SECTION V

U.S.S. SUWANEE (CVE27)
Kamikaze Damage
Off Samar
25 and 26 October 1944

U.S.S. SANTEE (CVE29)
Kamikaze and Underwater Damage
Off Samar
25 October 1944

U.S.S. SANGAMON (CVE26)
Kamikaze Damage
Off Okinawa
4 May 1945

Class.....SANGAMON (CVE26) Length (O.A.)..... 553 Ft. 0 In.
Comissioned as Carriers Beam (O.A.)..... 114 Ft. 3 In.
CVE26.....AUGUST 1942
CVE27 § 29...SEPTEMBER 1942
Displacement (Full Load)..24,275 Tons Draft (Full Load). 31 Ft. 0 In.

References:

(a) C.O. SUWANEE ltr. CVE27/A16-3(3), Serial 008 of 6 November 1944 (Action Report).
(b) SUWANEE War Damage Report prepared by Navy Yard, Puget Sound.
(c) C.O. SANTEE ltr. CVE29/A16-3, Serial 10018 of 5 November 1944 (Action Report).
(d) C.O. SANTEE ltr. CVE29/L11-1, Serial 433 of 7 January 1945 (War Damage Report).
(e) SANTEE War Damage Report Prepared by Navy Yard, Pearl Harbor.
(f) C.O. SANGAMON ltr. A16-3/CVE26, Serial 044 of 20 May 1945 (Action Report).
(g) C.O. SANGAMON ltr. A9/CVE26, Serial 041 of 8 May 1945 (War Damage Report).

Plates V-1 SUWANEE - Kamikaze Damage
V-2 SANTEE - Kamikaze and Underwater Damage
V-3 SANGAMON - Kamikaze Damage
V-4 ASHTABULA (A051) and MISSISSINEWA (A057) - Profile and Tank Arrangement
V-5 COMMENCEMENT BAY (CVE105) - Profile and Deck Arrangement

Photographs - Furnished as follows:

5-1 to 5-10 by C.O. SUWANEE and Navy Yard, Puget Sound
5-11 to 5-20 by C.O. SANTEE and Navy Yard, Pearl Harbor
5-21 to 5-30 by C.O. SANGAMON and Navy Yard, Norfolk

SUWANEE (CVE27), SANTEE (CVE29) and SANGAMON (CVE26)

5-1. The COMMENCEMENT BAY (CVE105) Class of escort carriers is the latest class and is, at present, the only class of CVE's in active service. The first of these ships was completed too late in the war to see much action and as a result, they experienced no battle damage. Their prototype was the SANGAMON Class which had been converted from CIMARRON (A022) Class fleet oilers. The latter were twin-bulkhead, twin-screw vessels, 553 feet in length overall and 75 feet in beam. Ships of the SANGAMON Class, of which there were only four, saw continuous service as carriers from the fall of 1942 until the end of the war. To provide some basis for estimating the damage resistance of the COMMENCEMENT BAY Class, brief summaries follow of damage experience in SUWANEE, SANTEE and SANGAMON. The principal damage in each case was due to Kamikaze attack. SUWANEE and SANGAMON both had severe fires among parked aircraft. The fire in the former was brought under control with surprising promptness. In SANGAMON the devastating blast and fragment effect of a bomb detonating in the hangar disabled the sprinkling system and water curtains locally and made the conflagration much more difficult to control. SANTEE also suffered underwater damage which was reported to have been due to a submarine torpedo. The extent of her underwater damage, however, was considerably less than would normally have been anticipated from a torpedo hit. To amplify the information on torpedo damage in hulls of similar construction, brief outlines of such damage occurring in two CIMARRON Class tankers, ASHTABULA (A051) and MISSISSINEWA (A059), are included with the paragraphs on SANTEE.

SUWANEE (CVE27)

5-2. About 0800 on the morning of 25 October 1944, enemy aircraft attacked the CVE's of U.S. Task Unit 77.4.1, the southern of the three escort carrier units which were east of Samar, operating aircraft in support of the amphibious forces in Leyte Gulf. At that time, SUWANEE was in a modified Material Condition ABLE, having secured from routine dawn General Quarters stations to send the crew to breakfast. Only three of her aircraft remained aboard, two on the flight deck and one in the hangar, none of which were fueled or armed. The ship's gasoline system was secured.

