

SECRET DISPATCH

41674 4-3-54

DRAFTER	EXT.	ADDRESSEES	PRECEDENCE
FROM	JOINT CHIEFS OF STAFF EVALUATION BOARD ATOMIC TESTS	ASTERISK (*) MAILGRAM ADDRESSEE	
RELEASED BY		FOR ACTION JOINT CHIEFS OF STAFF	PRIORITY 1
DATE	30 JULY 46		ROUTINE 2
TOR CODE ROOM	1655		DEFERRED 3
DECODED BY	LYON		BASEGRAM 4
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ROUTED BY			BASEGRAM 8

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PRELIMINARY REPORT FOLLOWING SECOND ATOMIC BOMB TEST.
PARA 1. IN COMPLIANCE WITH YOUR DIRECTIVE OF 27 FEBRUARY 1946,

THE EVALUATION BOARD PRESENTS A SECOND PRELIMINARY REPORT OF THE ATOMIC BOMB TESTS HELD AT BIKINI ATOLL.

SECTION 1 SUPPLEMENTAL TO PRELIMINARY REPORT ON TEST A.
PARA 1. IN GENERAL THE OBSERVATIONS ON SHIP DAMAGE PRESENTED

BY THIS BOARD IN ITS FIRST REPORT WERE CONFIRMED BY ENGINEERING SURVEYS. THE LOCATION OF THE BOMB BURST, ACCURATELY DETERMINED

FROM PHOTOGRAPHS, WAS SUCH THAT ONLY 1 SHIP WAS WITHIN 1,000 FEET OF THE SURFACE POINT OVER WHICH THE BOMB EXPLODED. THERE

WERE ABOUT 20 SHIPS WITHIN A HALF MILE, ALL OF WHICH WERE BADLY DAMAGED, MANY BEING PUT OUT OF ACTION AND 5 SUNK. IT REQUIRED

UP TO 12 DAYS TO REPAIR ALL OF THOSE SHIPS LEFT AFLOAT SUFFICIENTLY SO THAT THEY COULD HAVE STEAMED UNDER THEIR OWN

POWER TO A MAJOR BASE FOR REPAIR.
PARA 2. IT IS NOW POSSIBLE TO MAKE SOME ESTIMATE OF THE

RADIOLOGICAL INJURIES WHICH CREWS WOULD HAVE SUFFERED HAD THEY BEEN ABOARD THE TEST A TARGET VESSELS. MEASUREMENTS OF

No. 1 ADMIRAL.

No. 2 FILE.

No. 3F-1 OR CHARTROOM.

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RADIATION INTENSITY AND A STUDY OF ANIMALS EXPOSED IN SHIPS SHOW THAT THE INITIAL FLASH OF PRINCIPAL LETHAL RADIATIONS, WHICH ARE GAMMA RAYS AND NEUTRONS, WOULD HAVE KILLED ALMOST ALL PERSONNEL NORMALLY STATIONED ABOARD THE SHIPS WITHIN A HALF MILE OF THE AIRBURST AND MANY OTHERS AT GREATER DISTANCES. PERSONNEL PROTECTED BY STEEL, WATER OR OTHER DENSE MATERIALS WOULD HAVE BEEN RELATIVELY SAFE AT DISTANCES GREATER THAN 1 1/2 MILES. THE EFFECTS OF RADIATION EXPOSURE WOULD NOT HAVE INCAPACITATED ALL VICTIMS IMMEDIATELY; EVEN SOME OF THE MOST SEVERELY AFFECTED MIGHT HAVE REMAINED AT THEIR STATIONS SEVERAL HOURS. THUS IT IS POSSIBLE THAT INITIAL EFFORTS AT DAMAGE CONTROL MIGHT HAVE KEPT SHIPS OPERATING BUT IT IS CLEAR THAT VESSELS WITHIN A MILE OF AN ATOMIC BOMB AIR BURST WOULD EVENTUALLY BECOME INOPERATIVE DUE TO CREW CASUALTIES.

