| Rev. | ECO | Description | Author | Approved | Date |
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| - | N/A | Taken from LSE Specification QAP-F-601 | | | 09/28/90 |
| A | N/A | Initial Release | B. Klatt | | UNK |
| B | N/A | General Review | B. Klatt | | 03/09/06 |
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| G | 37-525 | Implement anomaly process | J. Montigny | RFGoeke | 01/03/17 |

# Massachusetts Institute of Technology

**Kavli Institute for Astrophysics and Space Research (MKI)**

## Nonconforming Material and Nonconforming Material Reports

**Dwg. No. 99-02004**
**Revision G**
November 23, 2016

## Preface

This document was taken from LSE Specification QAP-F-601 dated 09/28/90.

Revision A was the Initial Release written by Brian Klatt.

Revision B issued a General Review on 03/09/06.

Revision C issued a Corrected format and clerical errors on 09/17/13.

Revision D issued an updated format and general editorial update on 07/16/14.

Revision E issued to define major and minor non-conformances on 2/4/16.

Revision F issued a major rewrite update to describe the corrective action and preventative action policy and to revise all forms on 5/5/16.

Revision G issued an expansion of the process to include treatment of anomalies on 11/23/16.

## 1.0 Scope

This procedure describes the methods used to control, disposition, and address nonconforming product at MKI for flight projects and software/hardware. It also addresses anomaly observations. *Product* may collectively describe components, parts, materials, assemblies, or equipment. This process may also be applied to non-hardware problem issues. The procedure may be adjusted to accommodate sponsored project requirements.

## 2.0 Applicable Documents

| | |
|---|---|
| 99-03001 | Fabrication Documentation |
| 99-02004.01 | NONCONFORMING MATERIAL REPORT (Form) |
| 99-02004.02 | NONCONFORMING MATERIAL REPORT LOG (Form) |
| 99-02004.03 | SUPPLIER CORRECTIVE ACTION REQUEST (Form) |
| 99-02004.04 | ANOMALY REPORT (Form) |

## 3.0 Overview

Product is nonconforming if it does not meet requirements or specifications; is defective or damaged; or is otherwise unsuitable for flight use.

Nonconforming product is identified and controlled to prevent mixing with conforming product. The product is then dispositioned. Cause of the nonconforming product is reviewed and corrections are implemented to prevent further reoccurrence and other related occurrence.

Anomalies are observations or events that are cause for concern regarding flight systems. This may include unexpected, unplanned, failing, suspicious, or unsafe issues identified by engineering or management.

## 4.0 Responsibility

Incoming inspection or receiving personnel should initiate a Nonconforming Material Report (NMR) for issues related to nonconforming product identified upon receipt.

Operations personnel should initiate a NMR for issues related to nonconforming product identified during assembly or integration operations.

Quality Assurance (QA) or Engineering personnel should initiate a NMR for issues related to nonconforming product identified during inspection or test operations.

All MKI Management and Staff may initiate a NMR for an issue of concern. They may also submit an anomaly for review and place product or procedures on hold to ensure system safety.

## 5.0 Nonconformances

### 5.1 Containment Action

Containment Action is the initial, immediate action initiated to address a nonconformance. This action should provide an accurate, detailed description of the current issue and its effect. This realization is important to prevent immediate reoccurrence impacting similar product and for risk mitigation. Once contained, the product shall be identified, controlled, and dispositioned.

A NMR shall be completed to document nonconforming flight product and the follow-up actions. The use of the report form is described in Section 5.8.

## 5.2 Identification

Nonconforming product shall be clearly identified to communicate its current status; this may include a notice of hold or disposition. The product or its storage bin/location shall be physically tagged with a notice of nonconformance. The NMR Form shall remain with the product traveler and be included in the system end item data package.

## 5.3 Control

Nonconforming product shall be segregated from conforming product to avoid the use, integration, or shipment of the nonconforming product. Best practice is to place the nonconforming product in a controlled access area or cabinet. If sensitive or large products can't be safely moved, extra identification controls shall be implemented to prevent misidentification; this may include signs, covers, or tags. Personnel whose work may be affiliated with the product should be advised of the product status.

