DNB-1907-eat
07C19555
14 Jul 1955

~~CONFIDENTIAL~~

EIGHTH ENDORSEMENT on subject Court of Inquiry

From: Commandant of the Marine Corps
To: Chief of Naval Operations

Subj: Court of Inquiry - Deaths and injuries to Naval and Marine Corps personnel and to one civilian in explosion and fire aboard USS BENNINGTON (CVA20) on 26 May 1954 near Newport, Rhode Island; ordered by the Commander Air Force, U. S. Atlantic Fleet on 26 May 1954

1. Forwarded, contents noted.

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By direction

329-54

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C-CVA20(522)
Ser 522-036

ENDORSEMENT on subject Court of Inquiry

From: Chief, Bureau of Ships
To: Chief of Naval Operations (2)
Via: Commandant of the Marine Corps (1)

8 - JUL 1955

Subj: Court of Inquiry - Deaths and injuries to Naval and Marine Corps personnel and to one civilian in explosion and fire aboard USS BENNINGTON (CVA20) on 26 May 1954 near Newport, Rhode Island; ordered by the Commander Air Force, U. S. Atlantic Fleet on 26 May 1954

1. Forwarded.

2. The Chief of the Bureau of Ships concurs in the proceedings, findings of facts, opinions, and recommendations of the Court of Inquiry, as modified by the convening authority, subject to the following comments:

a. Recommendations 1, 2, 3, 4, 6, 11, 12 and 13 relating to non flammable hydraulic fluids, the use of nitrogen, modification of pressure relieving methods, and research programs.

(1) The high pressure hydropneumatic systems installed in surface ships and submarines consist of two general types. The type involved in this casualty is the direct contact type wherein the pressurizing medium is in direct contact with the hydraulic fluid. The other type is that in which the pressurizing medium is separated from the hydraulic fluid by a piston or diaphragm. All submarine hydropneumatic systems are of the latter type. Such a system is inherently safer than the direct contact type, although the bag or diaphragm is subject to failure, resulting in direct contact conditions. Nitrogen charging of bag or diaphragm systems was attempted in submarines of the SSK1-3 class. However, excessive leakage, necessitating recharging with air due to the lack of space for installation of replacement nitrogen storage or nitrogen generating capability, nullified the effectiveness of the initial charge in a short time. Consequently, nitrogen charging of bag or diaphragm type hydropneumatic systems has been held in abeyance pending further investigation of system leakage. This action is subject to compliance with current safety precautions regarding slow opening of air charging valves and root valves to Bourdon pressure gages. (Recommendations 3 and 4).

(2) Regarding direct contact high pressure hydropneumatic systems charged with nitrogen, the relatively small percentage of oxygen remaining in the system after initial charging with nitrogen, a small amount included as an impurity in nitrogen used for recharging, oxygen introduced by recharging with

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(6)

In the event nitrogen is not available on board when recharging is necessary or that oxygen which becomes mixed with the hydraulic fluid in gravity tanks open to the atmosphere may prevent complete safety at high pressure. The exact percentage of oxygen present in the system which will compromise the safety of the system is not known. Experiments to establish this percentage are very time-consuming and final results are not expected for about three years. However, all naval engineering and research facilities concur that inerting of a high pressure direct contact hydropneumatic system containing combustible oil is essential and provides additional safety. Accordingly, action has been initiated to incorporate nitrogen as the pressurizing medium in all high pressure direct contact hydropneumatic shipboard systems under the cognizance of the Bureau of Ships. (Recommendations 3 and 4).

(3) Means for detection of nitrogen leaks by scenting the gas are under investigation and development, although to date no scenting agent or method of introduction has been found. In the interim, flame safety lamps are being used to indicate oxygen deficiency in compartments containing nitrogen pressurized systems. Detailed requirements have been established and explicit instructions published regarding operation of ventilation systems during system blowdown. Installation of warning plates incorporating these instructions is required as a part of the modification to the system which provides for the use of nitrogen. (Recommendation 3).