SECTION 2 OBSERVATIONS ON TEST B.

PARA 1. THE BOARD DIVIDED INTO 2 GROUPS FOR THE OBSERVATION

OF TEST B. 4 MEMBERS, AFTER SURVEYING THE TARGET ARRAY FROM THE AIR, WITNESSED THE EXPLOSION FROM AN AIRPLANE 8 MILES

AWAY AT AN ALTITUDE OF 7500 FEET. THE OTHER 3 MEMBERS INSPECTED THE TARGET ARRAY FROM A SMALL BOAT THE DAY BEFORE THE TEST AND

OBSERVED THE BOMB'S EXPLOSION FROM THE DECK OF THE USS HAVEN, 11 MILES AT SEA TO THE EAST OF THE BURST.

PARA 2. THE BOARD REASSEMBLED IN THE HAVEN ON 26 JULY AND THE MEMBERS HAVE SINCE EXAMINED PHOTOGRAPHS, DATA ON RADIO

ACTIVITY AND REPORTS OF OTHER PHENOMENA, AND HAVE INSPECTED SOME OF THE TARGET VESSELS. THEY ALSO CONSULTED WITH MEMBERS

OF THE TASK FORCE TECHNICAL STAFF.

PARA 3. AS SCHEDULED, AT 0835 BIKINI TIME ON 25 JULY, A BOMB

OF THE NAGASAKI TYPE WAS DETONATED WELL BELOW THE SURFACE OF THE LAGOON, WHICH AT THIS POINT IS 180 FEET DEEP. THIS BOMB WAS

SUSPENDED FROM THE LSM-60 NEAR THE CENTER OF THE TARGET ARRAY. THE EXPLOSION WAS OF PREDICTED VIOLENCE AND IS ESTIMATED TO HAVE

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BEEN AT LEAST AS DESTRUCTIVE AS 20,000 TONS OF TNT.
PARA 4. TO A DEGREE WHICH THE BOARD FINDS REMARKABLE, THE
VISIBLE PHENOMENA OF EXPLOSION FOLLOWED THE PREDICTIONS MADE
BY CIVILIAN AND SERVICE PHENOMENOLOGISTS ATTACHED TO JOINT TASK
FORCE 1. AT THE MOMENT OF EXPLOSION, A DOME WHICH SHOWED THE
LIGHT OF INCANDESCENT MATERIAL WITHIN, ROSE UPON THE SURFACE OF
THE LAGOON. THE BLAST WAVE WAS FOLLOWED BY AN OPAQUE CLOUD
WHICH RAPIDLY ENVELOPED ABOUT HALF OF THE TARGET ARRAY. THE
CLOUD VANISHED IN ABOUT 2 SECONDS TO REVEAL, AS PREDICTED, A
COLUMN OF ASCENDING WATER. FROM SOME OF THE PHOTOGRAPHS IT
APPEARS THAT THIS COLUMN LIFTED THE 26,000 TON BATTLESHIP
ARKANSAS FOR A BRIEF INTERVAL BEFORE THE VESSEL PLUNGED TO THE
BOTTOM OF THE LAGOON. CONFIRMATION OF THIS OCCURRENCE MUST
AWAIT THE ANALYSIS OF HIGH SPEED PHOTOGRAPHS WHICH ARE NOT YET
AVAILABLE.

PARA 5. THE DIAMETER OF THE COLUMN OF WATER WAS ABOUT 2200 FEET
AND IT ROSE TO A HEIGHT OF ABOUT 5500 FEET AT AN INITIAL RATE OF
3200 FEET PER SECOND. SPRAY ROSE TO A MUCH GREATER HEIGHT.
THE COLUMN CONTAINED ROUGHLY 10 MILLION TONS OF WATER. FOR
SEVERAL MINUTES AFTER THE COLUMN REACHED MAXIMUM HEIGHT, WATER
FELL BACK, FORMING AN EXPANDING CLOUD OF SPRAY WHICH ENGULFED
ABOUT HALF OF THE TARGET ARRAY. SURROUNDING THE BASE OF THE
COLUMN WAS A WALL OF FOAMING WATER SEVERAL HUNDRED FEET HIGH.