## 5.4 Disposition

Mission Assurance with concurrence from engineering or management directs the immediate containment of the product or issue. Containment efforts seek to resolve and mitigate risk. Additional analysis or review by the team will direct the disposition of the product per one of the following disposition actions:

**Minor Dispositions**

- **Rework to Specification:** Rework is action taken on a nonconforming product so it will fulfill the originally specified requirements without an adverse effect on safety, performance, interchangeability, reliability, or quality. Material that has been satisfactorily reworked is returned to the normal flow of operations after inspection and release by QA.
- **Return to the Vendor (RTV):** Nonconforming product that was sourced from a supplier may be dispositioned for product return. This is done when the discrepancy is evidently the suppliers responsibility and MKI rework, scrap, or Material Review Board (MRB) action are not recommended. A supplier corrective action request is typically submitted along with the return.
- **Scrap:** Nonconforming product is discarded if the product is unusable or not recoverable for flight use. The product shall be directly, permanently marked for identification of scrap status and segregated from other product. If there are extended concerns for mixing or misuse, the product should be destroyed.

**Major Dispositions**

Nonconforming product not dispositioned as a minor nonconformance shall be dispositioned per a MRB. If there is a question or disagreement regarding disposition of any product, it is referred to the MRB. The following disposition actions may only be authorized by the MRB:

- **Repair:** Action taken on a nonconforming product so it will fulfill the intended usage requirements, although it may not conform to the originally specified requirements. Material that has been satisfactorily repaired is returned to the normal or a designated special flow of operations after inspection and release by QA.
- **Use-as-is:** The nonconforming product is released for flight use without further action.

**MRB Process**

- The MKI Material Review Board consists of the Mission Assurance Manager, the appropriate Design or Test Engineer, and the System Engineer, as a minimum. This board may be augmented with knowledgeable individuals who are intimately involved with a specific discrepancy. The Ground Support Equipment Engineer, Government Representative, Project Engineer, Project Manager, and Manufacturing Manager are examples of such augmentation. Dispositions of Major Nonconformances usually require sponsor participation.
- The decisions of the MRB shall be unanimous or the matter will be referred to the sponsoring Project Office for adjudication. The MRB may disposition product with any of the five disposition decisions. The decisions of the MRB shall be documented in the nonconforming material report and include supporting data as appropriate.

## 5.5 Root Cause Analysis / Corrective Action (RCCA)

Corrective Action is the process taken to address the root cause of a nonconformance so it does not reoccur.

**Typical RCCA Steps:**

1. Collect the appropriate team to address the problem
2. Identify and describe the problem
3. Implement additional containment actions as needed
4. Utilize cause analysis tools to identify the root cause
5. Determine corrections and analyze effectiveness
6. Implement and validate the selected corrections
7. Expand the corrective actions to similar product

## 5.6 Preventative Action

Preventative Action is the process taken to avoid an identified potential risk. Preventative Action is performed and documented on a project basis; it is not documented with the NMR Form.

**Typical Preventative Actions:**

1. Identification of potential risks with tools such as a Failure Mode and Effect Analysis, Fault Detection and Correction Plans, or Project Risk Lists.
2. Collection of data to determine occurrence probability, opportunity for detection, and severity of risk impact.
3. Mitigation of risks:
    a. Avoidance
    b. Acceptance
    c. Transfer
4. Document the improvement actions and review effectiveness. This may be captured within the related risk analysis/plan/list documents.

## 5.7 Documentation

Table 8-1 details the requirements for nonconformance report distribution.

The NMR/MRB File is the formal record for the NMR Forms; they are maintained by Mission Assurance.

The NMR for incoming product (other than Scrap and RTV) is kept with the product in bonded stores. When the product is kitted, the NMR is kept with the Assembly Work Order (AWO).

The NMR for product in assembly/integration/test (other than Scrap and RTV) is kept with the AWO.

