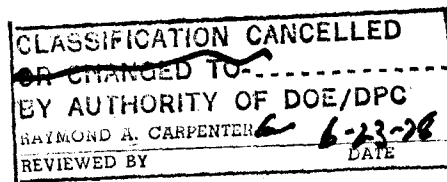


JTF-1/01/pm
 File: A9-8/A9-16 U.S.S. MT. MCKINLEY (AGC-7) Flagship
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JOINT TASK FORCE ONE

10 July 1946.

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From: Commander Joint Task Force ONE.
 To : The Joint Chiefs of Staff.

Subject: Test "A" - Preliminary Technical Report of Results.

Reference: (a) CJTF-1 Top Secret dispatch 051733 of July 1946.

Enclosure: (A) Copy of aerial photograph in mosaic showing central part of target array.
 (B) One set of photographs of ship damage.

1. In accordance with Commander Joint Task Force ONE Operation Plan Number 1-46, an atomic bomb of the Nagasaki type was dropped from a B-29 aircraft on the Test "A" target array in Bikini Lagoon at 090029, 1 July, Bikini local time, (22 hr. 00 Min. 29 Sec., 30 June, Greenwich Civil Time). Reference (a) gives the position of the burst with respect to the NEVADA. The approximate horizontal position of the burst is indicated in enclosure (A), a part of mosaic of aerial photographs taken thirty minutes before the bomb was dropped. Further refinement of the position reported may be expected after additional photographic and other data have been evaluated and plotted. It is considered that the position of the burst as reported in reference (a) is correct within 50 yards. Distances given in this report should also be considered as accurate within 50 yards and are given from the reported point of burst, as determined from photo-triangulation, to the foremast of each ship.

2. The concentration of ships in the target array below the point of burst was somewhat less than the concentration in a similar area about the NEVADA. Within a 700 yard horizontal radius from the burst, which appears to include the area of appreciable damage, there were 12 ships. A similar radius about the NEVADA would have included 14 ships.

3. The following is a summary of damage to target ships as ascertained from photographs taken shortly after the burst, visual observation from the air by trained observers, and subsequent inspection of surviving ships by inspection teams. Enclosure (B) is a set of photographs showing general views of damaged ships.

(a) The following ships were sunk either immediately or within the first half hour:

(1) U.S.S. GILLIAM (APA-57). The U.S.S. GILLIAM was located approximately 100 yards horizontal distance from the point of the burst. Early photographs do

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not show this ship at all, indicating that she sank almost immediately after detonation. Examination by divers indicates that the entire superstructure was broken off, and that the hull is broken into three parts, although the parts are not completely severed from each other. Examination by divers, including underwater photography, is continuing, and it is expected that more detailed information on damage to the GILLIAM will be obtained.

(2) U.S.S. ANDERSON (DD-411). The U.S.S. ANDERSON was located approximately 650 yards, horizontal distance from the point of the burst. The exact time of her sinking has not yet been determined. However, photographs indicate that she capsized about 0903, and by 0906 only a portion of the bottom forward was visible. Photographs from towers on Aomoen and Enyu islands taken approximately three (3) seconds after detonation show violent explosions in the location of the ANDERSON. It is believed that at least one torpedo on the ANDERSON detonated. Part of a torpedo tube spoon was found on the deck of ARDC-13 moored next to the ANDERSON. Fire at about 0902 is clearly visible in photographs. Diving operations now being conducted are expected to furnish additional information.

(3) U.S.S. CARLISLE (APA-69). The U.S.S. CARLISLE was located approximately 500 yards horizontal distance from the point of the burst. The time of sinking has not yet been established, but was prior to 0940. At about 0902 photographs reveal the vessel to be heavily on fire amidships on the port side with both stacks, the after kingpost, and the upper superstructure missing.

(b) The following ships were severely damaged and sank later due to progressive flooding:

(1) U.S.S. LAMSON (DD-367). The U.S.S. LAMSON was located approximately 650 yards horizontal distance from the point of the burst. This ship capsized to starboard (toward blast) and was seen floating in the lagoon until 1300. Exact time of sinking is not known.

(2) Ex-Japanese light cruiser SAKAWA. The SAKAWA was located approximately 450 yards horizontal distance from the point of the burst. Photographs show a fire at the stern of this ship, almost immediately after the detonation. This fire burned until the morning of ABLE plus one day. SAKAWA suffered very severe structural damage topside and at the stern, the latter permitting water to enter the hull. Progressive flooding undoubtedly took place, as draft aft increased steadily until the morning of ABLE day plus one. This ship was taken under tow on the morning of 2 July with the intention of beaching her as directed by Commander Joint Task Force ONE. At that time her stern was awash and her stability had been reduced to the vanishing point. Soon after being taken in tow, she heeled over to an angle of about 85 degrees to port and sank by the stern at 1044.

