



DEPARTMENT OF THE NAVY  
NAVAL SEA SYSTEMS COMMAND  
1333 ISAAC HULL AVE SE  
WASHINGTON NAVY YARD DC 20376-0001

IN REPLY REFER TO  
NAVSEAINST 5100.21B  
Ser 05S/2019-018  
**AUG 04 2020**

NAVSEA INSTRUCTION 5100.21B

From: Commander, Naval Sea Systems Command, Naval Systems Engineering (SEA 05)

Subj: FAILURE REVIEW BOARD POLICY

- Ref:
- (a) NAVSEAINST 5400.97C, Virtual SYSCOM Engineering and Technical Authority Policy, of 27 November 2006
  - (b) DoD Instruction 5230.24, Distribution Statements on Technical Documents, of 23 August 2012
  - (c) ETAP 4.6.4, Engineering and Technical Authority Critique Procedure, of 13 November 2013
  - (d) OPNAVINST 5102.1D, Navy and Marine Corps Mishap and Safety Investigation, Reporting, and Record Keeping, of 7 January 2005
  - (e) NAVSEAINST 5400.111A, NAVSEA Engineering and Technical Authority Policy, of 29 December 2014
  - (f) NAVSEAINST 5100.12B, Systems Safety Engineering Policy, of 3 August 2011
  - (g) S9800-AB-MAN-010, Engineering and Technical Authority Manual, Appendix E, Risk Management, of 6 July 2011
  - (h) NAVSEAINST 5000.8, Naval SYSCOM Risk Management Policy, of 21 July 2008

- Encl:
- (1) Failure Analysis Template – Example
  - (2) Failure Analysis Report
  - (3) Failure Review Board Charter – Example
  - (4) Failure Review Board Process Flowchart
  - (5) Tools Used in Root Cause Analysis
  - (6) Failure Review Board Close-Out Memo – Example

1. Purpose

a. To update the Failure Review Board (FRB) process and define responsibilities and criteria for conducting an engineering or design investigation related to failures of shipboard equipment and systems developed, produced, or managed by Naval Sea Systems Command (NAVSEA). The objectives of an FRB are to investigate and determine root causes of the failure; determine if system design, operation, or maintenance contributed to the root causes; recommend corrective and preventive actions to preclude recurrence; and assess risk(s) if recommendations are not implemented

b. Changes in this revision include merging the two phases of an FRB into one process, the addition of an outline of criteria for convening an FRB, update to the FRB process flowchart, codifying the requirement for Objective Quality Evidence (OQE) to be submitted for action item

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closeout, and for the FRB chair or co-chair to issue a close-out memo once all FRB actions have been completed. The close-out memo will include the OQE that supports each action closure. Enclosures (1) through (6) have been updated as necessary to clarify guidance. This instruction is a complete revision and should be reviewed in its entirety.

2. Cancellation. NAVSEAINST 5100.21A of 7 July 2015.

3. Scope and Applicability

a. Failure investigations conducted under this instruction are required when directed by the NAVSEA Chief Engineer (CHENG) (SEA 05). The NAVSEA Deputy CHENG (SEA 05B) may act for the NAVSEA CHENG for any FRB action described in this instruction.

b. This instruction is applicable to all NAVSEA programs and activities, other than those exempted as stated in 3.c below. It sets policy for forming FRBs to determine if the shipboard equipment, warfare systems, procedures, or system design and design requirements contributed to a failure and ensures corrective and preventative actions are taken.

c. This instruction applies to all programs and Program Executive Offices but does not apply to the exclusions listed in reference (a), which include all matters under the cognizance of the Naval Nuclear Propulsion Directorate (SEA 08) and the strategic weapons systems under the cognizance of the Strategic Systems Program.

d. All records created by this process must be handled and disposed of per the provisions of reference (b) and labeled with "Distribution Statement F" until released by Commander, Naval Sea Systems Command (COMNAVSEA).