(4) Concurrent with the introduction of nitrogen as a pressurizing medium in these hydropneumatic systems, development of a non-combustible hydraulic fluid which will be suitable for use in these systems is being pursued. At the present time, no satisfactory fluid has been developed. Houghto-Safe 271, currently in use in Bureau of Aeronautics hydraulic catapults, does not appear suitable for use in hydraulic elevator machinery. The service life of catapult hydraulic pumps using Houghto-Safe is comparable to the service life of these pumps when a petroleum hydraulic fluid is used. However, the service life of airplane elevator pumps is less than one-half the required time when Houghto-Safe 271 is used in an elevator system. One fluid shows promise for use in these elevators, and a pilot installation will be made in the near future. (Recommendations 1 and 2).

(5) Provisions for instantaneous emergency venting must be provided, if possible, on all pressure vessels containing combustible fluids. The replacement of relief valves on direct contact hydropneumatic accumulators containing combustible fluids has progressed to the point where a trial installation of safety heads, or blow-out discs, has been made in the catapult systems in USS HENNINGTON (CVA20). This trial installation has been made to establish whether or not such an installation is compatible with the operating characteristics of a varying pressure direct contact hydropneumatic system. A design investigation has been initiated to explore the feasibility of providing safety heads in air-

plane elevator direct contact hydropneumatic systems. If such an installation proves feasible and a satisfactory hydraulic fluid is not available, safety heads will be installed. (Recommendation 6).

(6) Pressure snubbers for installation in pneumatic gage lines to prevent compression-ignition upon quick opening of valves or system pressure surges have been developed and satisfactorily tested. Instructions for procurement and installation are being prepared for use on pneumatic systems afloat. Flame screen coolers to prevent flame propagation in piping systems are undergoing development and testing. To date, no satisfactory flame screen cooler has been manufactured.

(7) Research is continuing at the Engineering Experiment Station, the Naval Research Laboratory, and at the Bureau of Standards in the development of kinetics of ignition and combustion. (Recommendations 11, 12, 13, 14 and 15).

b. Recommendations 5, 8 and 23, relating to: the restricted use of hydropneumatic equipment pending the introduction of suitable hydrolube and insofar as practical an adequate percentage of nitrogen; the consideration that all compartments containing high pressure hydropneumatic systems charged with a hydrocarbon oil and air are hazardous; the isolation required to prevent widespread distribution of explosive gases, flame and blast effects from any source within combatant ships.

(1) The second endorsement states that the Commander in Chief, U. S. Atlantic Fleet considers the complete isolation of catapult compartments is an absolute necessity until such time as the cognizant technical bureaus in the Navy Department state unequivocally that the hydrolube selected has been tested and found to be non-inflammable in all pressure and temperature ranges known or thought to exist in the launching accumulator. The intent of this comment, and that of recommendation 5 was implemented by the Chief of Naval Operations by message in June, 1954, and subsequently cancelled upon introduction of Houghto-Safe 271 in hydraulic catapults. In view of the fact that the degree of safety achieved by the introduction of nitrogen as the pressurizing medium in a direct contact hydropneumatic system is uncertain, and since to date no satisfactory non-inflammable hydraulic fluid has been developed for use in elevators, additional instructions are being issued by the Bureau of Ships relative to isolation of elevator machinery compartments. (Recommendations 8 and 23).

(2) It is acknowledged that air and oil in direct contact in a high pressure hydropneumatic system constitutes a hazard. It is considered that the hazard is somewhat less in an elevator hydropneumatic system than in catapult systems due to the lower operating pressures, which are in the order of 1000 psi

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and slower moving parts. The introduction of nitrogen on an interim basis further reduces this hazard, and places it in the calculated risk category accepted in aircraft carriers with regard to the stowage and handling of ammunition, bombs, rockets, missiles and aviation gasoline. Consequently, no reduction in operation of elevators is recommended. The incorporation and use of nitrogen as a pressurizing medium in these systems will be continued pending the development of a satisfactory hydraulic fluid. It is the ultimate goal that all shipboard hydraulic systems of all types employ such a fluid. (Recommendation 5).

c. Recommendation 16 - Discharge of catapult system gravity tank vents overboard.