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(c) The following ships would have been temporarily immobilized, or practically so, because of lost or severely damaged stacks, and ruptured uptakes and boiler casings:

- (1) NEVADA (BB-36)
- (2) ARKANSAS (BB-33)
- (3) PENSACOLA (CA-24)
- (4) SALT LAKE CITY (CA-25)
- (5) HUGHES (DD-410)
- (6) INDEPENDENCE (CVL-22) (Damaged uptake, boilers apparently in good condition).

Repairs have been undertaken in each of these cases to permit operation of one boiler and the testing of main propulsion machinery. These repairs are estimated to require from four to ten days for completion, depending on the severity of damage in each case.

(d) The following ships have received significant structural or other damage of varying degrees of severity:

(1) U.S.S. SKATE (SS-305). The U.S.S. SKATE was the closest surviving ship to the point of burst, at a horizontal distance of 400 yards. This ship received severe damage to her superstructure, including periscopes. The pressure hull and conning tower are undamaged. The SKATE was dangerously radioactive until ABLE plus three days when the radioactivity had decayed to a level permitting six hours exposure. On ABLE plus four days she was refloated and proceeded under own power, using her starboard engine, alongside a tender. Repairs were made to the damaged port engine muffler, and both engines were in operation on ABLE plus five days. Minor repairs are required before the vessel can be dived with entire safety, and extensive repairs are needed to restore the ship to full operating condition; but she could proceed now on the surface to Hawaii and could dive, in emergency.

(2) U.S.S. INDEPENDENCE (CVL-22). This ship was located approximately 600 yards horizontal distance from the point of burst. The flight deck was so badly damaged that the ship could not have operated as an aircraft carrier without complete rebuilding of the flight deck, requiring at least three months in time of war. Although the structure, equipment, and fittings above the hangar deck level suffered very severe damage, this damage had little or no effect on the structural strength of the ship girder itself. A fire and low order explosion of twelve Mark XIII torpedo war-heads occurred just aft of the after bulkhead. Firecontrol and topside electronic equipment was seriously damaged.

(3) U.S.S. ARKANSAS (BB-33). This ship was located approximately 600 yards horizontal distance from the point of the burst. Although the ARKANSAS suffered severe topside damage, this did not affect the overall strength of the ship. The fire control and topside electronic equipment were severely damaged.

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(4) U.S.S. NEVADA (BB-36). This ship was located approximately 650 yards horizontal distance from the point of the burst. The NEVADA suffered medium topside damage. The principal structural damage is the general deflection of the main deck. This deflection varies from several inches at the stern to negligible or none at the bow. The fire control and topside electronic equipment were severely damaged.

(5) U.S.S. PENSACOLA (CA-24). This ship was located approximately 700 yards horizontal distance from the point of the burst. She received heavy topside damage including structural damage to the main deck amidships. The PENSACOLA also suffered severe damage to fire control and topside electronic equipment.

(6) U.S.S. SALT LAKE CITY (CA-25). Damage to the SALT LAKE CITY follows the same general pattern as that to the PENSACOLA. The extent, however, was somewhat less, being located some 900 yards horizontal distance from the point of the burst. She suffered severe damage to topside electronic equipment.

(7) U.S.S. CRITTENDEN (APA-77). The CRITTENDEN was located approximately 650 yards horizontal distance from the point of the burst. This ship suffered heavy dishing of the forward surface of the superstructure and bridge and heavy topside blast damage. The topside electronic equipment was severely damaged.

(8) The U.S.S. HUGHES, 900 yards, U.S.S. RHIND, 900 yards, and the U.S.S. DAWSON, 900 yards horizontal distance from the point of the burst, suffered topside blast damage, particularly to light structure. Their topside electronic equipment was heavily damaged.

(9) Ex-Japanese battleship NAGATO. The NAGATO was located approximately 800 yards horizontal distance from the point of burst. The damage suffered by this ship is not as distinguishable as that suffered by some of the other ships because this ship had suffered damage from two bomb hits during the war which has not been repaired. The Japanese had cut off the top of her stack and much of the light superstructure aft when using her as an AA defense ship in Tokyo Bay. In general, after the burst, the remaining superstructure was dished and distorted in varying degrees. The remainder of her stack was flattened on both sides. The forward superstructure tower withstood the blast well as a unit, but the after port surfaces were dished in varying degrees dependent upon the weight of plating.