5-3. At 0804, a Kamikaze identified as a ZEKE dived on SUWANEE at an angle of about 45 degrees from an altitude of about 8000 feet. Although it was set afire by defensive gunfire, this plane with its bomb crashed into the flight deck 40 feet forward of the after elevator and penetrated to the hangar where the bomb detonated and the remains of both the ZEKE and the plane parked in

the hangar burned until extinguished by the fire party about 15 minutes later. A hole about 10 feet in diameter was opened in the flight deck by the passage of the plane and a hole about 20 feet in diameter was opened in the hangar deck at frame 64 by the passage of the plane's engine and by the bomb detonation. The engine came to rest on the main deck below. The blast of the bomb detonation sprung the after elevator platform slightly and elevator machinery was made inoperable by fragment damage to electrical cables. Fragments also damaged the after master gyro compass and the electric wiring to its repeaters. This damage made it necessary to transfer steering control to the after steering station.

5-4. Prompt employment of the sprinkling system in the after end of the hangar effectively controlled the hangar fire. Foam was used to extinguish the burning remains of the Kamikaze and CO2 was used against the fire in the parked plane. The latter could not readily be jettisoned owing to the absence of large enough side openings in the hangar. Fragment damage to the main deck and first platform permitted fire fighting water to drain into the crew's galley, A-212L, and to the bread stowage below in A-314AL, to a depth of about 10 inches. This water was too shallow to permit submersible pumps to maintain a suction and had to be removed by bucket brigades. The galley was restored to operation in time for the noon meal the same day.

5-5. Other essential emergency repairs were promptly undertaken by the ship's force, and by 1010 the flight deck had been patched and flight operations were resumed (Photo 5-2). Arresting wires 1, 2, 3, and 4 only were used due to damage to the five units farther forward. Normal steering control was not restored until that evening at 2037.

5-6. The limited extent of bomb damage on 25 October indicated that the bomb carried by the attacking plane was more probably 63 Kg GP rather than 250 Kg GP, the estimate of the ship's bomb disposal officer.

5-7. Severe damage was incurred the next day while SUWANEE was headed into the wind at 18 knots, recovering aircraft. True wind was not reported, but it was subsequently observed that the high relative wind prevented the effective use of fog in fire fighting on the flight deck. The crew had just finished lunch and a modified Material Condition ABLE was in effect. Seven fighters and three torpedo bombers were parked forward on the flight deck and ten aircraft were parked in the hangar. All twenty were fully gassed, including belly tanks. The three torpedo bombers on the

flight deck were each armed with two 350-pound torpex-loaded depth bombs. At about 1238, a VT landed and taxied onto the forward elevator. Almost immediately thereafter an attacking enemy plane, another ZEKE, dived from a 3000 foot altitude at an angle of 45 degrees and crashed into the plane on the forward elevator. Observers reported that the Kamikaze's bomb appeared to have been released at bridge height and detonated a short distance after penetrating the elevator platform. A few minutes later another attacking plane, which did not attempt to crash SUWANEE, released a bomb which penetrated the flight deck farther forward on the port side and detonated in the catapult machinery room. From the extent of damage both bombs are estimated to have been 63 Kg GP.

5-8. As a result of the first of these two hits, flaming gasoline and fragments ignited nearly all surrounding aircraft on both the hangar and flight decks. JZ circuits were disrupted and all damage control communications were conducted by messenger. Blast and fragments ruptured nearly all gasoline tanks in the parked planes and also ruptured piping and hoses at forward plane fueling stations on the flight deck level, causing large quantities of gasoline to be added to the conflagration. The ship's fire marshal, who was in the hangar when the crash occurred, manually opened the sprinkling and water curtain control valves despite having been knocked down and stunned by the blast. This prompt action limited the spread of fire in the hangar. Fragments pierced the risers to the sprinkling system forward in several places, but did not interfere seriously with its operation. The fire on the flight deck was much more difficult to control. All available topside personnel not assigned to gun stations assisted in handling hose lines and in jettisoning aircraft. Eight 2-1/2-inch hoses were employed and high and low velocity fog, solid streams, liquid and powder foam were all tried. Liquid foam proved the most effective. The depth bombs in the three torpedo bombers were ruptured by fragments and the torpex burned. This complicated the fire fighting problem considerably. However, no depth bomb explosions occurred and all fires were reported under control in twenty-five minutes and extinguished in fifty minutes. The ship had left the formation in the meantime and headed downwind at five knots to reduce the relative wind over the flight deck.