PARA 6. WAVES OUTSIDE THE WATER COLUMN, ABOUT 1000 FEET FROM
THE CENTER OF EXPLOSION, WERE 80 TO 100 FEET IN HEIGHT. THESE
WAVES RAPIDLY DIMINISHED IN SIZE AS THEY PROCEEDED OUTWARD, THE
HIGHEST WAVE REACHING THE BEACH OF BIKINI ISLAND BEING 7 FEET.
WAVES DID NOT PASS OVER THE ISLAND AND NO MATERIAL DAMAGE
OCCURRED THERE. MEASUREMENTS OF THE UNDERWATER SHOCK WAVE ARE
NOT YET AVAILABLE. THERE WERE NO SEISMIC PHENOMENA OF SIGNIFICANT
MAGNITUDE.

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PARA 7. THE EXPLOSION PRODUCED INTENSE RADIOACTIVITY IN THE WATERS OF THE LAGOON. PART OF THIS WAS BY REASON OF THE NEUTRON BOMBARDMENT OF THE SODIUM IN THE SALT BUT THE WATER WAS FURTHER DANGEROUSLY CONTAMINATED BY FISSION PRODUCTS FROM THE BOMB ITSELF. RADIOACTIVITY IMMEDIATELY AFTER THE BURST IS ESTIMATED TO HAVE BEEN THE EQUIVALENT OF MANY HUNDRED TONS OF RADIUM.

A FEW MINUTES EXPOSURE TO THIS INTENSE RADIATION AT ITS PEAK WOULD, WITHIN A BRIEF INTERVAL, HAVE INCAPACITATED HUMAN BEINGS AND HAVE RESULTED IN THEIR DEATHS WITHIN DAYS OR WEEKS.

PARA 8. GREAT QUANTITIES OF RADIOACTIVE WATER DESCENDED UPON THE SHIPS FROM THE COLUMN OR WERE THROWN OVER THEM BY WAVES. THIS HIGHLY LETHAL RADIOACTIVE WATER CONSTITUTED SUCH A HAZARD THAT AFTER 4 DAYS IT WAS STILL UNSAFE FOR INSPECTION PARTIES, OPERATING WITHIN A WELL ESTABLISHED SAFETY MARGIN, TO SPEND ANY USEFUL LENGTH OF TIME AT THE CENTER OF THE TARGET AREA OR TO BOARD SHIPS ANCHORED THERE.

PARA 9. AS IN TEST A, THE ARRAY OF TARGET SHIPS FOR TEST B DID NOT REPRESENT A NORMAL ANCHORAGE BUT WAS DESIGNED INSTEAD TO

OBTAIN THE MAXIMUM DATA FROM A SINGLE EXPLOSION. OF THE 84 SHIPS AND SMALL CRAFT IN THE ARRAY, 40 WERE ANCHORED WITHIN 1 MILE AND 20 WITHIN ABOUT 1/2 MILE. TWO MAJOR SHIPS WERE SUNK, THE BATTLESHIP ARKANSAS IMMEDIATELY AND THE HEAVY HULKED AIRCRAFT CARRIER SARATOGA AFTER 7 AND 1/2 HOURS. A LANDING SHIP, A LANDING CRAFT AND AN OILER ALSO SANK IMMEDIATELY. THE

DESTROYER HUGHES IN SINKING CONDITION AND THE TRANSPORT FALCON, BADLY LISTING, WERE LATER BEACHED. THE SUBMERGED SUBMARINE

APOGON WAS SENT TO THE BOTTOM EMITTING AIR BUBBLES AND FUEL OIL, AND 1 TO 3 OTHER SUBMERGED SUBMARINES ARE BELIEVED TO HAVE SUNK.

