

**MWI 8715.17**

**REVISION E**

**EFFECTIVE DATE: October 30, 2020**

**EXPIRATION DATE: October 30, 2025**

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# **MARSHALL WORK INSTRUCTION**

## **QD01**

# **HAZARDOUS OPERATIONS READINESS REVIEW PROGRAM**

**COMPLIANCE IS MANDATORY**

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### DOCUMENT HISTORY LOG

| Status<br>(Baseline/<br>Revision/<br>Change/<br>Revalidation/<br>Canceled) | Document<br>Revision/<br>Change | Effective<br>Date | Description  |
|--|---------------------------------|-------------------|--|
| Baseline   |                                 | 9/11/2009         |  |
| Revision   | A                               | 11/22/2010        | Added a 5th risk level for very low risk. Changed names of the risk levels to line up with the risk level listed in the RAC and MWI 8715.15. Reworded several definitions to match MWI 8715.15. General wording changes throughout the MWI.  |
| Revision   | B                               | 9/7/2012          | Total rewrite. Revised per 2011 management review. Rearranged some sections so that the flow is easier to follow and the requirement is clearer. Deleted responsibilities sections. Changed Chapters to Appendices. Reformatted per MPR 1410.2 & MWI 1410.1 latest revisions.  |
| Revision   | C                               | 8/8/2013          | The update makes the MWI more generic so that it is applicable to both MSFC and MAF. Where applicable replaced "MSFC and MAF" with "Center" so the instruction is more generic and can be easily applicable to both locations. Where applicable replaced Center specific organization names (ISB, EEOH and, FMO) with the generic terms "Center Safety Office, Center Occupational Health Office, Center Environmental Engineering Office, and Center Facilities Management Office" so the instructions can be easily applicable to both locations. Used MSFC or MAF if the instruction is applicable to only one location. Added definitions in Appendix A for "Center Safety Office, Center Occupational Health Office, Center Environmental Engineering Office, Center Facilities Management Office, and Center Quality Assurance Office" and identified which org at each location (MSFC or MAF) performs the instruction. |
| Change   | 1                               | 1/8/2014          | On 1/8/14, an Administrative Change was made at the request of the OPRD to update the definitions for high, moderate, low and minimum risk, remove references to the IHOPS database and startup notification.  |
| Revision   | D                               | 7/29/2015         | S&MA to SMA, Remove assurance from quality. Removed reference to MSFC's Inside Marshall in Startup Notification definition. Changed some NOTES to paragraph numbers. General word changes in several sections to clarify difference between readiness review types. Removed reference to Readiness Review Committees (RRC). Changed some NOTES to paragraph numbers.   |
| Change   | 1                               | 3/21/2016         | On 3/21/16, at the request of the OPRD, administrative changes were made to format NOTES and change OSHA titles.   |
| Change   | 2                               | 3/16/2017         | On 3/16/17, at the request of the OPRD, administrative changes were made to update Appendix D Records, references to InsideMarshall SharePoint site, and NOTE 5.2.2 and definition.  |
| Revision   | E                               | 10/30/2020        | Editorial changes through the document for clarity. Removed page numbers from Table of Contents per NPR 1400.1, 3.5.1a. (1) and quotation marks from around document titles per NPR 1400.1 P.3 and P.4.  |

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## **1. PURPOSE**

To provide instructions for performing a systematic review of facilities/operations identified to have a high, moderate, low, and minimal level of risk to assure their mission readiness as required by NPD 8700.1.

## **2. APPLICABILITY**

2.1 This MWI applies to Center personnel, programs, projects, and facilities/operations, including contractors and resident agencies to the extent specified in their respective contracts or agreements. (“Contractors,” for purposes of this paragraph, include contractors, grantees, Cooperative Agreement recipients, Space Act Agreement partners, or other agreement parties.)

2.2 This MWI applies to the Michoud Assembly Facility (MAF).

2.3 This MWI applies as follows: all mandatory actions (i.e., requirements) are denoted by statements containing the term “shall.” The terms: “may” or “can” denote discretionary privilege or permission; “should” denotes a good practice and is recommended, but not required; “will” denotes expected outcome; and “are/is” denotes descriptive material.

