and split open the cases, but that no 5 inch projectiles were noted to have detonated. The immediate consequences of this bomb hit were as follows:

- (1) No.6 - 5"/25 gun was put out of action and a number of its crew were killed.
- (2) Three men on No.4 - 5"/25 gun were killed.
- (3) The light metal joiner bulkheads in the Admiral's and Chief of Staff's cabin area were disrupted.
- (4) Fires were started in Admiral's and Chief

of Staff's cabin which were soon reported under control. The upholstered furniture in these cabins was very difficult to extinguish after catching fire.

- (5) A serious fire developed in the marine quarters, port side of main deck, just abaft the Chief of Staff's cabin. This fire probably was a continuation of the fire forward. It was soon extinguished.
- (6) The flight deck above the 5-inch ready service compartment was bulged upward slightly, the wood deck was splintered, but the damage was not sufficient to cause any interference with flight operations.

(B) The second direct hit was scored on the port side of the smoke stack structure about nine feet above the .50 caliber machine gun platform and at about frame 103. This was reported to be a small bomb, probably about 100 pounds. This Bureau considers that it was the same type of bomb as struck the 5-inch ready service locker. It had instantaneous fuse action. The immediate consequences of this hit were as follows:-

- (1) Fragments killed several people manning the port .50 caliber battery.
- (2) Fragments penetrated the stack and killed and injured several men on the starboard .50 caliber platform.
- (3) Fragments killed and wounded several persons in after 5-inch gun control station and injured several in sky control station forward. These latter injuries may not have been a direct result of the bomb detonation.

(C) The third bomb explosion was a near-miss on the port side, centered at about frame 87. This bomb was probably of the same type as the first two. It detonated on contact with the water and resulted in the following damage:

- (1) The forward three 20 mm gun hinged-platforms in the port boat pocket (frames 84 to 97) were blown upward and inboard, putting these guns out of action.
- (2) Fragments penetrated the shell plating in this vicinity and water entered at least two of the provision storerooms outboard on the third deck. These compartments were closed which effectively localized the flooding.

(D) At least two additional near-miss bomb explosions occurred on the port quarter. These bombs detonated on contact with the water and caused the following damage:

- (1) Fragments entered the carpenter shop and nearby spaces. No serious damage resulted.
- (2) The 5"/25 caliber gun platform on the main deck level was inundated by the splash from the explosions.

- (3) Fragments hit the gun bulwarks (25 lb. STS) and one fragment was known to have penetrated the bulwark killing one man. A great many fragments were rejected, however, and the ship's personnel considered that the bulwarks here, as well as forward, saved many lives.
- (4) The mastic deck covering on the 5-inch gun platform flew up and severely injured one member of the gun's crew.

(E) There were several additional near-misses at such an appreciable distance from the ship that they probably caused no damage to the ship. At least two of these were reported on the starboard side aft. Several of these bombs were observed to detonate deep in the water.

A small amount of machine gun strafing was noted, but it was not part of the tactics of all attacking aircraft.

TORPEDO ATTACK AND DAMAGE

The torpedo hits on the port side occurred almost simultaneously, but it is believed that the forward hit occurred first.

(A) The after torpedo explosion, whether of one or two torpedoes, appeared to be centered at about frame 85. A photograph was taken from the flight deck life nets and showed the light upper blister plating to be blown outward at this location.

As a result of this torpedo explosion, the following damage occurred:

- (1) Some fractures in piping occurred in boiler rooms #2, 4 and 6, the most important of which was the rupture of the port firemain which was subsequently secured, cutting out the port firemain system in the forward part of the ship.
- (2) As a result of the ruptures of piping and minor leakage around rivets boiler rooms flooded as follows:

BR #2	-	18" over floor plates
BR #4	-	12' of water
BR #6	-	6' of water

All these boiler rooms were subsequently pumped dry (except for very minor leakage) and secured. The Engineer Officer stated they could have been placed in operation again if needed.