**Table 5-1: Nonconformance Report Distribution Requirements**

| NMR Disposition | To Supplier | In NMR/MRB File | With AWO | With Bonded Stock |
|---|---|---|---|---|
| **RTV** | X | X | | |
| **Scrap** | | X | | |
| **Rework** | | X | X | X |
| **Repair** | | X | X | X |
| **Use As Is** | | X | X | |

## 5.8 Nonconforming Material Report Instructions

The following details the entries for blocks 1 through 37 on the Nonconforming Material Report, see Figure 5-1; enter 'N/A' if data is not applicable/available:

**Table 5-2: Nonconforming Material Report Instructions**

| Block# | Data Item | Form Entry Detail | Responsible Function |
|---|---|---|---|
| 1, 2 | Originator & Date | Name of the NMR initiator; date of report initiation | ORIGINATOR |
| 3 | Project | Project name from the AWO or the Purchase Order Number | ORIGINATOR |
| 4 | NMR# | Record NMR record number obtained from the NMR Log | ORIGINATOR |
| 5 | Description | Product title or name | ORIGINATOR |
| 6, 7 | P/N & Rev | Product part number and revision | ORIGINATOR |
| 8, 9 | *(Quality Assurance)* Name & Date | QA representative signs/dates to acknowledge initiation of NMR | QA |
| *10-17* | *PROCUREMENT DETAIL* | *ENTER DATA IN THIS SECTION IF THE ISSUE IS RELATED TO INCOMING PRODUCT.* | *ORIGINATOR* |
| 10 | Supplier | Supplier name, as noted on the PO | ORIGINATOR |
| 11 | PO# | Purchase Order number | ORIGINATOR |
| 12 | Contact | Name of person who ordered the product | ORIGINATOR |
| 13 | L/N | Product source lot/batch number | ORIGINATOR |
| 14 | S/N | Product serial number | ORIGINATOR |
| 15 | #RECD | Product quantity received from the supplier | ORIGINATOR |
| 16 | #ACC | Product quantity accepted at the initial lot inspection | ORIGINATOR |
| 17 | #REJ | Product quantity rejected at the initial lot inspection | ORIGINATOR |
| 18 | ITEM# | Designate an item number or list S/N for each discrepancy | ORIGINATOR |
| 19 | QTY | Product quantity applicable to each discrepancy | ORIGINATOR |
| 20 | DESCRIPTION | Short informal note describing the product | ORIGINATOR |
| 21 | NONCONFORMANCE | Summarized nonconformance description; quote requirements and specifications | ORIGINATOR |
| 22 | DISPOSITION | Disposition action per discrepancy; use the noted titles; REPAIR and USE AS IS are only permitted by MRB approval | ENGINEERING |
| 23 | N/A | Check this box if an MRB review was not called | ENGINEERING |
| 24, 25 | APPROVAL & DATE | MRB members sign and date to indicate approval of the disposition noted in the previous section; clarify membership titles in the GROUP field | MRB CHAIR |
| 26 | ITEM# | The item number as is in the FAILURE/DISPOSITION DETAIL | ENGINEERING |
| 27 | ROOT CAUSE | Root Cause identified per procedure Section 5.5 | ENGINEERING |
| 28 | CORRECTIVE ACTION | Corrections identified per procedure Section 5.5; may also list verification of the corrective action as needed | ENGINEERING |
| 29, 30 | Name, Date | Signature/Date of approver of the Operation Instructions | ENGINEERING |
| 31 | OP# | Line number for correction actions: 1, 2, 3… | ENGINEERING |
| 32 | OPERATION INSTRUCTIONS | Rework/Repair/Inspection instructions per ENG/MRB | ENGINEERING |
| 33, 34 | TECH & DATE | Initial/Date of individual performing the operation | OPERATIONS |
| 35 | INSP | Initial/Stamp of QA approval of the operation | QA |
| 36, 37 | Name, Date | Signature/Stamp & Date of QA approval of actions/documentation completion and NMR closure. | QA |

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**NONCONFORMING MATERIAL REPORT**

| Originator: | 1 | Date: | 2 | Project: | 3 | NMR#: | 4 |
|---|---|---|---|---|---|---|---|

| PRODUCT DETAIL | | | | QUALITY ASSURANCE | | | |
|---|---|---|---|---|---|---|---|
| Description: | 5 | P/N: | 6 | Rev.: | 7 | Name: 8 | Date: 9 |

**PROCUREMENT DETAIL**

| Supplier: | 10 | PO#: | 11 | Contact: | 12 | | |
|---|---|---|---|---|---|---|---|
| L/N: | 13 | S/N: | 14 | #RECD: | 15 | #ACC: 16 | #REJ: 17 |