4 Discussion

a. Failures and unplanned events may be of varying levels of severity. Minor events may only need a failure analysis, immediate correction, and equipment or system owner notification, led by the program office following their standard processes. The local activity where the failure occurred, the program office responsible for the ship or system, or the technical authority responsible for the ship or system may initiate a critique of the failure per their local instructions. When the failure indicates that there was a significant problem with the engineering and technical authority processes or the checks and balances needed to design and field safe systems, then a critique per reference (c) may be required. Where these methods are not sufficient, an FRB may be appropriate. In those cases, enclosure (1) is a failure analysis template, enclosure (2) is a failure analysis report template, and enclosure (3) is an example of an FRB charter, all of which may be used.

b. FRBs may be established by the NAVSEA CHENG to investigate ship incidents such as a fire, collision, death or injury to personnel; equipment damage or failure; or Class A and B

mishaps per reference (d). During FRB investigations, findings and recommendations of significance may be identified, benefiting other involved organizations or investigation boards. A single incidence may require critiques, mishap safety investigation boards (SIB), Judge Advocate General Manual (JAGMAN) investigations, and FRBs, all of which have different intents or findings. The following instances are examples for which SEA 05 products, processes, or services may warrant the creation of an FRB:

- (1) Injury or death.
- (2) A mishap incurring substantial cost or schedule impact, or significant feedback from the fleet identifying a problem with SEA 05 products, processes, or services.
- (3) Significant error in issued technical direction or correspondence (e.g., drawing approvals, nonconformance reviews and approvals, and approvals for configuration changes).
- (4) Strong potential for significant lessons learned to share with the community or to inform future designs.

c. Consistent with reference (e), the NAVSEA CHENG is the technical authority responsible and accountable for the safety and reliability of aircraft carriers, surface ships, submarines, and related systems. The NAVSEA CHENG delegates technical authority within NAVSEA, resolves disagreements, and approves the analyses of serious and high safety risks.

## 5. Policy

a. An FRB will be initiated when approved by the NAVSEA CHENG. The purpose of the FRB is to conduct a fact-finding investigation into the design adequacy, procedures, or actions that led to the failure. The investigation identifies the root causes of the failure with sufficient evidence for taking short and long-term action. Hazard assessment reports, if required, are developed to provide the risks if recommendations are not implemented. An FRB must be conducted when:

- (1) The responsible organization(s) are directed to conduct an FRB by the NAVSEA CHENG.
- (2) The responsible organization(s) collectively agree to conduct an FRB. In this case, leadership from the responsible organization(s) will lead FRB efforts, while keeping the NAVSEA CHENG informed of all activity. If no agreement between organizations is made, the NAVSEA CHENG will determine if an FRB is necessary.
- (3) A critique or failure analysis determines that an in-depth technical investigation is required. If it is determined that an FRB is not required, the program's internal processes may be used.

b. When none of criteria above are met, and the determination is made that an FRB is not required, programs and activities may use internal processes as necessary to determine causality and appropriate corrective actions. If a program or activity initiates an internal review, the templates enclosed in this document should be followed to the greatest extent possible and investigation reports submitted to SEA 05. Consistent with reference (f), the NAVSEA CHENG Principal for Safety in SEA 05S will review any situations in which the necessity for an FRB is questionable and will provide a recommendation to the NAVSEA CHENG.

c. The sequence of the FRB process will follow the flowchart in enclosure (4). After the FRB is approved and a charter is signed, the FRB's first action will be to develop the preliminary timeline for the event. This timeline, supported by relevant OQE, will be used for developing findings, understanding root causes, and pursuing subsequent actions. Developing the preliminary timeline will not be delayed by waiting to gather all information; the timeline should be updated as more information becomes available. Having a preliminary timeline early in the FRB process also allows sharing of the timeline with other interested organizations, such as a SIB or a JAGMAN investigation team. Actions and recommendations, if any, are identified and tracked to completion. Action items could be closed by transferring them to a locally maintained corrective action item database or similar tracking system. OQE is required to be collected to support action closure.