5-9. On the bridge, which became engulfed in smoke and flames so that conn had to be shifted aft, most of the ship control instruments were seriously damaged by shock or fragments, or were made inoperable by damage to interior communication cables. Disabled instruments included the following:

(1) All bridge gyro repeaters
(2) Engine order telegraph
(3) Engine revolution telegraph
(4) Anemometer and wind direction indicator

(5) Rudder angle indicator
(6) All sound-powered telephones
(7) 1MC, 3MC, and 5MC systems
(8) Pitometer log indicator
(9) Shaft revolution counter indicator

While temporary repairs by the ship's force permitted resumption of conn at the bridge within 24 hours, all lighting, ventilation and some power systems on the flight deck, gallery deck and in the hangar were disrupted and largely beyond repair by the ship's force.

5-10. The hit in the catapult machinery room completely disabled the catapult (Photo 5-9). The bomb appeared to have detonated just above the air flask adjacent to the accumulator. Fragments punctured the 2-1/2-inch steel walls of the flask. The flask was not under pressure at the time; so no damage was done by rapid release of high pressure air. The distribution panel and power transfer switch for the normal and alternate power feeders to the catapult machinery were destroyed by the blast and subsequent fire, although the fire was promptly extinguished. Catapult motor controllers were damaged beyond repair. The motors were damaged but salvageable.

5-11. The forward 40mm mounts and directors were damaged slightly and the power supply was interrupted by fire, blast and salt water. Similarly, the various radar and radio installations were partially damaged so that, while a large proportion of the repairs were within the capacity of the ship's force, the cumulative repair work load was too great to permit satisfactory restoration without a major overhaul.

5-12. Blast and fragment damage to the gallery, forecastle and main deck from the hit in the catapult machinery room permitted fire fighting water to flood several spaces below the flight deck. Very soon after hoses were turned on, flooding in compartment A-204L was noted and effective corrective action was promptly taken. Within 15 minutes after the hits, three submersible pumps were operating in this compartment. These pumps were powered through casualty power cables which had to be led from the main distribution board due to the inadequate number of casualty power outlets. Water was prevented from rising more than four feet above the deck. As soon as the space was pumped out, shortly after SUWANEE returned to her position in the formation, openings to this compartment were sealed off with welded plates. Water which accumulated in gallery and forecastle deck spaces was drained to the main deck and overboard through holes burned with portable oxy-acetylene outfits. The casualty power system in CVE105 Class has been markedly

improved and extended in order to obviate the difficulty experienced by SUWANEE in not finding a convenient outlet.

5-13. The personnel casualties in SUWANEE were severe and the facilities to care for them heavily overloaded. F.T.P. 170 (B), Damage Control Instructions, specifically lists, as an integral part of damage control, " facilitating care of personnel casualties" In SUWANEE over 100 men were killed in action or died of wounds soon thereafter. Another 170 were wounded. Altogether, nearly a third of the complement required medical care. A problem of this scope had not been planned for in either the design of the ship or the composition of the complement. The problem of damage control was made more difficult by the lack of medical facilities and of personnel who had been adequately trained in emergency first aid measures. The case of SUWANEE emphasized the importance of making adequate preparations to provide battle dressing stations and emergency wards with appropriate stocks of burn dressings, morphine, plasma, Stokes stretchers and other essential first aid supplies together with a staff of personnel who are competent to undertake first aid. The adequacy of such arrangements is clearly interrelated with the overall effectiveness and morale of a ship's damage control organization in the event of major damage.

SANTEE (CVE29)

5-14. SANTEE was damaged in the same action as SUWANEE on 25 October 1944 while operating with Task Unit 77.4.1 off Samar. About 0740, while modified Material Condition ABLE was in effect, a JUDY or TONY in a surprise Kamikaze attack dived on SANTEE and strafed during its approach. At this time, personnel in the hangar were in the process of arming a number of torpedo planes with depth bombs. These planes had just been fueled. The exact number and location of aircraft on board at the time was not reported, but it is estimated that approximately 12, the full complement of VT's, were in the hangar at the time. About 24, 350-pound, depth bombs containing 245 pounds of torpex and the same number of 100-pound, GP bombs loaded with TNT had been removed from the magazine and were laid out on deck preparatory to arming the planes. A few additional aircraft, completely armed and fueled, were located on the flight deck.