**FAILURE/DISPOSITION DETAIL**

| ITEM# | QTY | DESCRIPTION | NONCONFORMANCE | DISPOSITION |
|---|---|---|---|---|
| 18 | 19 | 20 | 21 | 22 |
| | | | | |
| | | | | |
| | | | | |

*Disposition categories: Rework, RTV, Scrap, *Repair, *Use As Is*

| MRB DETAIL | | N/A 23 |
|---|---|---|
| GROUP | APPROVAL | DATE |
| Quality Assurance | 24 | 25 |
| Engineering: | | |
| Engineering: | | |
| Other: | | |

**CAUSE/CORRECTION DETAIL**

| ITEM# | ROOT CAUSE | CORRECTIVE ACTION |
|---|---|---|
| 26 | 27 | 28 |
| | | |
| | | |
| | | |

**REWORK/REPAIR DETAIL**

| Eng. Preapproval | Name: 29 | Date: 30 |
|---|---|---|

| OP# | OPERATION INSTRUCTIONS | TECH | DATE | INSP |
|---|---|---|---|---|
| 31 | 32 | 33 | 34 | 35 |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**QA APPROVAL/CLOSURE**

| Name: | 36 | Date: | 37 |
|---|---|---|---|

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**FIGURE 5-1: Annotated Nonconforming Material Report**

## 6.0 Anomalies – As required by program sponsors

### 6.1 Identification

Anomalies are unexpected or unintended events during acceptance testing, system calibration or flight operations of flight hardware.

### 6.2 Notification

Notify the Instrument Program Manager and Instrument Mission Assurance Manager immediately upon initial anomaly detection and for change of status. Use the project contact list. Notify the role delegates if the primary contact is not available.

### 6.3 Reporting

**Minor anomaly events are:**

- those which have caused no damage or potential damage to flight hardware nor require a change to flight software.
- reported to the Instrument Anomaly Review Board:
    - Instrument Program Manager
    - Instrument Mission Assurance Manager
    - Instrument Systems Engineer
    - Instrument Science
    - Instrument Other Engineering (Elec/Mech/I&T)
- documented on the traveler/procedure record or a Non-conforming Material Report.

**Major anomaly events are:**

- those which have resulted in test failures and damage or potential damage to flight hardware.
- reported to the Instrument Anomaly Review Board and to the Program Sponsor:
    - Instrument Program Manager
    - Instrument Mission Assurance Manager
    - Instrument Systems Engineer
    - Instrument Other Engineering (Elec/Mech/I&T)
    - Instrument Science
    - Sponsor/Project Manager
    - Sponsor/Project Mission Assurance Manager
    - Sponsor/Project Systems Manager
- documented on the Anomaly Report form.

For Major Anomalies, deliver the Anomaly Report to the sponsoring Project Office within 24 hours of initial detection or change of status; deliver the proposed closure to the Project Office for approval review.

### 6.4 Risk ratings

The numerical ratings for failure effect risk and corrective action risk per the following criteria:

**Failure Effect Risk Rating** – indicates the potential impact of the anomaly on hardware or software performance if it occurred during the mission. Redundancy shall be ignored in establishing this rating. The project shall assign a failure effect risk rating per the following criteria and corresponding numerical values:

1. Negligible or no effect on mission, system or instrument performance, reliability or safety.
2. Moderate or significant effect on the mission, system or instrument performance, reliability or safety, defined as: an appreciable change in functional capability, an appreciable degradation of engineering or science telemetry, causing significant operational difficulties or constraints, or causing a reduction in mission lifetime.
3. Catastrophic or major degradation to mission, system or instrument performance, reliability or safety.

**Corrective Action Rating** – indicates the confidence in the root cause and the corrective action. The project shall assign a failure corrective action risk rating per the following criteria:

1. Recurrence very unlikely – the root cause of the anomaly has been determined with confidence by analysis or test. Corrective action has been determined, implemented, and verified with certainty. There is a very low probability of recurrence.
2. Recurrence unlikely – the root cause of the anomaly has not been determined with confidence. However, some corrective action has been determined, implemented, and verified to the extent that there is a very low probability of recurrence.
3. Recurrence possible – the root cause is considered known and understood with confidence. Corrective action has not been determined, implemented, or verified with certainty. There exists a possibility that the anomaly may recur.
4. Recurrence credible – the root cause has not been determined with confidence. Corrective action has not been determined, implemented, or verified with certainty. There exists a possibility that the anomaly may recur.