(1) Each FRB will conduct an in-depth investigation into the root causes of the failure and address the same issue or similar issues on other ship classes or systems. A complete root cause analysis should be performed to provide more extensive corrective and preventive actions. Examples of root cause analyses are: 5 Whys, Fishbone Diagram, Switch Theory, and Fault Tree. Examples of root cause analysis tools are contained in enclosure (5). Corrective actions are then identified and prescribed which will address the full scope of the failure. This includes using methods for system safety and programmatic risk management in references (f) through (h) to provide a range of technically acceptable alternatives with risk and value assessments so that NAVSEA leadership may make informed decisions.

(2) Each FRB will produce a draft report that details the investigation, root causes, recommendations, and any actions. All FRB actions and recommendations for NAVSEA managed FRBs must be approved by the NAVSEA CHENG before the report is finalized. Additionally, the FRB chair will get concurrences from the points of contact before an action is assigned. The NAVSEA CHENG, or their designee, is then responsible for tracking actions from the report to closure and for collecting OQE to support each closure. Once all actions have been completed, the NAVSEA CHENG will issue a close-out memo that briefly discusses the FRB, lists all actions, and outlines how each action or recommendation was completed. OQE should be included in the close-out memo package as enclosures. A sample close-out memo is provided in enclosure (6). The close-out memo and actions will be provided to the cognizant program office for awareness and action, as applicable.

6. Responsibilities. The following FRB responsibilities for NAVSEA managed FRBs are assigned by COMNAVSEA.

a. NAVSEA CHENG. The NAVSEA CHENG, or a designee, will coordinate the completion of all FRB actions and report progress to stakeholders and cognizant program offices.

b. FRB Chair/Co-Chair. The FRB chair or co-chair will be assigned by the NAVSEA CHENG and formally appointed in the FRB charter. The appointed FRB chair or the co-chair may be a civilian or a uniformed military person. Enclosure (2) is an example of an FRB charter that the FRB chair or co-chair may use for the writing of the charter. The chair or co-chair may be assigned from Industrial Operations (SEA 04), SEA 05, Undersea Warfare (SEA 07), Surface Ship Maintenance and Modernization (SEA 21), responsible program office, or other NAVSEA activity, depending on the ship or system associated with the failure. The chair or co-chair are responsible for ensuring that the FRB process is performed per this instruction and informing SEA 05S that an FRB has been initiated. The chair or co-chair will provide oversight to the team and will act as a liaison between senior leadership and involved organizations. The FRB chair will appoint the FRB team, which is comprised of members from the program office, the ship design manager (SDM), technical warrant holder (TWH), in-service engineering agent (ISEA), type commander (TYCOM), fleet personnel, etc. The chair will ensure the FRB report meets the intended need, will determine recommended recipients, and will obtain stakeholders and the NAVSEA CHENG endorsement. The chair or co-chair will interface with other organizations performing investigations concurrent with the FRB, such as SIB and JAGMAN investigation, or Naval Criminal Investigative Service (NCIS) investigation, to prevent duplication of effort and ensure FRB efforts support other investigations when required by higher-echelon instruction. Per reference (d), the JAGMAN and NCIS investigators may not have access to information gathered by the SIB. Reference (d) states, "Unauthorized disclosure of safety information by military personnel is a criminal offense punishable under article 92, Uniform Code of Military Justice (UCMJ). Unauthorized disclosure of safety information by civilian personnel will subject them to disciplinary action under civilian personnel instruction 752." When FRB information is requested by NCIS or personnel conducting a JAGMAN, do not include information gathered from the SIB unless permission is granted by Commander, Naval Safety Center.

c. Failure Investigation Team (FIT). The FIT must be formally established by the FRB chair with the membership identified in the FRB charter. There may be multiple FITs established to address each unique aspect of the failure (e.g., combat systems FIT, ship survivability FIT, and shipboard machinery FIT). The team membership must include individuals from the involved organizations and those directly involved with, or knowledgeable of, the ship or system associated with the failure. The involved organizations are identified in the FRB charter and may be a shipyard, supervisor of shipbuilding (SUPSHIP), regional maintenance center (RMC), planning yard, NAVSEA code, warfare center, the program management office, or an outside agency (e.g., National Transportation Safety Board [NTSB]); personnel from which may include TWHs, engineering managers, lead engineers, engineering

field representatives, and other subject matter experts (e.g., maintenance engineers, ISEAs, and TYCOMs).

d. SEA 05S. SEA 05S once notified by the FRB Chair that a FRB has been initiated, will be responsible for tracking all action items determined by the FIT to closure. They will also track safety trends, root causes, lessons learned and corrective actions taken.