4. The following are general observations covering certain categories of damage:

(a) No appreciable damage to guns or mounts of 5" caliber or larger has been discovered. Damage to a few smaller caliber guns was mainly from falling debris.

(b) No evidence has been found that, except in the case of the U.S.S. ANDERSON, any ammunition or ammunition components exploded or were activated

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as a direct result of heat from the atomic bomb itself. Except for the burning and low order detonation of torpedoes in the U.S.S. INDEPENDENCE and a probable topside detonation on the ANDERSON, there is no evidence, as yet, of any ammunition exploding as a result of fire.

(c) Major damage was suffered by all aircraft on weather decks of ships within about 2000 yards of the bomb burst. Fourteen (14) aircraft were sunk with target vessels or blown overboard. Major damage was suffered by 29 additional airplanes.

(d) Food, clothing and ship's store material stowed below decks were not affected to any practical extent. Some minor danger exists in the consumption of unsealed foods left on topsides.

(e) Approximately 90% of the test animals were recovered alive. Flash burn was not an important cause of death or injury. It is expected that most animals recovered from the U.S.S. NEVADA, INDEPENDENCE, FALLON, CATRON, and SALT LAKE CITY will suffer severe radiation illness and most will die. It is expected that most on the remaining outer target ships (outside of 1500 yards) will survive with or without permanent injury.

(f) No ship except those sunk had any appreciable underwater damage or flooding.

(g) No ship suffered appreciable loss of military efficiency from fires alone except in the case of INDEPENDENCE where the fires aft consumed her reserve supply of torpedoes. All other fires except in ships which sank were in exposed locations, and started in such materials as Army quartermaster equipment, cordage, signal flags, canvas fire hoses, boats and gun bloomers. In all other cases fires could have been put out by uninjured personnel on board.

(h) LST 52 suffered moderate damage. All other landing craft, seven (7) destroyers, seven (7) submarines and ten (10) attack transports showed either no damage or negligible damage.

(i) Bureau of Yards and Docks equipment exposed for test consisted of one concrete drydock and two concrete barges. The concrete drydock developed a few minor cracks, one of which was slightly below water, permitting slow flooding in one compartment. The concrete and wooden superstructure of YO-160 were almost completely demolished by the blast. Other damage, including fire damage, was minor. YOG-83 showed only negligible damage.

(j) By ABLE plus four, all ships had been cleared for reboarding by ship teams, except YO-160 which still had too much radioactivity to permit continuous living on board. Ships which were not habitable had crews aboard only during daylight hours. By ABLE plus five, forty (40) ships, not counting LST's or any other landing craft, had reported all of their crews subsisting on board. At present all crews are subsisting aboard except in the INDEPENDENCE.

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(k) Army equipment exposed on target ships showed the following results:

- (1) Heavy items such as guns and tanks were relatively unaffected.
- (2) The blast was destructive to lighter equipment at distances out to 1500 to 2500 yards, depending on size, construction and presentation of exposed surfaces.
- (3) Heat radiation was responsible for damage and loss of light combustible items up to distances of 2500 yards.
- (4) The effect of shielding was important. Items which when directly exposed sustained damage from either the blast or heat radiation, in some instances when shielded, were found undamaged at much closer exposures. In some instances, of two groups of similar items separated by a few feet, one was destroyed by fire while the other which was shielded was damaged only by singeing from the fire of the destroyed group.

(1) It is noteworthy that none of the expected oil fires occurred either on ships remaining afloat or on the surface of the water. The ships which sank on ABLE day had heavy fires, but it is not known if fuel oil was involved.

5. The scientific instrumentation was quite extensive and embraced a wide variety of measurements. It is expected that much valuable information will be gained after all the data has been collected and analyzed. Unfortunately, some records were lost due to the unexpected position of burst and to timing signal failures. The complete results will take an appreciable length of time to assemble and evaluate, but the following highlight summary includes some of the observations that have been made available at the present time:

(a) Quite accurate pressure measurements were made at various distances from the burst by means of five gallon cans and fifty-five gallon drums distributed about the target vessels. All the pressure data obtained by this means agree extremely well with the best predictable curve for the calculated TNT blast equivalent.

