DEPARTMENT OF THE NAVY

NAVAL SEA SYSTEMS COMMAND
WASHINGTON, D.C. 20362-5101

IN REPLY REFER TO

NAVSEAINST 9310.1B
OPR 66521
Ser 06/487
13 June 1991

NAVSEA INSTRUCTION 9310.1B

From: Commander, Naval Sea Systems Command

Subj: NAVAL LITHIUM BATTERY SAFETY PROGRAM

Ref: (a) Technical Manual S9310-AQ-SAF-010 Batteries, Navy Lithium Safety Program Responsibilities and Procedures of 20 Jul 88,
(b) OPNAVINST 5100.8G of 24 May 89,
(c) MIL-STD-882B of 30 Mar 84

Encl: (1) Naval Lithium Battery Safety Approval Process

1. Purpose. To issue policy and responsibilities for the safety of all lithium batteries and equipment powered by such batteries.

2. Cancellation. NAVSEAINST 9310.1A of 11 March 1982 was cancelled by NAVSEANOTE 9310 of 11 June 1985. NAVSEANOTE 9310 of 11 June 1985 is hereby cancelled.

3. Scope. This instruction applies to all Navy and Marine Corps activities and all lithium battery powered devices intended for use or transport on Navy facilities, ships and aircraft, regardless of source. Material to which this instruction applies includes all primary and secondary, active, thermal and reserve lithium batteries, and all equipment powered by lithium electrochemical power source(s) throughout all phases of the life of such systems.

4. Background

a. The stringent performance requirements of present and future naval battery powered systems necessitate the use of advanced lithium batteries with extended energy and life characteristics. In recent years, battery manufacturers in the United States and various foreign nations have been developing new lithium batteries using lithium or lithium alloy metal anodes coupled with either carbon monofluoride $(CFx)_n$, sulfur dioxide (SO_2, thionyl chloride ($SOCl_2$) or other cathode materials. Active, thermal or reserve lithium batteries represent a major breakthrough as primary power sources and provide certain unique advantages over other electrochemical systems. The advantages are: (1) a substantial increase in specific energy, (2) higher operating cell voltage, (3) low temperature operation, and (4) longer shelf life. While lithium batteries, in general, offer five to ten times the specific energy of other systems, each

design differs from the others in its level of performance and hazards.

b. Lithium batteries should be respected as hazardous at all times. They should not be pierced, crushed, burned, dropped, cannibalized, dismantled, modified, or otherwise carelessly handled nor short circuited. They should not be charged or reused unless designed as secondary batteries. Under conditions of abuse, misuse, partial discharge or depletion, incidents have been documented involving the venting of toxic gases, fires and explosions.

c. An understanding of lithium battery characteristics under all possible operational conditions is the key to the identification and control of related safety and environmental hazards. This understanding is essential if efforts to overcome these hazards by battery design or by logistics management and control are to succeed. The highly energetic and reactive nature of lithium batteries require that safeguards be employed in their design, fabrication, procurement, packaging, handling, transportation, use, storage and disposal. In general, manufacturers are aware that under certain conditions lithium batteries may be unsafe and most manufacturers have incorporated safety devices such as pressure relief mechanisms, fuses to protect against electrical and thermal overload and diodes to prevent cell reversal or charging. The effectiveness of these safety devices, in many cases, is dependent on the environment in which the battery is used, as well as the mode of operation.

5. Policy

a. Full consideration and timely attention will be given to matters concerned with lithium battery safety. All lithium batteries and every system (end item) using a lithium battery must be reviewed, tested and approved in accordance with reference (a) before the system shall be permitted to advance to the next stage of development and before test, prototype or production units are introduced into the Fleet. The Naval Surface Warfare Center, White Oak Laboratory (R-33) or the Naval Weapons Support Center, Crane (Code 305B), under the direction of the Naval Sea Systems Command, Weapons and Explosives Safety Division (SEA 665), will act as lead Navy activities in performing this function. After service use approval of a lithium battery powered system (end item), the Naval Weapons Support Center, Crane (Code 305B) will, under the direction of SEA 665, act as the lead Fleet Engineering Support Agent. They will review and assess the adequacy of lithium battery packaging, handling, transportation, storage and disposal procedures throughout the battery/system life cycle.

b. Due to the hazard potential in use and the environmental hazards associated with disposal, lithium batteries may be used only when it is established that no other safer, environmentally improved battery will provide adequate performance to meet an operational requirement. Only lithium batteries which have been approved for a specific end item application shall be procured for Fleet use and they shall be used solely for that application. A technical safety evaluation of the battery and its intended use will be the basis for the approval decision. Reprocurement without repeating safety tests of a previously approved lithium battery, when a break in production has occurred, is prohibited. Any break in production requires recertification.

c. Specific questions relating to the design, use, packaging, storage, transportation and disposal of these batteries are to be addressed to the Commander, Naval Sea Systems Command (SEA 665), Washington, D.C. 20362-5101.

6. Responsibilities

a. The Commander, Naval Sea Systems Command as designated technical authority for lithium battery safety within the Department of the Navy, in accordance with reference (b), will:

(1) Direct and coordinate efforts of all technical offices in regard to lithium battery safety.

(2) Provide technical guidance and act authoritatively for all Naval Commands in such matters.

(3) Serve as a single point of contact for lithium battery safety and technical matters within the Department of the Navy.