7. Point of Contact. The point of contact is Mr. Adam Bernstein, SEA 05S3, [adam.bernstein@navy.mil](mailto:adam.bernstein@navy.mil), 202-781-5416.

#### 8. Records Management

a. Records created as a result of this instruction, regardless of format or media, must be maintained and dispositioned for the standard subject identification codes 1000 through 13000 series per the records disposition schedules located on the Department of the Navy/Assistant for Administration, Directives and Records Management Division portal page at <https://portal.secnav.navy.mil/orgs/DUSNM/DONAA/DRM/Records-and-Information-Management/Approved%20Record%20Schedules/Forms/AllItems.aspx>.

b. For questions concerning the management of records related to this instruction or the records disposition schedules, please contact your local records manager.

9. Review and Effective Date. Per OPNAVINST 5215.17A, SEA 05S will review this instruction annually around the anniversary of its issuance date to ensure applicability, currency, and consistency with Federal, Department of Defense, Secretary of the Navy, and Navy policy and statutory authority using OPNAV 5215/40 Review of Instruction. This instruction will be in effect for 10 years, unless revised or cancelled in the interim, and will be reissued by the 10-year anniversary date if it is still required, unless it meets one of the exceptions in OPNAVINST 5215.17A, paragraph 9. Otherwise, if the instruction is no longer required, it will be processed for cancellation as soon as the need for cancellation is known following the guidance in OPNAV Manual 5215.1 of May 2016.



J. M. LLOYD  
By direction

#### Releasability and distribution:

This instruction is cleared for public release and is available electronically only, via the NAVSEA Public Website located at <http://www.navsea.navy.mil/Resources/Instructions/>

FAILURE ANALYSIS TEMPLATE – EXAMPLE  
(Tailoring is required)

1. Initial Notification
  - a. Identify the problem, condition, situation, or action that was unwanted or unplanned: \_\_\_\_\_  
\_\_\_\_\_
  - b. Date: \_\_\_\_\_
  - c. Time: \_\_\_\_\_
  - d. Ship, Sub, Carrier, or System: \_\_\_\_\_
  - e. Location: \_\_\_\_\_
  - f. Current Status: \_\_\_\_\_
  - g. Initial Point of Contact: \_\_\_\_\_
  - h. Preliminary timeline of events related to the failure: \_\_\_\_\_
2. Failure Analysis
  - a. Failure analysis lead investigator: \_\_\_\_\_
  - b. Assemble the following supporting documentation:
    - (1) CASREP/SITREP/HAZREP/WESS NAVAL MESSAGE
    - (2) Operating Procedures
    - (3) Technical Publications
    - (4) Departures
    - (5) Other
  - c. Conduct initial assessment of failure
    - (1) Verify area surrounding the failure is safe to enter
    - (2) Log current condition of space/area/compartment
    - (3) Log assessments from:
      - (a) Operator or Watchstander
      - (b) Commanding Officer or Officer in Charge
  - d. Conduct interviews as necessary. Record the following information:
    - (1) Interviewee's name
    - (2) Interviewee's command/code/activity
    - (3) Interviewee's contact information
    - (4) Date and time of interview
    - (5) Jobs, responsibilities, and actions or observations at the time of failure
  - e. Coordinate Technical Review with Technical Authorities and Program Offices
  - f. Prepare Failure Analysis Report.
  - g. Brief Failure Analysis to SDM or SIM and Cognizant Cross Platform TWHs and their DWOs.
  - h. File Failure Analysis with SEA 05 Technical Authority and Program Office.