2.4 This MWI applies the following: all document citations are assumed to be the latest version unless otherwise noted.

## **3. AUTHORITY**

NPD 8700.1, NASA Policy for Safety and Mission Success

## **4. APPLICABLE DOCUMENTS AND FORMS**

4.1 Basic Program Elements for Federal Employees Occupational Safety and Health Administration (OSHA), 29 Code of Federal Regulations (CFR) pt 1960

4.2 NPD 1800.2, NASA Occupational Health Program

4.3 NPD 8500.1, NASA Environmental Management

4.4 NPR 1800.1, NASA Occupational Health Program Procedures

4.5 NPR 8621.1, NASA Procedural Requirements for Mishap and Close Call Reporting, Investigating, and Recordkeeping

4.6 NPR 8715.1, NASA Occupational Safety and Health Programs

4.7 NPR 8715.3, NASA General Safety Program Requirements

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4.8 NPR 8831.2, Facilities Maintenance and Operations Management

4.9 MPR 7123.1, MSFC Systems Engineering Processes and Requirements

4.10 MPR 8710.1, MSFC Requirements for Ground-Based Pressure Vessels and Pressurized Systems (PVS)

4.11 MPR 8715.1, Marshall Safety, Health and Environmental (SHE) Program

4.12 MWI 8715.15, Ground Operations Safety Assessment Program

4.13 NRRS 1441.1, NASA Records Retention Schedules

4.14 MSFC Form 3739, Review Item Discrepancy

## **5. INSTRUCTIONS**

### **5.1 General**

5.1.1 A readiness review of the appropriate level [Operational Readiness Inspection (ORI), Safety Review Team (SRT), Operational Readiness Review (ORR), Test Readiness Review (TRR), or an informal review] shall be performed prior to the startup/restart of facilities/operations.

5.1.2 The readiness review shall ensure all hazardous or unsafe/unhealthy conditions and risks, directly associated with the facility/operation, are identified and eliminated, reduced, or controlled to a safe/healthful working level. (See MWI 8715.15 for more information.)

### **5.2 Notification to Begin a Readiness Review**

5.2.1 Organizations, expected to provide support for a readiness review, shall receive sufficient notification from the facility/operation owner of the projected startup/restart of a facility/operation.

5.2.2 The Center's Safety Office may be alerted of projected startup/restart of facilities/operations by a variety of methods including, but not limited to, the following: Facility Utilization Review Committee, Test Project Kick-Off Meetings, Program Planning, Budget Evaluation Planning, or entry of a new facility/operation into the Center's inventory of operations.

*NOTE 1: At MSFC, the Operations Tracking System (OpsTrak) is used for the inventory of operations identified to have an increased level of risk (high, moderate and low) to cause/contribute to an accident, injury, illness, or damage to property or environment due to the nature of the work being performed. OpsTrak is maintained on MSFC's "Inside Marshall," select "Organizational Websites," locate "Safety and Mission Assurance*

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*Directorate,” select “Safety, Health and Environmental,” select “Safety Information,” select “Safety Assessments,” and select “OpsTrak.”*

*NOTE 2: MSFC’s “Inside Marshall” is located on NASA’s SharePoint page.*

5.2.2.1 Notification to the Center’s Safety Office shall be provided by the facility/operation owner far enough in advance of the projected startup/restart of a facility/operation to allow the Center’s Safety Office to plan accordingly if they are expected to be involved in supporting the development of a Hazard Analysis (HA) and readiness review of a projected startup/restart of a facility/operation.

5.2.2.2 Safety & Mission Assurance (SMA) support for the readiness reviews is typically provided by the Center’s Safety Office and the Center’s Quality Office.

*NOTE: See Appendix A of this MPR for the organizations that serve in the roles of the Center’s Safety Office and Center’s Quality Office at MSFC and MAF.*

5.2.3 The preliminary notification shall include basic information such as name and location of the facility/operation, a Point of Contact (POC) and organization code, and the projected startup/restart date.

5.2.3.1 Additional detailed information shall be provided by the facility/operation owner as it becomes available.

5.2.4 Appendix F of this MWI may be used to identify any issues that need to be worked and resolved prior to declaring the facility/operation ready to schedule and perform a readiness review.

5.2.4.1 The facility/operation owner should identify the issues to be worked and resolved in preparation for a readiness review.

### 5.3 Level of Readiness Review

5.3.1 The facility/operation owner, with concurrence from SMA, shall identify the appropriate level of readiness review (ORI, SRT, ORR and TRR) for the facility/operation and the appropriate level of management (Approving Authority) to approve the startup/restart of the facility/operation.