- (3) No damage occurred to main holding bulkheads of the torpedo protection system, except slight weeps noted above.
- (4) Fuel oil and reserve feed tanks between frames 73 and 103 were reported to have been contaminated.

- (5) There was no damage to main propulsion machine and the ship continued to make 25 knots for some considerable time after the three boilers were secured. Shock damage to electrical equipment was inconsequential.
- (6) It was reported that oil seeped up through the third deck into compartments located outboard of the longitudinal bulkhead.

Immediately following the torpedo hits the ship took a port list of 6-7 degrees due essentially to the torpedo explosion in way of the boiler rooms. The drafts of the ship on leaving Pearl Harbor were 34'-6" aft and 31' forward. The ship had refueled on May 3, and the drafts at the time of the attack were not definitely known.

Prior to the attack the following were, in general, the liquid loading conditions in the ship.

(I) PORT SIDE

(1) Forward of Frame 75.

All gasoline tanks filled. All inboard and outboard voids surrounding gasoline tanks filled with fresh water. All fuel tanks filled with oil.

(2) Frames 75 to 133.

Outboard layer of F.O. tanks (emergency tanks) filled with oil.

Second layer (sluice tanks) empty.

Third layer (service tanks) filled with oil.

Fourth layer (reserve feed tanks) filled with water.

Water bottoms port side were filled with feed water.

(3) Aft of Frame 133.

Innermost layer empty. Outboard layers filled. Fuel oil bottoms aft frame 140 to 173 being used as service tanks.

(II) STARBOARD SIDE.

(1) Forward of Frame 75.

Same as for port side.

(2) Frames 75 to 133.

Outboard layer F.O. tanks (emergency tanks) filled with oil.

Second layer (sluice tanks) empty.

Third layer (service tanks) filled with F.O.

Fourth layer (reserve feed tanks) empty.

Starboard feed bottoms empty.

(3) Aft of Frame 133.

Approximately same as for port side.

Accordingly the flooding from the torpedo explosion in this vicinity filled the empty port "sluice tanks" (probably four:- B-22F to B-48-F) and produced a port list of 6-7 degrees. This was counteracted by transferring oil from the port after service tanks to opposite starboard sluice tanks. In one hour and twenty minutes after the torpedo hits the ship was again on an even keel.

(B) The forward torpedo hit occurred between frames 60-65 in way of the port gasoline stowage tanks. All of the damage to structure resulting from this torpedo explosion could not be ascertained, but the following observations were made:-

- (1) Both main elevators were immediately put out of commission due to loss of hydraulic pressure. The elevators were at the flight deck level and immediately dropped on to their safety latches.
- (2) The hatch cover to the port "elevator bottle room" (elevator air tank compartment) blew open and was again closed. Later when an air-test fitting cap was loosened, air under pressure began to escape, accompanied by an oily mist.
- (3) The port forward corner of the bulkhead between the elevator bottle room and forward distribution room was found to be buckled and was subsequently shored. This buckling is believed to have been caused by air pressure which developed from leaks in the H.P. air system.
- (4) The I.C. motor generator room, on the 1st platform just forward of the elevator bottle room and between gasoline stowage tanks and I.C. room was inspected. The outboard bulkhead (holding bulkhead of torpedo protection system) was bulged inboard about 6-8 inches, but was not observed to be leaking. The deck in this space was bulged upward but was not noted to be ruptured. The motors were noted to be running hot due, probably, to misalignment. The mechanical exhaust ventilation blower serving this space and located in the elevator bottle room was put out of commission by the explosion. The watch in this compartment was withdrawn, the space closed and the motor generators were left running.
- (5) The gasoline control room just forward of the I.C. motor generator room and on the same level and the gasoline pump room directly below were inspected. The statements concerning

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the status of surrounding bulkheads in these two spaces are not entirely clear and in agreement with each other, probably due to the fact that two levels are involved in the gasoline control compartments. The best estimate of the situation, however, appears to be that the outboard bulkhead in the lower space (gasoline pump room) was damaged and leaking slightly, and that the outboard bulkhead in the upper space (gas control room) was undamaged. It seems definitely established that gasoline cleavage gauges and other gas fittings in the upper space were not damaged. Following inspection the lower space (gas pump room) was flooded with salt water and the upper space (gas control room) was filled with CO₂.