FAILURE ANALYSIS REPORT  
(Tailoring is required)

|                                                                          |                |
|--------------------------------------------------------------------------|----------------|
| Subject:                                                                 | Date of Event: |
| Lead Investigator:                                                       |                |
| Failure:                                                                 |                |
| Ship/Submarine/Carrier Name and Class; or Other:                         |                |
| Location:                                                                |                |
| System(s) Involved:                                                      |                |
| Technical Information (Drawings, Technical Standards, Departures, etc.): |                |
| Synopsis of Failure:                                                     |                |
| Sequence of Events:                                                      |                |
| Immediate Corrective and Preventive Actions Taken:                       |                |
| Likely Scenario of Failure:                                              |                |
| Root Cause:                                                              |                |
| Root Cause Analysis (attach):                                            |                |
| Scope of Problem (One-Off, Class Issue, Fleet Issue):                    |                |
| Long Term Corrective and Preventive Recommendations:                     |                |
| Further Recommendations:                                                 |                |

FAILURE REVIEW BOARD CHARTER – EXAMPLE

From: Commander, Naval Sea Systems Command (SEA 05)

Subj: USS SHIP STARBOARD MAIN REDUCTION GEAR DAMAGE; FAILURE  
REVIEW BOARD CHARTER

Ref: (a) NAVSEAINST 5100.21B, Failure Review Board Policy, of date

Encl: (1) Failure Review Board for USS SHIP Main Reduction  
Gear (MRG); FRB Charter of DD MMM YYYY

1. Purpose. NAVSEA established a Failure Review Board (FRB) to investigate the USS SHIP Main Reduction Gear (MRG) Damage. (DESCRIBE NATURE OF FAILURE [1 OR 2 SENTENCES].) Reference (a) contains NAVSEA policy for conducting an FRB. The purpose of the FRB is to conduct a fact-finding investigation into the design and manufacturing adequacy, maintenance, procedures, and actions that led to the casualty. The objectives of this FRB are as follows: determine if design or maintenance practices contributed to the root causes of the bearing failures, recommend corrective actions to preclude recurrence, and assess risk if recommendations are not implemented.

2. Action

- a. (ASSIGNED CHAIR'S NAME HERE) will chair the FRB (Phase 1).
- b. The FRB will develop a Plan of Action and Milestones (POA&M) to capture the activity and objectives.
- c. The FRB will rely on input from a critique conducted by (INSERT COMMAND WHO CONDUCTED CRITIQUE [IF APPLICABLE]).
- d. FRB members are listed in enclosure (1).
- e. The FRB will accomplish the following:
  - (1) (LIST DIRECTION FROM NAVSEA CHENG)

3. Authority and Scope

- a. The FRB is authorized to draw subject matter experts from across NAVSEA as required to execute this tasking.

b. The FRB will investigate all potential spaces, systems, equipment, operating conditions, personnel, training, PMS, or any other areas deemed relevant to the determination of design issues that could have contributed to the root causes and any other contributing conditions associated with the abnormal performance.

c. Coordinate with any other investigation personnel, if applicable, to the maximum extent possible to reduce duplication of effort and provide technical support across investigations.

4. Reporting. The FRB will provide a preliminary written report of findings and recommendations to NAVSEA CHENG. The FRB will provide a final written report to the NAVSEA CHENG.