5.3.2 The level of readiness review performed is generally determined by the overall level of risk classification identified for the facility/operation to ensure the appropriate level of management approves the startup/restart of the facility/operation.

5.3.3 The level of readiness review may be determined by one the following:

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5.3.3.1 Agreement between the facility/operation owner’s Directorate/Office Executive or designee and the Center’s Director of SMA or designee based on their knowledge of the proposed facility/operation. This agreement is typically for facilities/operations identified to have an overall level of risk classification of high or moderate.

5.3.3.2 The overall level of risk classification (high, moderate, low or minimal) is assigned to the facility/operation when it is entered into the Center’s inventory of operations. (See Appendix E Table 2 of this MWI for more information.)

*NOTE: At MSFC, the overall level of risk selected for a facility/building may be maintained in ePort. Access to ePort is requested through the NASA Application Management System (NAMS).*

5.3.3.3 The highest initial or residual (final) Risk Assessment Code (RAC) classification listed in the HA for the facility/operation.

*NOTE: See Appendix P of the MWI for more information.*

#### 5.4 Level of Management Approval

5.4.1 Management approval shall be obtained prior to the actual startup/restart of a facility/operation and is obtained from the appropriate level of management based on the overall level of risk classification assigned to the facility/operation. (See Appendix E Table 2 of this MWI for more information.)

5.4.1.1 High risk facility/operations shall be considered as “Highly Undesirable” and require approval from the MSFC Engineering Management Council (EMC).

*NOTE: The MSFC EMC serves as the Approving Authority for the Center Director to accept and document the approval to startup/restart high risk facilities/operations. (See Appendix M of this MWI.)*

5.4.1.2 Moderate risk facility/operations shall be considered as “Undesirable” and require approval from the facility/operation owner’s Department/Laboratory/Manager or designee. (See Appendix M of this MWI.)

5.4.1.3 Low risk facility/operations shall be considered as “Acceptable” and require approval from the supervisor directly responsible for the facility/operation. (See Appendix N of this MWI.)

5.4.1.4 Minimal risk facility/operations shall be considered as “Acceptable” and do not require a documented approval from the facility/operation’s supervisor.

5.4.2 All levels of management shall have the option of electing to elevate the approval and acceptance of residual risk identified during the readiness review to the next higher level of

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management when they determine the level of risk is higher than their approval authority, if necessary. (See NPD 8700.1 and NPR 8715.3 chapters for Risk Assessment and Risk Acceptance, and System Safety for more information.)

*NOTE: See Appendix P of the MWI for more information.*

## 5.5 Forming a Readiness Review

5.5.1 A readiness review shall be formed by the following:

5.5.1.1 Select an Approving Authority.

a. The Approving Authority is the level of management that the readiness review presents its findings and recommendations. The Approving Authority for facilities/operations designated with a high or moderate level of risk is identified by the facility/operation owner's Directorate/Office Executive or designee with concurrence from the Center's Director of SMA or designee. (See Appendix E, Table 2 of this MWI for more information.)

b. The Approving Authority for facilities/operations assigned with a low level of risk may be the Branch Chief or designee.

c. The Approving Authority may also serve in role of the Appointing Official with concurrence from the Center's Director of SMA or designee.

5.5.1.2 Select an Appointing Official.

a. The Appointing Official shall be selected by the Approving Authority when the Approving Authority is not also severing as the Appointing Official.

b. The Appointing Official shall identify the scope of the readiness review.

c. The facility/operation owner and Center's Safety Office may coordinate the expansion of the scope of the review with the Appointing Official as necessary to ensure that a thorough readiness review of the facility/operation is performed.

5.5.1.3 Select a readiness review Chairperson.

a. The readiness review Chairperson shall be selected by the Appointing Official.

c. Concurrence with the selection of the readiness review Chairperson and members shall be obtained from both the Center's Director of SMA or designee and Appointing Official.

5.5.1.4 Select the readiness review members.

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a. The readiness review members shall be selected by the readiness review Chairperson and Appointing Official.

5.5.2 A readiness review Appointment Letter identifying the readiness review membership shall be initiated by the readiness review Chairperson after obtaining concurrence from the Appointing Official.

5.5.2.1 Readiness reviews for facilities/operations assigned a low level of risk do not require an official readiness review Appointment Letter, unless determined necessary by the Appointing Official.

5.5.3 An evaluation shall be performed prior to selecting readiness review members to ensure that they have the appropriate technical expertise and degree of independence necessary for the level of risk assigned to the facility/operation (e.g., the higher the level of risk, the greater the degree of independence required).