5-15. The attacking plane hit the flight deck near frame 62 about 15 feet from the port side. It carried a small bomb, identified from fragments as 63 Kg GP, which detonated a short distance below the flight deck in the same vicinity. The impact and blast opened a long narrow hole in the flight deck about 30 feet by 15 feet (Photo 5-11). In the carpenter and shipfitters' shop on the hangar deck many of the repair division personnel were killed or

wounded and the shop was demolished. Owing, however, to the shallow penetration of the bomb and the failure of the attacking plane to hit over a lethally loaded area of the hangar deck, the resultant fires were of a minor nature. The hangar deck was depressed a few inches over an area about 10 feet in diameter below the blast. Structurally the blast and fragment damage was not extensive and the ship's force effected repairs which permitted resumption of flight operations at 0935.

5-16. Fragments split open some of the depth bombs in the hangar, causing the torpex filler to burn with a sizzling noise without exploding. Two fire hoses, previously laid out, were put in use immediately to extinguish the blaze and to cool other depth bombs and general purpose bombs in the vicinity. Steps were undertaken immediately to jettison this ordnance material.

5-17. During these proceedings, and 16 minutes after the Kamikaze hit, an underwater explosion occurred on the starboard side near frame 58 abreast the after elevator. This was reported to have been a submarine torpedo hit; however, several circumstances indicate the possibility that it was the detonation of one of the jettisoned depth bombs. Tanks 8S, 9S, 8C and 9C immediately flooded from the sea. Uncontrolled slow flooding took place in A-415A, A-414M, A-316AE, and A-214L. A-413M, the bomb stowage above tank 8C, had some leakage which was readily controlled with one submersible pump. The pump room, B-3E, abaft tank 9C remained dry and suffered no damage. No serious engineering casualties resulted although some vibration was noted thereafter in the starboard main engine. SANTEE's speed of 17-1/2 knots was maintained. The ship initially developed about a 7 degree starboard list, but by 0935, when flight operations were resumed, this had been entirely removed. The draft increased as follows:

	Forward	Aft	Mean
Before Damage	27'-10"	29'-8"	28'-9"
After Damage	26'-8"	35'-2"	30'-11"

5-18. Before the explosion occurred, the liquid loading in way of the damage had been as follows:

Tank 8S - 25'-4" water
Tank 9S - 25'-0" water
Tank 8C - empty
Tank 9C - empty

5-19. The damage to structure in way of the underwater explo-

sion, as may be observed from the accompanying photographs, was less extensive than would be expected from a contact explosion of even the smallest Japanese submarine torpedo warhead in use at the time, the "6th year type" containing about 450 pounds of block-loaded Shimose, an explosive of power comparable to TNT. The report of the first repair yard suggested that the limited extent of damage was attributable to a glancing torpedo hit such that the detonation occurred some distance from the side. Reference (d) stated that the wake of the torpedo was visible in photographs taken by PETROF BAY. However, an examination of these photographs indicated that this wake more probably was that of SANTEE.

5-20. The absence of a major rupture in the starboard longitudinal bulkhead and the absence of flash or debris thrown up by the explosion indicated a detonation deeper in the water and of less power than was normally associated with Japanese torpedoes. The wrinkling of the bottom, the shock to machinery aft and the tearing of the side plating rather than its shattering — all appear to confirm that the explosion occurred below the turn of the bilge and a few feet away from the shell. The power of the 245 pounds of torpex in a depth bomb was not so much less than that of the 450 pounds of Shimose in the type of torpedo mentioned in paragraph 5-19 that its effects would be readily distinguishable. Therefore, the best evidence as to the weapon causing the damage is the apparent location and time of the blast. Although the length of the opening in the shell, about 36 feet, was comparable with that to be expected from a torpedo hit, the manner in which the hinged section of shell was torn suggests that much of the missing structure may have been carried away by working at sea rather than by blast. The extent of flooding which took place was somewhat less than might have been expected from the usual torpedo hit since bulkhead 57 was not breached and the distortion of the longitudinal bulkhead was slight.