SEA 05  
By direction

Distribution:  
(AS DIRECTED)

**FAILURE REVIEW BOARD  
FOR  
USS SHIP MAIN REDUCTION GEAR (MRG); FRB CHARTER  
OF  
DD MMM YYYY**

**Chair**

(AS ASSIGNED BY NAVSEA CHENG)

**Co-Chair**

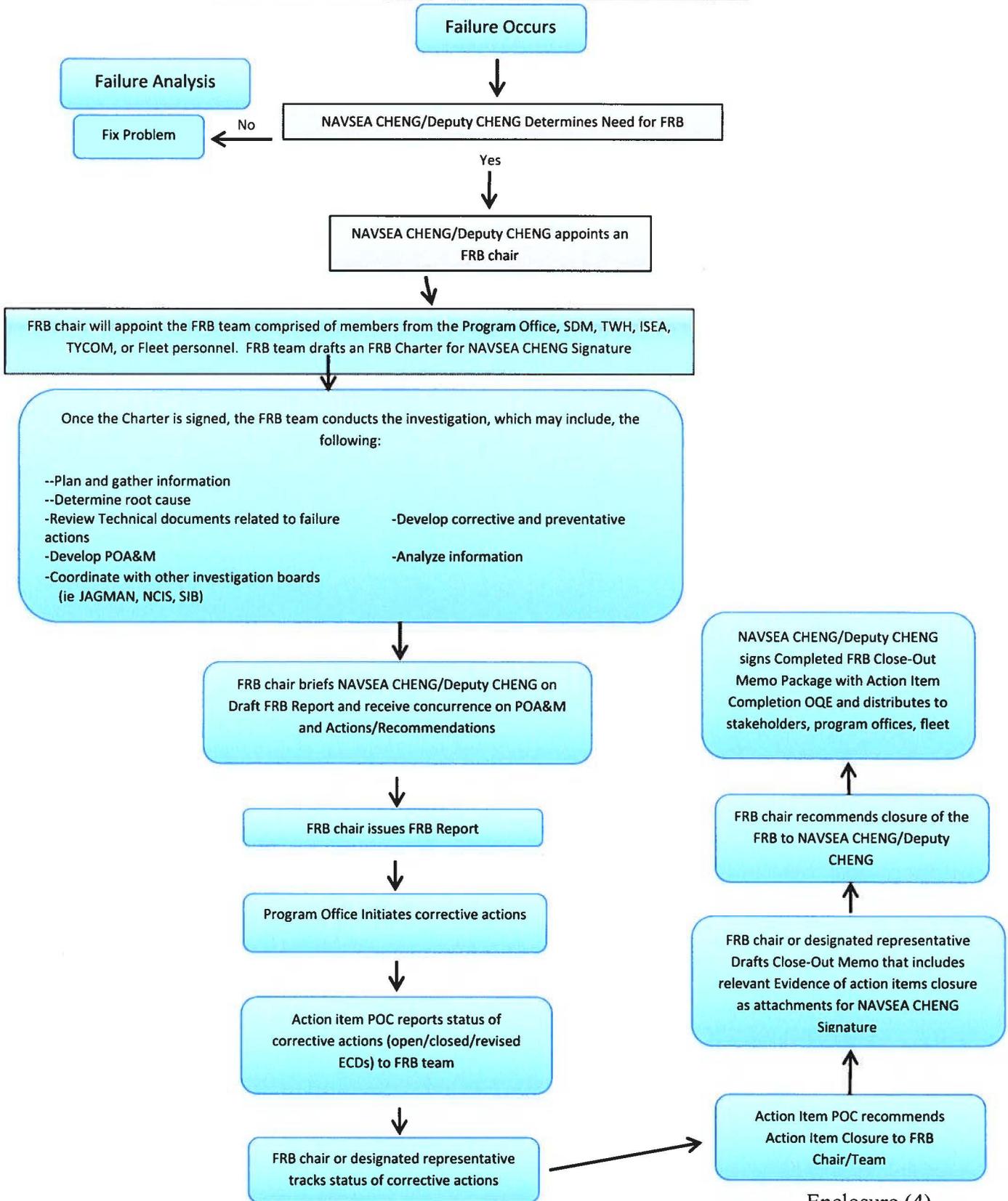
(AS ASSIGNED BY NAVSEA CHENG)

**Failure Investigation Team (FIT)**

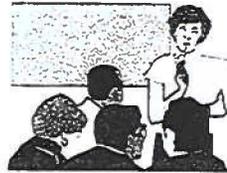
(AS ASSIGNED BY CHAIR)