(1) This recommendation has been implemented insofar as is practicable in consideration of the location of the catapult machinery in the ship, and permissible back pressure on the gravity tanks involved. With the introduction of Houghto-Safe 271, this requirement has been considered met if the gravity tanks vent into an airplane elevator pit open to the hangar area. It has been standard practice for many years to provide special ventilation in elevator pits to remove gasoline vapors which are sometimes present in the hangar space, and which could otherwise collect in such locations. This ventilation also serves to remove catapult fluid vapor.

d. Recommendation 24 relating to location and accessibility of boiler fuel oil emergency trip devices:

(1) Emergency trip devices are located at the front of each boiler, accessible from the upper and lower levels of the fireroom, and also outside the firerooms at the top of the escape hatches. The accessibility, ease of operation, and location of these devices are being investigated to determine if they are adequate and if any modification or relocation is necessary.

e. Recommendation 25 relating to location of OBA equipment in certain isolated key control centers, such as the Damage Control Central:

(1) OBA equipment is provided in sufficient quantity to equip 30% of the ship's crew. This equipment is dispersed throughout the ship in accordance with a location plan developed upon recommendations of the forces afloat. Further, it is considered the Commanding Officer's prerogative to effect minor redistribution of this equipment if such is considered necessary. Major relocation of equipment and increase of allowance is contingent upon receipt of specific recommendations of forces afloat.

3. It is strongly recommended that a consolidated report on the results of

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the investigation conducted by the Court of Inquiry into this matter be issued on an unclassified basis for wide distribution to operating forces to emphasize the necessity for compliance with pertinent safety precautions, operating instructions and material directives.

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~~C O N F I D E N T I A L~~

Aer-SI-34/4
04156
2 March 1955

SIXTH ENDORSEMENT on subject record

From: Chief, Bureau of Aeronautics
To: Chief of Naval Operations
Via: (1) Chief, Bureau of Ships
(2) Commandant of the Marine Corps

Subj: Court of Inquiry - Deaths and injuries to Naval and Marine Corps personnel and to one civilian in explosion and fire aboard USS BENNINGTON (CVA-20) on 26 May 1954 near Newport, R. I.; Ordered by the Commander Air Force, Atlantic Fleet on 26 May 1954

Encl: (1) One (1) copy, "Summary of Action by BUAER Relative to the Recommendations of the Court of Inquiry, Convened to Inquire into the Fire and Explosion aboard the USS BENNINGTON (CVA-20) on 26 May 1954 as associated with material and components under BUAER Cognizance."
(2) One (1) copy of BUAER ltr Aer-SI-341 ser 145362 of 6 Nov 1953
(3) One (1) copy of BUAER ltr Aer-SI-34 ser 160053 of 12 Dec 1953
(4) One (1) copy of BUAER msg 022104Z Jun 1954
(5) One (1) copy of BUAER Conf ltr ser 011566 of 14 Jun 1954
(6) One (1) copy of BUAER Conf ltr ser 013191 of 7 Jul 1954
(7) One (1) copy of BUAER ltr Aer-SI-34/50 of 19 Jul 1954
(8) One (1) copy of H8 Catapult Change No. 34 - Hydraulic Oil, Replacement of; and Oilgear Type Power Plant Pumps, modification of
(9) One (1) copy of H2-1, H4B, H4C, H4-1 Catapult Changes 42, 50, 57, and 52 - Hydraulic Oil Replacement of Oilgear Type Power Plant Pumps, modification of
(10) One (1) copy of H2-1, H4B, H4C, H4-1 Catapult Changes 43, 62, 61, and 56 - Hydraulic Oil Replacement of, and Oilgear Type Power Plant Pumps; modification of
(11) One (1) copy of BUAER ltr Aer-SI-34/16 of 8 Mar 1954
(12) One (1) copy of H2-1, H4B, H4C, H4-1, H8, C7, C11, C11-1, C11-2 Catapult Change No. 99, 145, 110, 121, 91, 12, 12, 12, 12, Safety Precautions Regarding the Use of Nitrogen; Instructions concerning
(13) One (1) copy of BUAER msg 021347Z Jul 1954
(14) One (1) copy of CNO msg 021927Z Jul 1954
(15) One (1) copy of BUAER msg 302233Z May 1954
(16) One (1) copy of CNO msg 311637Z May 1954
(17) One (1) copy of CNO msg 311639Z May 1954
(18) One (1) copy of BUAER ltr Aer-SI-34/6 of 9 Feb 1954
(19) One (1) copy of BUAER ltr Aer-SI-341/54 of 23 Jun 1954
(20) One (1) copy of BUAER ltr Aer-SI-34/70 of 16 Jul 1954
(21) One (1) copy of BUAER ltr Aer-SI-34/81 of 21 Aug 1954
(22) One (1) copy of BUAER ltr Aer-SI-34/80 of 19 Aug 1954
(23) One (1) copy of NAMATCEN ltr PE-21-RFB:mdb S83/H8 of 25 Jun 1954
(24) One (1) copy of NAMATCEN ltr PE-21-RFB:mdb S83/H8 S83/H2 of 15 Jul 1954