5-21. ASHTABULA (A051) and MISSISSINEWA (A059), CIMARRON Class fleet oilers with hulls similar to SANTEE's, both were definitely torpedoed and their experiences are related for comparison.

5-22. On 24 October 1944, while under air attack in formation in Leyte Gulf, ASHTABULA was hit on the port side almost squarely amidships in way of No. 6 wing tank by a Japanese aircraft torpedo, probably containing 520 pounds of cast Shimose. At the time of the attack, the ship was loaded to 65% of capacity with a mixed cargo of fuel oil, Diesel oil and aviation gasoline. All tanks were partially filled except for No. 3 centerline and No. 6 wing tanks which were empty. The hit immediately flooded No. 6 port wing tank while the level in No.6 centerline tank, containing Diesel oil, dropped down to the external waterline. The port wing bulkheads, 66 and 69, were ruptured forward

and aft of No. 6 port wing tank. This opened No. 7 and No. 5 port wing tanks to the sea. The increase in the mean draft of 24 feet - 6 inches before damage was only 1 foot - 4 inches. Trim did not change. A 12 degree port list developed immediately, then slowly increased to 13-1/2 degrees and remained such until it was counteracted by transferring fuel oil from two undamaged port wing tanks to corresponding starboard wing tanks and by flooding No. 6 starboard tank by sluicing from No. 6 port tank. This brought the ship to an even keel within approximately an hour. There was no fire and no engineering or gyro casualties occurred. The ship carried out her mission without further casualty. Subsequent reports as to the extent of structural damage as observed in dock are, unfortunately, not available.

5-23. MISSISSINEWA was less fortunate. While at anchor at Ulithi on 20 November 1944, ready for sea with a mixed cargo of aviation gasoline, Diesel oil and fuel oil, she was hit forward, port side, near bulkhead 79 by a Japanese midget-submarine torpedo. The torpedo contained approximately 790 pounds of block-loaded, Type 97 explosive, about equal in power to a similar weight of TNT. A violent explosion occurred which enveloped the forward half of the ship in flame, and threw debris high in the air. Thirty seconds later a second violent explosion took place in the same vicinity. This later blast had the characteristics of a gasoline vapor explosion. The conflagration ignited by the torpedo detonation was spread aft rapidly by a strong wind from ahead. Control of the fire was never attained despite extensive assistance from eight salvage vessels. About 45 minutes after the torpedo struck, a third heavy explosion occurred, apparently a mass detonation in the after five-inch magazine initiated by fire since none of the after tanks contained gasoline. This resulted in extensive flooding aft. Two hours after the third explosion, MISSISSINEWA capsized slowly to port and remained floating keel up for about an hour before she sank, bow first. Just before the attack the ship had reported ready for sea with a standard load which consisted of 404,000 gallons of aviation gasoline in No. 2 center tank, 9,000 barrels of Diesel oil in No. 6 center, and fuel oil in all other tanks except four, No. 1 port and starboard, No. 3 center and No. 9 center, which were empty but not yet gas-freed. It is conjectured that the torpedo hit ruptured centerline tanks Nos. 2 and 3 at the top and sides, igniting the gasoline thrown out of No. 2 tank, and thereby initiating a vapor explosion in No. 3 tank. It will be noted from Plate V-4 that wing tanks forward are considerably narrower than those aft, which would facilitate the passage of flame and fragments to the centerline tanks. With respect to the capsizing, it is to be noted that enormous quantities of fire fighting water were pumped into the superstructure by assisting vessels and that MISSISSINEWA rolled over

almost three hours after the initial damage and after three major explosions had occurred.

5-24. The digest of these cases of underwater damage to tanker type hulls indicates that for an unarmored vessel these ships are exceptionally resistant to damage and can absorb a large amount of underwater damage without critical danger to the strength or stability of the ship. In the CVE105 Class the presence of the heavy twin longitudinal bulkheads and the extensive proportion of the total full load displacement devoted to ballast (nearly 35%) probably gives these ships as large a measure of underwater protection as many cruisers or other formally designed warships of comparable size.