(4) Provide recommendations for any use, including Release to Full Production and Fleet introduction of the items using lithium batteries based on a review of the safety design, analysis and tests conducted.

b. The Systems Commander having cognizance of the development or acquisition is responsible for issuing the final approval for service use after receiving a recommendation from SEA 665. The systems commander is also responsible for demilitarization and disposal of this equipment.

c. All program managers, designers, producers, processors, packagers, handlers or users of lithium batteries are responsible for safety within their realm of activity.

d. All Systems Commanders, Project Managers and Research and Development Activities are responsible for implementing the Lithium Battery Safety Program within their cognizant material support area. Specifically:

(1) Assure that lithium battery safety criteria are incorporated in the design of lithium batteries and all lithium battery powered equipment under their cognizance.

(2) Provide a systems safety program as prescribed in references (b) and (c) to ensure the safety of the lithium battery in the end use item and its interface with operational vehicles (i.e., aircraft or ships) shall begin at the inception of a program or the modification of an existing system. All development or contractual documents shall reflect a formal program for a systems safety evaluation and shall provide for adequate funding of the program. The safety program shall remain in effect throughout the entire life cycle (e.g., storage, use and disposal) of the system.

(3) Assure that all lithium batteries and equipment powered by such batteries complete the lithium battery approval procedures in accordance with enclosure (1).

(4) Advise SEA 665 of plans for new or modified lithium batteries and all lithium battery powered equipment, for new or revised processing methods, stowage, packaging and handling, shipping and usage; and plan and fund for necessary safety studies, tests and documentation. All Commands shall ensure that they neither introduce nor change lithium battery systems nor their related procedures and documentation without adequate safety studies. These safety studies, tests and documentation shall be submitted to the Naval Sea Systems Command (SEA 665) for review prior to requesting recommendation of approval.

G. R. MEINIG, JR.
Rear Admiral, U. S. Navy
Deputy Commander for
Weapons and Combat Systems

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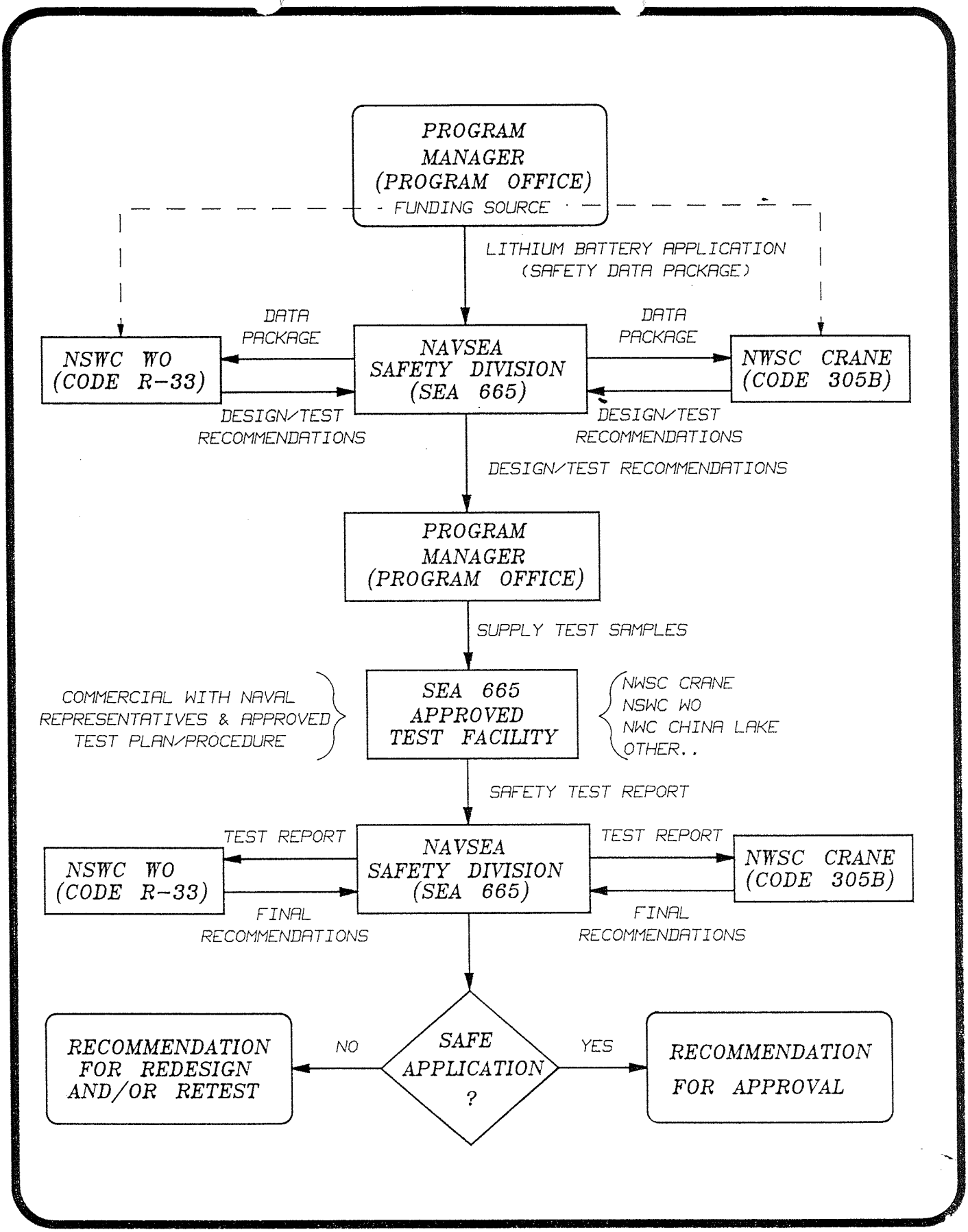

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