- (6) Approximately twenty-five persons were stationed in the I.C. room, central station and forward distribution room area and did not at any time report presence of gasoline fumes. The deck in these spaces was apparently undamaged.
- (7) The only space below the 1st platform deck which is known to have been inspected was the evaporator room where the port outboard bulkhead between it and the elevator bottle well was noted to be bulged inboard.
- (8) Oil was noted on the deck of the General Workshop Issuing Room and adjacent passageway outboard on the third deck. This area was over the center of the explosion and the oil undoubtedly came from a ruptured F.O. filling line which passes through both spaces.
- (9) At about 1242 gas fumes of considerable intensity were reported in the General Workshop and in the CPO messing spaces. All personnel were ordered to immediately evacuate these areas.

(C) It was reported, but not confirmed, that one torpedo detonated forward on the port side just abaft the stem. No inspection of this area was made to confirm an explosion having occurred. An additional torpedo was reported to have hit the ship while traveling on a converging course but this torpedo did not detonate.

INTERNAL EXPLOSIONS AND RESULTANT FIRES

The combined bomb and torpedo attack lasted only about 7 or 8 minutes - probably measured from the time of the first hit - and had been completed by about 1132.

At 1247 a violent internal explosion shook the ship. Its intensity was reported to be greater than the previous

torpedo explosions and its center appeared to be just forward of the elevator well - about the third deck level.

All communication with central station was lost; in fact, all but the JV circuits to main control and trick wheel aft were out. The bridge annunciators, rudder indicators and forward gyro were out. Steering control was maintained on the bridge by use of the after gyro compass, and the JV circuit to the steering room for passing instructions to the trick wheel.

Fire immediately broke out in the CPO mess rooms (A-211-L, A-210-L, A-208-L) on the 2nd deck and CPO bunk room (A-310-L) frames 49-54 on the 3rd deck. The fire in the Admiral's cabin which had long been under control, broke out with renewed intensity. The doors along the 2nd deck passageway forward of frame 55 were blown open up to the sick bay area. The blast effect extended as far forward as the doctor's office, frames 27 to 30, and the doctor was severely injured. The hatch in the middle half deck at frame 59 was blown upward and fires immediately broke out in the adjoining office spaces (A-110-L).

Fire fighting in this general area was greatly hampered by dense smoke in all spaces affected; by loss of pressure on some of the starboard firemain risers; by non-availability of fog nozzles; by ~~non-availability of asbestos suits and new type rescue breathing apparatus.~~ The drain pumps in the drain pump room forward in the hold, frames 41 to 44, which are shown in the Damage Control Book to be connected to the firemain forward were not used for this purpose as they develop a pressure of only 35 lbs./in.2. Fire hoses led forward from after fire plugs were also used.

Although approximately 25 persons in the Central Station area were killed or badly injured there were a few survivors who were able to describe what happened in this area.

One survivor stationed in the I.C. and F.C. workshop, and who escaped through the I.C. room, stated that the bulkhead between the I.C. room and Motor Generator Room was blown inward at the bottom. The doors to the Central Station and the Forward Distribution Room had been open prior to the explosion. An officer stationed on the after starboard side of the Distribution Room saw a bright red flash and was knocked against the switchboard by the blast which entered through the door to the Central Station. Fire did not break out in any of these spaces. After the explosion an enlisted man entered this area for rescue purposes and reported that about six inches of water with an oily film covered the deck in the I.C. room.

Personnel previously stationed in the Central Station area were removed to the hangar deck through the hatch leading to the Lighting Motor Generator Room.

A sound like rushing air was noted coming from the trunk in the port forward corner of the I.C. Room and in a very short interval as the observer was leaving the compartment a minor explosion occurred. So far as is known this was the

last man to visit this area.