SANGAMON (CVE26)

5-25. SANGAMON received damage of relatively minor extent from a bomb near-miss, southeast of Surigao Strait during the Battle for Leyte Gulf (See Section VII-D). Major damage to SANGAMON was incurred, however, off Okinawa the following May. On the latter occasion the ship was conducting flight operations with night fighters when a twin-engined Japanese Army plane with a large bomb crashed into the flight deck between the elevators among about 18 parked aircraft. The Kamikaze's bomb detonated in the hangar, also densely loaded with aircraft. Fortunately all planes were degassed and unarmed in accordance with the ship's established practice, except for approximately 25 gallons of gasoline left in each plane to facilitate handling. The bomb detonation extensively disrupted the hangar fire protection installations. This seriously handicapped the effort to establish control of the ensuing severe fire which largely destroyed installations and equipment on the flight, gallery and hangar decks from the forward end of the island to abaft the after elevator. The fire was finally extinguished after about three hours. Further flight operations were impossible without virtual reconstruction of the flight and hangar decks and renewal of almost all plane handling gear. The ship therefore retired to Ulithi, thence to Norfolk for repair. The end of hostilities occurred before she could be returned to service and SANGAMON has since been stricken from the Navy List.

5-26. The action summarized above took place shortly after dark on 4 May 1945. SANGAMON had replenished provisions and ammunition at Kerama Retto that day and was returning to the operating area at 18 knots when the attack occurred. The sea was calm with a slight swell. There was a 3-knot wind from the east. The ammunition had been struck below except for ammunition boxes containing 48,five-inch,aircraft rocket bodies and a similar number of

rocket warheads, which were stacked in the hangar. Radar interception of enemy aircraft permitted General Quarters stations to be manned and Material Condition ABLE to be set adequately in advance. About 1900, an attacking TONY was shot down and narrowly missed the ship. Two night fighters were then catapulted and preparations were made to launch two more. Approximately 27 other aircraft were aboard, 11 in the hangar and the rest on the flight deck. As stated above, all 27 planes had been degassed, leaving only 10 to 25 gallons in each.

5-27. About 1930 as darkness set in, a second bogey was picked up by SP radar. The air-borne fighters failed interception and the attacking plane, with a speed estimated to have been 350 knots, penetrated intense gunfire in a 20 degree glide from astern. Just before the plane crashed, the pilot released a bomb which penetrated the flight deck 7-1/2 inches forward of frame 67 on the centerline and detonated high-order in the hangar at frame 70, about 7 feet below the flight deck. The plane penetrated the flight deck at frame 70 and a major portion, including the plane's engines and heavily armored wing sections, was found on the hangar deck directly below the entry hole. Severe fires were ignited on the main, hangar, gallery and flight decks. The ship was promptly turned out of the wind and slowed down to reduce the intensity of the flames. The bridge was then cleared of all personnel except the Captain and three others. Efforts to employ the water curtain and sprinkling systems in the hangar were initially thwarted by the damage to risers and the inaccessibility of controls, although parts of the system were later operated. All interior communications to spaces above the hangar deck were disrupted by fire within 15 minutes after the hit. At 2025, conn was shifted to the forward end of the flight deck, steering control having been previously shifted to Batt. II.

5-28. In the meantime, much assistance was rendered by accompanying vessels. HUDSON (DD475) came alongside to windward (starboard) at 2010, supplied fire-fighting water via eight hoses and took off some wounded personnel. Topside damage forced HUDSON to move clear about 2025, after which three amphibious vessels came alongside to render similar assistance. The fire was reported under control by 2200. At 2330, the screen resumed formation and the ship proceeded to join its task group.

5-29. The plane which hit SANGAMON was identified from recovered parts as a NICK, a twin-engined Japanese Army fighter weighing about 12,000 pounds. This type of aircraft normally carried no bombs but on a suicide mission from a nearby field it could have handled a 250 Kg bomb by sacrificing some fuel capacity. The bomb

used was identified from the base fuze as a 250 Kg GP Army type, containing about 230 pounds of block-loaded Shimose. The same fuze was used with the 500 Kg GP type which might, therefore, have been the type which hit SANGAMON.