(b) According to the best evidence available at the present time, the peak pressures to which the heavily damaged surviving ships were subjected ranged from approximately 100 pounds / square inch at the stern of the SKATE (375 yards from the burst) to 10 pounds / square inch at the RHIND (about 900 yards from the burst). Pressures exerted on sunken ships have been ascertained indirectly. The pressures directly under the burst and at the GILLIAM have not been determined. The SAKAWA was subjected to approximately 70 pounds / square inch, the CARLISLE and ANDERSON to around 50 pounds / square inch, whereas peak pressures on the PENSACOLA and SALT LAKE CITY were around 20 pounds / square inch. Very minor structural damage was done at distances greater than 1000 yards and by pressures less than 10 pounds / square inch.

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(c) Highly satisfactory pressure - time records were obtained by means of Taylor Model Basin diaphragm blast gauges. The measured air pressure on BRISCOE (APA-65) at 1600 yards from the burst was 4.8 psi. and lasted for 0.99 seconds, whereas on BRACKEN (APA-64) at 2050 yards, the pressure was 2.8 psi. lasting for 0.94 seconds. By means of these data both the TNT equivalence of the bomb and the position of the burst have been calculated.

(d) The surface waves generated by the explosion above the water surface were smaller than expected. Within fifty yards of the burst, there was first a depression of the water surface, amounting to about six feet, and lasting for about five seconds, followed by a rapid rise to a height of two feet above mean level. The surface then slowly approached normal level, which was reached nearly forty seconds after the blast, lasting for ten seconds, and followed by a rise of less than a foot, again of about ten seconds duration.

(e) On the ships remaining afloat, special temperature-indicating materials showed no temperature over four hundred to five hundred degrees Fahrenheit, and such temperatures as these only in isolated instances.

(f) Personnel film badges were issued to monitors in order to record radiation exposure of the personnel of monitoring parties. Out of two thousand such films developed, only six films showed exposures above daily tolerance. The highest dose received by any of the monitors was 0.6 roentgens, i.e. 6 times daily tolerance. This exposure is quite safe and of no consequence.

(g) Air pressure records of the burst were recorded at the North end of Kwajalein Island, over 200 miles from Bikini. These were first recorded approximately twenty-three minutes after the burst. The pressure waves at this location had a velocity of approximately 292 meters per second, peak intensities of approximately 15 - 75 dynes per square centimeter, and periods increasing from 2.0 to 4.0 seconds.

(h) Spectra of the burst were taken with three quartz spectrographs on the U.S.S. KENNETH WHITING covering the wave length range from 1850 to 8200 A. The distance was 18 nautical miles. Brief conclusions from visual inspection of the spectrum plates are:

(1) The bomb spectrum was similar to that of a star at a surface temperature not greatly different from that of the sun.

(2) The intensity distribution in the bomb spectrum was not greatly different from that of the solar spectrum, but could not be determined precisely by visual inspection.

(i) Television equipment installed in steel towers on Bikini Island operated satisfactorily throughout the explosion period and transmitted good picture signals to remote points. SK radar equipment on the U.S.S. PANAMINT was used to determine the reflectivity of the ionized column of smoke emanating

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from the area of burst to electromagnetic waves at a frequency of 200 megacycles and at a distance of 18 miles. No observable reflections from the column were received. In general, electronic equipment operated satisfactorily at 800 yards from the burst. In some cases there was a momentary shorting out, but operation returned to normal after ten milliseconds.

(j) Photographic coverage was extensive and highly successful. Over 20,000 still photographs of ships, and of the detonation and subsequent events were taken, plus 100,000 feet of motion picture film. Many of these photographs have proved valuable in determining damage, sequence of events, and substantiating observations made by other means. Further study and analysis will undoubtedly yield additional valuable information.

(k) Radio-controlled drone boats, controlled from the U.S.S. BEGOR and conned by TBM planes flying over the lagoon, were operated in the target area within an hour of the explosion, to obtain samples of radioactive water. Operation was successfully concluded, the boats returned to the control ship, and water samples made available for analysis.

(l) The Army Air Forces and Navy drone operations for the collection of radioactive air samples were highly successful. One Navy F6F drone went out of control prior to the detonation and was lost. Four A.A.F. drones and three Navy drones penetrated the radioactive cloud and collected excellent samples. Little turbulence was experienced, and no structural damage was found. Remote controlled take-off and landings were without incident. All drones were found to be radiologically contaminated when landed. While in flight, mother planes could not approach closer than 200 to 300 feet due to high Geiger counter readings.

W. H. P. BLANDY.

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