5 DAYS AFTER THE BURST, THE BADLY DAMAGED JAPANESE BATTLESHIP NAGATO SANK. IT WAS FOUND IMPOSSIBLE IMMEDIATELY TO ASSESS

DAMAGE TO HULLS, POWER PLANTS AND MACHINERY OF THE TARGET SHIPS BECAUSE OF RADIOACTIVE CONTAMINATION. FULL APPRAISAL OF DAMAGE

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WILL HAVE TO AWAIT DETAILED SURVEY BY ENGINEER TEAMS. EXTERNAL OBSERVATION FROM A SAFE DISTANCE WOULD INDICATE THAT A FEW

ADDITIONAL SHIPS NEAR THE TARGET CENTER MAY HAVE SUFFERED SOME HULL DAMAGE. THERE WAS NO OBVIOUS DAMAGE TO SHIPS MORE THAN

1/2 MILE FROM THE BURST.

SECTION 3 OBSERVATIONS AND CONCLUSIONS, BOTH TESTS.

PARA 1. THE OPERATIONS OF JOINT TASK FORCE 1 IN CONDUCTING THE TESTS HAS SET A PATTERN FOR CLOSE, EFFECTIVE COOPERATION OF THE ARMED SERVICES AND CIVILIAN SCIENTISTS IN THE PLANNING AND EXECUTION THIS HIGHLY TECHNICAL OPERATION. MOREOVER, THE TESTS HAVE PROVIDED VALUABLE TRAINING OF PERSONNEL IN JOINT OPERATIONS REQUIRING GREAT PRECISION AND COORDINATION OF EFFORT.

PARA 2. IT IS IMPOSSIBLE TO EVALUATE AN ATOMIC BURST IN TERMS OF CONVENTIONAL EXPLOSIVES. AS TO DETONATION AND BLAST EFFECTS,

WHERE THE LARGEST BOMB OF THE PAST WAS EFFECTIVE WITHIN A RADIUS OF A FEW HUNDRED FEET, THE ATOMIC BOMBS EFFECTIVENESS CAN BE

MEASURED IN THOUSANDS OF FEET. HOWEVER, THE RADIOLOGICAL EFFECTS HAVE NO PARALLEL IN CONVENTIONAL WEAPONS. IT IS NECESSARY THAT

A CONVENTIONAL BOMB SCORE A DIRECT HIT OR A NEAR MISS OF NOT MORE THAN A FEW FEET TO CAUSE SIGNIFICANT DAMAGE TO A BATTLESHIP.

AT BIKINI THE SECOND BOMB, BURSTING UNDERWATER, SANK A BATTLESHIP IMMEDIATELY AT A DISTANCE OF WELL OVER 500 FEET. IT DAMAGED AN

AIRCRAFT CARRIER SO THAT IT SANK IN A FEW HOURS WHILE ANOTHER BATTLESHIP SANK AFTER 5 DAYS. THE FIRST BOMB, BURSTING IN AIR,

DID GREAT HARM TO THE SUPERSTRUCTURES OF MAJOR SHIPS WITHIN A HALF MILE RADIUS, BUT DID ONLY MINOR DAMAGE TO THEIR HULLS. NO

SHIP WITHIN A MILE OF EITHER BURST COULD HAVE ESCAPED WITHOUT SOME DAMAGE TO ITSELF AND SERIOUS INJURY TO A LARGE NUMBER OF

ITS CREW.

PARA 3. ALTHOUGH LETHAL RESULTS MIGHT HAVE BEEN MORE OR LESS EQUIVALENT, THE RADIOLOGICAL PHENOMENA ACCOMPANYING THE 2 BURSTS WERE MARKEDLY DIFFERENT. IN THE CASE OF THE AIRBURST BOMB, IT

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SEEMS CERTAIN THAT UNPROTECTED PERSONNEL WITHIN 1 MILE WOULD HAVE SUFFERED HIGH CASUALTIES BY INTENSE NEUTRON AND GAMMA RADIATION AS WELL AS BY BLAST AND HEAT. THOSE SURVIVING IMMEDIATE EFFECTS WOULD NOT HAVE BEEN MENACED BY RADIOACTIVITY PERSISTING AFTER THE BURST.