5-30. The structural damage caused by the plane impact and bomb detonation was very extensive as indicated in the appended photographs. Although no flexural vibration of the hull was reported, the impact of the plane and detonation of the bomb caused a heavy shock which threw personnel in the vicinity off their feet. The combined effect of the plane impact and the bomb detonation opened a hole in the flight deck approximately 20 feet by 10 feet on the centerline at frame 70. The impact of the plane sheared the flight deck bent at frame 70, a 32-inch by 12-inch by 3/4-inch I beam, and turned the ends 90 degrees so that they pointed toward the hangar deck. The bomb detonation blew both elevators out of their wells and produced a considerable crown in their platforms. The after elevator platform was inverted and deposited upside down, on edge in the pit. The forward elevator platform was canted and thrown onto the flight deck. The flight deck was buckled upward for a length of 150 feet between the elevators. Four holes, each approximately 6 feet square were blown in the port and starboard hangar bulkheads between frames 66 and 70, and roller curtains throughout the hangar were demolished. Fragment damage was very extensive. Numerous perforations occurred in structure above the main deck throughout a 100 foot radius from the center of the blast.

5-31. The flash of the bomb detonation enveloped all of the hangar and a large part of the flight deck and had an intense incendiary effect. Damage to equipment in way of the fire was so extensive that no attempt to itemize it will be made. The island was gutted and all ship-control, fire-control, radio, radar and navigational equipment therein was disabled. The hangar, gallery, and flight decks were similarly gutted throughout the midship area. Below the main deck, the ship was intact. Fueling equipment on the open main deck under the hangar remained about 70% effective. In way of the hangar itself, cable runs and piping for the fire main and gasoline system were largely destroyed. All aircraft aboard were jettisoned or destroyed except the one on the port catapult. Those in the hangar were particularly difficult to dispose of and were finally cut up with acetylene torches since no sufficiently large side openings existed through which an assembled plane could be jettisoned.

5-32. It is notable that SANGAMON overcame the conflagration and survived. No other escort carrier managed to bring under

control a fire which had gained similar headway. This singular accomplishment is worthy of some analysis.

5-33. The action report, reference (f), attributed the accomplishment in large measure to the following:

(a) Reduction of fire hazard through the plane degassing procedure.

(b) Reduction of personnel casualties by clearing the hangar and flight deck as soon as the guns started firing.

(c) Thorough training of all hands in fire fighting at Navy Fire Fighting Schools.

The discussion of these points in the action report, reference (f), is quoted below:

"(a) The recently instituted practice on the SANGAMON of degassing all planes on the hangar deck at all times and those on the flight deck except the immediate flight or the standby planes, paid large dividends for the considerable effort required. None of the barrier crashes where planes ended up in the spot caught fire. One particular bad crash caused numerous minor electrical fires but these were extinguished with CO2. When the ship was hit there were less than 1800 gallons of gasoline in the planes aboard instead of the 11 or 12 thousand gallons which would have been in them if the tanks had been full. The 1800 gallons could have been reduced had the planes been degassed completely dry. However, this would interfere with operations an unacceptable amount. About 25 gallons were left in each plane for taxiing forward. This gasoline burned but it was a much lesser problem than had the same tanks contained 450 gallons per plane.

"(b) The relatively small number of casualties was a direct result of the doctrine of clearing the hangar deck of all personnel as soon as the guns started firing. In this particular case no one was killed on the hangar deck because there was no one there. It is certain that if anyone had been on the hangar deck they would have been killed. This is proven by the fact that men in clipping rooms on both sides of the hangar deck were killed, although they had the protection of the clipping room bulkheads.

"(c) Again it has been proved that fire fighting school is worth all the man days it requires. It is recommended that material such as gasoline, lubricating

oil, rubber tires and aviation engines be used in the instruction fires as these materials are a great deal harder to extinguish than fuel oil fires. In fact the only burning material that could not be extinguished was the burning aircraft engines. It is impossible with the equipment at hand to stop the magnesium in the engines from burning once it gets started."

5-34. In addition to these factors, there were two unusual design features which gave an inherent advantage to the SANGAMON Class over other carriers insofar as overcoming a hangar fire was concerned. These were as follows:

(a) The open main deck under the hangar virtually eliminated the problem of loss of stability due to the pocketing of large volumes of fire fighting water high in the ship. This was in contrast to GAMBIER BAY and FRANKLIN (CV13) in particular.

(b) The placement of machinery spaces aft of the hangar permitted the engineering plant to function throughout the conflagration without interference. This was in contrast to almost every other severe hangar fire in other types of carriers. FRANKLIN and OMMANEY BAY were outstanding cases of contrast.

5-35. In the CVE 105 Class the space between the hangar deck and main deck has been enclosed. Half of the propulsion plant is located aft, hence the second advantage has been partially retained.