~~C O N F I D E N T I A L~~

ENCLOSURES RECEIVED IN 24

~~C-O-N-F-I-D-E-N-T-I-A-L~~

Aer-SI-34/4
04156

Subj: Court of Inquiry - Deaths and injuries to Naval and Marine Corps personnel and to one civilian in explosion and fire aboard USS BENNINGTON (CVA-20) on 26 May 1954 near Newport, R. I.; Ordered by the Commander Air Force, Atlantic Fleet on 26 May 1954

Encl: (25) One (1) copy of BUAER ltr Aer-SI-34/71 of 27 Jul 1954
(26) One (1) copy of BUAER TWX 202002 Sep 1954
(27) One (1) copy of BUAER ltr Aer-SI-34/113 of 11 Oct 1954
(28) One (1) copy of BUAER ltr Aer-SI-34/72 of 27 Jul 1954
(29) One (1) copy of Interdept Order NAer 01629 dated 25 Oct 1954
(30) One (1) copy of BUAER ltr Aer-SI-34/69 of 21 Jul 1954
(31) One (1) copy of H2-1, H4D, H4C, H4-1, H8 Catapult Bulletin No. 103, 151, 115, 127, 96 - Periodic Check of Relief Valve Lifting Pressures on Launching and Retracting Accumulators; Instructions concerning
(32) One (1) copy of H2-1, H4B, H4C, H4-1, H8 Catapult Bulletin No. 105, 153, 117, 129, 98 - Cleanliness of Hydraulic Catapult Systems; Instructions for maintaining

1. Forwarded.

2. Enclosures (1) to (32) inclusive, indicate the action taken by the Chief of the Bureau of Aeronautics and other Naval Activities relative to the recommendations of the subject Court of Inquiry as related to material and components under the cognizance of this bureau.

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Assistant Chief for Research & Development

Copy to: WITH ENCL (1) THRU (32) OF SIXTH END.
COMFLTAIR Quonset
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BUMED:333:K:als (D)
ADAMS, Charles Edward
B6
Serial No. 06145
29 November 1954

~~CONFIDENTIAL~~

FIFTH ENDORSEMENT on subject record

From: Chief, Bureau of Medicine and Surgery
To: Chief of Naval Operations
Via: (1) Chief, Bureau of Aeronautics
(2) Chief, Bureau of Ships
(3) Commandant of the Marine Corps

Subj: Ct. of Inq. - Deaths and injuries to Naval and Marine Corps personnel and to one civilian in explosion and fire aboard USS BENNINGTON (CVA-20) on 26 May 1954 near Newport, R.I.; ord. by ComAirForLantFlt on 26 May 1954

1. Forwarded.

2. This Bureau concurs particularly in Recommendations 25 and 26 which are essentially the same as have been separately emphasized by Commander B6 MC, USN, the Senior Medical Officer of the BENNINGTON at the time of the explosion.

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By direction

(25) A17

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This endorsement is automatically declassified when removed from the basic record

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ALL B6

Pers B12d-fl

Ser N- 01218

20 OCT 1954

~~CONFIDENTIAL~~

FOURTH ENDORSEMENT on subject Court of Inquiry

From: Chief of Naval Personnel
To : Chief of Naval Operations
Via : (1) Chief, Bureau of Medicine & Surgery
(2) Chief, Bureau of Aeronautics
(3) Chief, Bureau of Ships
(4) Commandant of the Marine Corps

Subj: Ct. of Inq. - Deaths and injuries to Naval and Marine Corps personnel and to one civilian in explosion and fire aboard USS BENNINGTON (CVA-20) on 26 May 1954 near Newport, R.I.; ord. by ComAirForLantFlt on 26 May 1954

1. Forwarded, contents noted.

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By direction

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