In the General Workshop (A-312-E) on the third deck the light bulkhead surrounding the Power Workshop in the starboard forward corner was blown to port. The bulkhead enclosure in the port forward corner of the machine shop was also blown down and some water flooded onto the deck of this space. The third deck was not observed to have been ruptured over the explosion. The vent ducts, believed to be supply ducts to the Gas Control Room, were found ripped open.

The General Workshop area was closed and not entered again. An effort was made to enter this compartment later through a door in the after bulkhead, but when the air test cap was backed off there was evidence of smoke and water in the compartment.

It was reported that the vent ducts, believed to be the natural supply ducts from the Gas Pump Room which terminated in the CPO mess room, had been capped prior to the beginning of the action. After the major internal explosion these vent pipes (about 8" diameter) were reported to be ripped open.

At intervals of fifteen to twenty minutes additional minor explosions occurred throughout the afternoon. One rather heavy explosion was noted at 1319. After each explosion the several fires seemed to gain appreciably in intensity.

At 1445 a second internal explosion of major intensity occurred in the elevator well. Prior to this time it had been reported that brown hydraulic oil covered the deck in the elevator well. Smoke was entering this well in increasing volume through the vent ducts from one or more of the following spaces:- The General Workshop, the I.C. Room, and the I.C. Motor Generator Room. This smoke was noted to be light brown in color.

A large fire immediately broke out in the hangar space and the only airplane in this space (located about frame 125) caught fire - probably at the same time. The water curtain at about frame 82 was turned on and was fully effective until the water pressure failed sometime after 1530. Following this explosion all light and auxiliary power circuits in the forward part of the ship failed, as a result of which ventilation to the forward machinery space failed, causing this space to be abandoned in about twenty-five minutes.

From this time on the fire in the forward part of the ship got progressively worse and began to spread aft with additional minor explosions occurring at increasingly frequent intervals. The ship was still going ahead with one-half the power plant in operation. The firemain pressure dropped from 80-100 pounds reported in the engine room, to about 30 pounds at the flight deck.

After 1530 an explosion occurred in B-21-4T on the port side of the 2nd deck outboard, which blew out some

shel plating and smashed one of the stakes below. This may have been caused by fuel oil vapor.

The remaining part of the engineering plant was secured and abandoned at 1630. At about 1630 two destroyers came alongside and passed two fire hoses apiece up to the flight deck. The pressure in these lines was too low to be really effective.

It was reported that the after magazines had all been flooded. Efforts had been made to flood the forward magazines but it was not known whether these measures had been effective. A further attempt was made to flood the forward magazines by flooding with hoses through the forward ammunition trunks.

There were twenty-seven torpedoes on the torpedo mezzanine along the starboard side of the hangar aft which could not be removed due to failure of the torpedo elevator. These torpedoes were sprinkled continuously until firemain pressure was lost.

There were 1000-pound bombs in the machine shop which were definitely reported under the water which had flooded into this space. There were 100-pound bombs in the bomb-handling room on the middle half deck abaft frame 64.

At 1707 the order was given to abandon ship. All personnel were taken off in good order. A total of 2770 officers and men were safely evacuated to escorting cruisers and destroyers.

At 1727 a large explosion occurred about amidships. Photos were made as this blast occurred. This was followed by a great explosion further aft which was believed to have been caused by detonation of the torpedo warheads. As a result of this explosion the after elevator blew off and several planes parked on the flight deck aft were blown into the air. A photograph was also taken of this explosion.

The ship at this time was still nearly on an even keel with a small list to port and a small trim down by the head. A destroyer was ordered to sink the LEXINGTON with torpedoes. Two hits were made on the port side with little visible effect, followed by one on the starboard side. The ship finally sank on approximately an even keel about 2000.

At about this same time a violent explosion occurred and the effects were noted by ships as far as twenty miles away.

DISCUSSION

All evidence indicates that the violent explosion which occurred at 1247 resulted from an accumulation of gasoline vapor in the I.C. Motor Generator Room, in the presence of operating electrical machinery which was capable of producing electric sparks.