PARA 4. IN THE CASE OF THE UNDERWATER EXPLOSION, THE AIR BURST WAVE WAS FAR LESS INTENSE AND THERE WAS NO HEATWAVE OF SIGNIFICANCE. MOREOVER, DUE TO THE ABSORPTION OF NEUTRONS AND GAMMA RAYS BY WATER, THE LETHAL QUALITY OF THE FIRST FLASH OF RADIATION WAS NOT OF HIGH ORDER. BUT, THE SECOND BOMB THREW LARGE MASSES OF HIGHLY RADIOACTIVE WATER ONTO THE DECKS AND INTO THE HULLS OF VESSELS WITHIN 1 MILE. THESE CONTAMINATED SHIPS BECAME RADIOACTIVE STOVES, AND WOULD HAVE BURNED ALL LIVING THINGS ABOARD THEM WITH INVISIBLE AND PAINLESS BUT DEADLY RADIATION.

PARA 5. IT IS TOO SOON TO ATTEMPT AN ANALYSIS OF ALL OF THE IMPLICATIONS OF THE BIKINI TESTS. BUT IT IS NOT TOO SOON TO POINT TO THE NECESSITY FOR IMMEDIATE AND INTENSIVE RESEARCH INTO SEVERAL UNIQUE PROBLEMS POSED BY THE ATOMIC BOMB. THE POISONING OF LARGE VOLUMES OF WATER PRESENTS SUCH A PROBLEM. STUDY MUST BE GIVEN TO PROCEDURES FOR PROTECTING NOT ONLY SHIPS CREWS, BUT ALSO THE POPULATIONS OF CITIES AGAINST SUCH RADIOLOGICAL EFFECTS AS WERE DEMONSTRATED IN BIKINI LAGOON.

PARA 6. OBSERVATIONS DURING THE 2 TESTS HAVE ESTABLISHED THE GENERAL TYPES AND RANGE OF EFFECTIVENESS OF AIR AND SHALLOW UNDERWATER ATOMIC BOMB BURSTS ON NAVAL VESSELS, ARMY MATERIEL, INCLUDING A WIDE VARIETY OF QUARTERMASTER STORES, AND PERSONNEL. FROM THESE OBSERVATIONS AND FROM INSTRUMENTAL DATA IT WILL NOW BE POSSIBLE TO OUTLINE SUCH CHANGES NOT ONLY IN MILITARY AND NAVAL DESIGN BUT ALSO IN STRATEGY AND TACTICS AS FUTURE EVENTS MAY INDICATE.

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PARA 7. NATIONAL SECURITY DICTATES THE ADOPTION OF A POLICY OF INSTANT READINESS TO DEFEND OURSELVES VIGOROUSLY AGAINST ANY THREAT OF ATOMIC WEAPON ATTACK AT ANYTIME AND ADHERENCE TO THIS POLICY UNTIL IT IS CERTAIN THAT THERE CAN NEVER BE AN ATOMIC WAR. ONE ENDURING PRINCIPLE OF WAR HAS NOT BEEN ALTERED BY THE ADVENT OF THE ATOMIC WEAPON. OFFENSIVE STRENGTH WILL REMAIN THE BEST DEFENSE. THEREFORE SO LONG AS ATOMIC BOMBS COULD CONCEIVABLY BE USED AGAINST THIS COUNTRY, THE BOARD URGES THE CONTINUED PRODUCTION OF ATOMIC MATERIAL AND RESEARCH AND DEVELOPMENT IN ALL FIELDS RELATED TO ATOMIC WARFARE.

SIGNED L H BRERETON
B DEWEY
T F FARRELL
J H HOOVER
R A OFSTIE
J W STILWELL
K T COMPTON, CHAIRMAN



JCS(#1)...ACT
BUORD(#2)...BUSHIPS(#3)...CJTF1(RE)(#4)...OOR(#5)...OO7(#6)...
WAR (COS AND COMGENAAF)(#7)...OP03(#8-13)...SECNAV(#14)...
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