## 6.5 Handling

**Minor anomaly event:**
When an anomaly is detected, the test or operations director shall be notified; they will direct the treatment of the system and resolution of the event; they will ensure that the event is recorded appropriately.

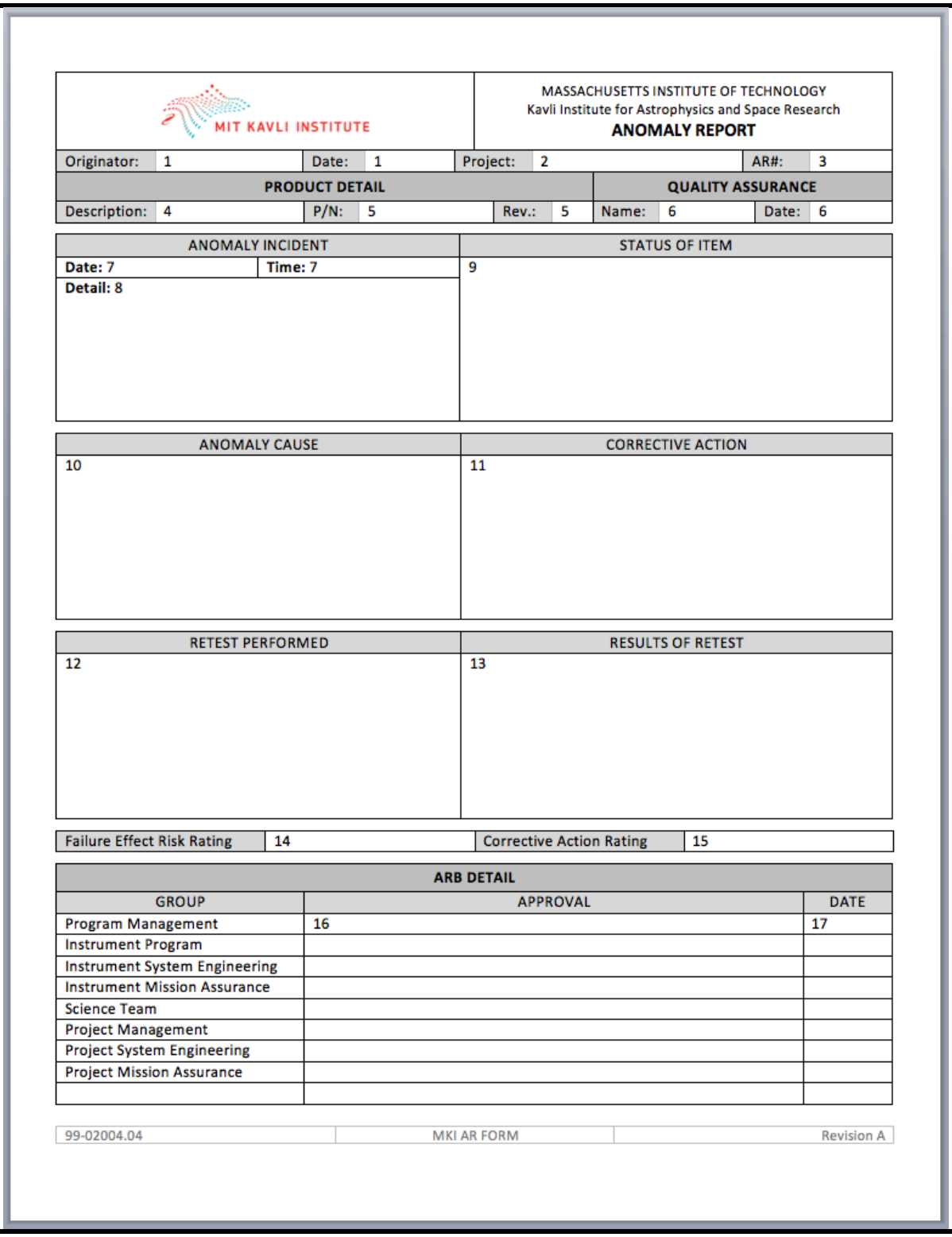
**Major anomaly event:**
When an anomaly is detected, the active procedure shall be placed on hold and the system set in a safe state. The system shall be segregated and identified as on-hold as directed by the local Mission Assurance representative. Special handling considerations include cleanroom and environmental requirements and electrostatic discharge precautions.