The exact paths by which the gasoline vapor entered this space are not known, but it is believed that as a result of the torpedo hit in way of the gasoline stowage, small structural leaks permitted a mixture of gasoline and water to enter the I.C. Motor Generator Room directly through the outboard bulkhead and/or into the space below this room from which vapor or gasoline might have worked up through the deck, which had been distorted. It is probable that gasoline also entered the gas pump room and eventually produced vapor in the ventilation supply duct which leads through the after CPO bunk room into the CPO mess room. Gasoline had undoubtedly mixed with water in A-50-V and gasoline vapor had probably risen in the ventilation supply duct which leads from this void into the CPO mess room.

The flash of the explosion undoubtedly entered the gasoline control room, ruptured the vent duct referred to above which passes through this space and caused an explosion in this duct which was transmitted to the duct from A-50-V. The fires in the CPO spaces were reported to have been started from the blast and flame coming from these ducts. Ventilation ducts through General Workshop were also reported to be split open by the explosion but fire did not start there immediately - probably because of the small amount of inflammable material in that space.

It is quite conceivable that the first explosion consumed most of the oxygen in the central station group of spaces, so that insufficient oxygen remained there to support a fire. There were some indications of carbon monoxide, the presence of which would be expected after an explosion of this kind. Carbon monoxide itself mixed with air in certain proportions is highly explosive. The small explosions which occurred in the area may have been from subsequent accumulations of small amounts of gasoline vapor or of carbon monoxide. The light brown smoke which poured into the elevator well very probably contained carbon monoxide and other unburned gases which may have flashed or become ignited in some manner as soon as they came into the presence of sufficient oxygen.

The main volume of gasoline and water in the port gasoline stowage compartments was not directly exposed to the fire in the early stages, because if the first explosion had ruptured the holding bulkhead inboard of these stowage spaces large quantities of gasoline and water would have poured directly into the I.C. Room, and that room would have been open to the sea.

It is quite possible that the torpedo hit was at rather deep draft, producing greater structural damage in the lower part of the torpedo bulkheads than in the upper part. The fact that no one reported torn blister plating in this area is negative evidence suggesting a deep hit. The damage to the holding bulkhead was somewhat greater than would be expected in a five-bulkhead system. This is largely attributable to the fact that all - or all but one - of the voids inboard of the gasoline tanks were filled with liquids. If the hit were at deep draft the center of the explosion, because of the form of the hull, would be brought nearer to

the holding bulkhead and this also would contribute to increased damage of the holding bulkhead. If gasoline and water had leaked through this bulkhead below the I.C. Motor Generator Room - as would be probable with a deep torpedo hit - the subsequent leakage of gasoline or gasoline vapor up through the deck into the I.C. Motor Generator Room would be very probable.

RECOMMENDATIONS

As a result of the study of this case the following recommendations were made for immediate application to SARATOGA, and, in so far as applicable, to all other aircraft carriers:-

- (1) SARATOGA to keep layer of tanks inboard of gasoline tanks void and filled continuously with inert gas mixture. (NOTE: The first part of this recommendation, to keep these spaces void, had previously been made to both SARATOGA and LEXINGTON). This step should operate to reduce shock damage to the holding bulkhead in case of a torpedo hit in this area.
- (2) SARATOGA to segregate port and starboard gasoline systems in order to avoid the possibility of pressure being put on a damaged system from an undamaged system.

All Carriers:-

- (3) In event of suspicion of gasoline vapors following attack operate exhaust ventilation in affected compartments as considered practicable. Early operation of these systems should prevent dangerous concentrations of gasoline vapor.
- (4) Shut down all electrical equipment subject to sparking throughout entire affected area, except where it is considered safe and desirable to run exhaust ventilation blowers.
- (5) Inspect all vent ducts from spaces involved to guarantee tightness. This should be done periodically before an attack, and again after the attack.

Steps were also taken to insure that the following equipment would be on board each carrier at the earliest possible date:-

- (1) 15 asbestos suits
- (2) 60 Type A rescue breathing apparatus
- (3) 1 Fog nozzle for each fire plug