(ENCLOSURE OF FRB LETTER)

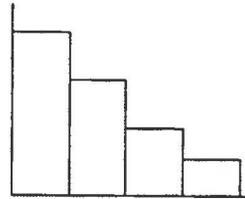
FAILURE REVIEW BOARD PROCESS FLOWCHART



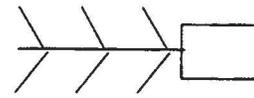
TOOLS USED IN ROOT CAUSE ANALYSIS



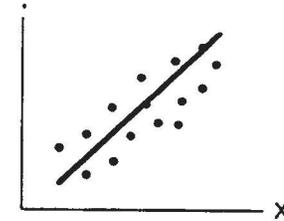
**BRAINSTORMING**



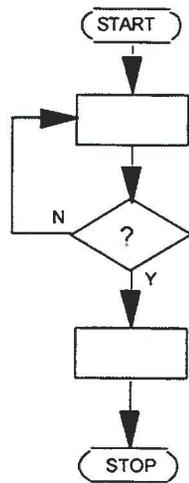
**PARETO CHART**



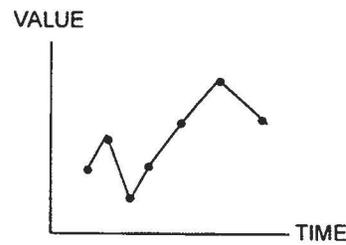
**FISHBONE DIAGRAM**



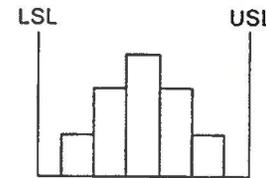
**SCATTER DIAGRAM**



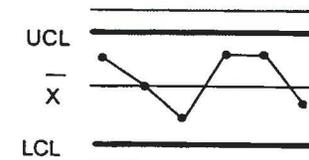
**FLOWCHART**



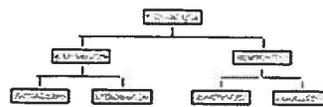
**RUN CHART**



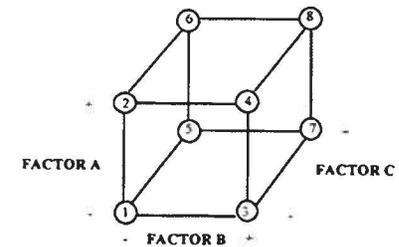
**HISTOGRAM**



**CONTROL CHARTS**



**TREE DIAGRAM**



**DESIGN OF EXPERIMENTS**

FAILURE REVIEW BOARD CLOSE-OUT MEMO – EXAMPLE

XXX  
Ser 05S/XXX

MEMORANDUM

From: Commander, Naval Sea Systems Command (SEA 05)

Subj: USS SHIP (CLASS #) FAILURE REVIEW BOARD (FRB) CLOSEOUT  
REPORT – FRB NAME

Encl: (1) List of FRB action items and Object Quality Evidence (OQE) of status

Ref: (a) NAVSEAINST 5100.21, Failure Review Board Policy, of date  
(b) NAVSEA 05 Ltr 9100 Ser XXXX Failure Review Board Report, of date

1. Purpose. Per reference (a), reference (b) executed a Failure Review Board (FRB) investigation into the failure of System on USS NAME CLASS ##. This memorandum documents the findings and the closure of all actions associated with reference (b).
2. Background. The FRB determined that the failure was \_\_\_\_\_. Multiple scenarios were investigated to determine the root cause which \_\_\_\_\_.
3. Discussion. Reference (b) documented ## actions that NAVSEA XXX has completed.
  - a. LIST ACTIONS AND RESULTS
4. Action. All actions required per reference (a) are complete and closed. No further actions associated with this FRB are merited.

SEA 05  
By direction

Copy

Chair Participant Codes  
PEO  
Program Office  
SHIP

NAVSEAINST 5100.21B  
4 Aug 2020

Ship Design Manager  
Action Codes  
SEA 05S

SAMPLE