## 6.6 Anomaly Report Instructions

The following details the entries for blocks 1 through 17 on the Anomaly Report, see Figure 6-1; enter 'N/A' if data is not applicable/available:

**Table 6-1: Anomaly Report Instructions**

| Block# | Data Item | Form Entry Detail | Responsible Function |
|---|---|---|---|
| 1 | Originator & Date | Name of the AR initiator; date of report initiation | ORIGINATOR |
| 2 | Project | Project name from the AWO or the Purchase Order Number | ORIGINATOR |
| 3 | AR# | Anomaly Report record number obtained from the AR Log | ORIGINATOR |
| 4 | Description | Product title or name | ORIGINATOR |
| 5 | P/N & Rev | Product part number and revision | ORIGINATOR |
| 6 | (Quality Assurance) Name & Date | QA representative name & date to acknowledge initiation of AR | QA |
| 7 | INCIDENT DATE & TIME | Calendar date and the time of the anomaly event. | ORIGINATOR |
| 8 | INCIDENT DETAIL | What was observed or what occurred to the system. Describe the environment or the operation details. | ORIGINATOR |
| 9 | STATUS OF ITEM | Condition of the product after the anomaly. | ORIGINATOR |
| 10 | ANOMALY CAUSE | The root cause for the anomaly event. | ENGINEERING |
| 11 | CORRECTIVE ACTION | The actions taken to resolve the root cause to prevent reoccurrence. | ENGINEERING |
| 12 | RETEST PERFORMED | Evaluations performed to validate acceptability of the product. | ENGINEERING |
| 13 | RESULTS OF RETEST | Results of the evaluations. | ENGINEERING |
| 14 | FAILURE EFFECT RISK RATING | Potential risk of impact per section 6.4 | ENGINEERING |
| 15 | CORRECTIVE ACTION RATING | Potential risk of reoccurrence per section 6.4 | ENGINEERING |
| 16 | APPROVAL | Name of personnel agreeing to closure of the anomaly. | ARB |
| 17 | DATE | Date of closure approval. | ARB |



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**ANOMALY REPORT**

| Originator: 1 | Date: 1 | Project: 2 | AR#: 3 |
|---|---|---|---|

| PRODUCT DETAIL | | | QUALITY ASSURANCE | |
|---|---|---|---|---|
| Description: 4 | P/N: 5 | Rev.: 5 | Name: 6 | Date: 6 |

| ANOMALY INCIDENT | | STATUS OF ITEM |
|---|---|---|
| **Date:** 7 | **Time:** 7 | 9 |
| **Detail:** 8 | | |

| ANOMALY CAUSE | CORRECTIVE ACTION |
|---|---|
| 10 | 11 |

| RETEST PERFORMED | RESULTS OF RETEST |
|---|---|
| 12 | 13 |

| Failure Effect Risk Rating | 14 | Corrective Action Rating | 15 |
|---|---|---|---|

| ARB DETAIL | | |
|---|---|---|
| GROUP | APPROVAL | DATE |
| Program Management | 16 | 17 |
| Instrument Program | | |
| Instrument System Engineering | | |
| Instrument Mission Assurance | | |
| Science Team | | |
| Project Management | | |
| Project System Engineering | | |
| Project Mission Assurance | | |
| | | |

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**Figure 6-1: Annotated Anomaly Report**

## 7.0 Acronyms

| | |
|---|---|
| MKI | Kavli Institute for Astrophysics and Space Research |
| NMR | Nonconforming Material Report |
| QA | Quality Assurance |
| RTV | Return to the Vendor |
| MRB | Material Review Board |
| AWO | Assembly Work Order |
| RCCA | Root Cause / Corrective Action |
| AR | Anomaly Report |
| NASA GSFC | National Aeronautics and Space Administration<br>Goddard Space Flight Center |