5.5.3.1 If a selected readiness review member that has the appropriate technical expertise, but does not have the necessary degree of independence, the readiness review Chairperson and Directorate/Office Executive or designee of the facility/operation shall provide rationale to the Appointing Official for the selection of the appointee to participate in the readiness review.

5.5.4 The readiness review Chairperson and members shall perform the functions listed in Appendix G and P of this MWI in support of the readiness review.

5.5.5 The readiness review shall be performed within the timelines identified in the readiness review Appointment Letter and continue to function until the facility/operation is approved for startup/restart or the readiness review members have been released by the Appointing Official. (See Appendix O of this MWI for more information.)

5.5.5.1 The Appointing Official and readiness review Chairperson shall determine the timeline for the readiness review.

## 5.6 Types of Readiness Reviews

*NOTE: Jointly performed readiness reviews are coordinated during the establishment of the review and selection of review committee/team/board personnel.*

5.6.1 A ORI is typically performed for facilities/operations assigned a “high level of risk” to cause the occurrence of an undesired event and when performed shall:

5.6.1.1 Be chaired by a NASA employee.

5.6.1.2 Consist of a Chairperson and members that are independent from the facility/operation being reviewed. (See Appendix H of this MWI for more information.)

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5.6.1.3 Include the areas/activities listed in Appendix J of the MWI in the review, as necessary.

5.6.1.4 Be performed for flight programs/projects and may be warranted by operations to be performed at the Center.

5.6.2 A SRT is typically performed for facilities/operations assigned a “moderate level of risk” to cause the occurrence of an undesired event and when performed shall:

5.6.2.1 Be chaired by a NASA employee unless agreed to by the Appointing Official and the facility/operation owner Directorate/Office Executive or designee that it may be chaired by a non-NASA employee.

5.6.2.2 Consist of a Chairperson and members that have the necessary level of independence from the facility/operation being reviewed. (See Appendix H of this MWI for more information.)

5.6.2.3 Include the areas/activities listed in Appendix J of the MWI in the review, as necessary.

*NOTE: A SRT may also be performed for moderate visibility or moderate value projects, facilities, or operations based on their complexity, structure, purpose and function or its potential effect on surrounding facilities/operations and environment, if determined necessary by the facility/operation owner’s management and Center’s Safety Office.*

5.6.3 A ORR is typically performed for facilities/operations assigned a “low level of risk” to cause the occurrence of an undesired event and when performed shall:

*NOTE: MPR 7123.1 defines the purpose and criteria for the ORR, and it is not to be confused with the ORR definition contained in this document for facilities/operations. The program/project may elect to perform their ORR in conjunction with the facility/operation ORI/SRT/ORR.*

5.6.3.1 Consist of the supervisor directly responsible for the facility/operation or a team formed by the supervisor with members that are knowledgeable of the hazards and risks associated with the facility/operation being reviewed. (See Appendix H of this MWI for more information.)

5.6.3.2 Include the areas/activities listed in Appendix J of the MWI in the review, as necessary.

5.6.3.3 An informal level of readiness review may be performed depending on the complexity of the facility/operation and the potential effect that it has on personnel, surrounding facilities/operations and environment.

*NOTE: An informal level of readiness review may also serve as a readiness review for an operation, equipment and systems similar to that performed by a TRR in section 5.6.4 for test activities. This level of review is intended to ensure that the facility/operation, equipment or system is safe to operate and is not intended to be a review of a test article. This level of*

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*review may be combined with a TRR, if agreed to by the facility/operation owner and Center's Safety Office.*

5.6.4 A TRR is typically performed before starting any “hazardous test identified with a high or moderate level of risk, or low level of risk if the hazards are not routine,” but may also be required if determined necessary by the management directly responsible for the test article and facility, unless recommended by an ORI, SRT, or Center’s Safety Office based on the overall degree of potential hazards and risk to employees and potential damage to the facility, equipment, or test article and when performed shall:

5.6.4.1 Be performed to determine the readiness for the intended test, to grant authorization to proceed with the test, and is the formal readiness review before the actual test is performed.

5.6.4.2 Consist of the members determined by the testing organization. (See Appendix H of this MWI for more information.)

5.6.4.3 Include the areas/activities listed in Appendix K of this MWI in the review, as necessary.

5.6.4.4 Be performed for flight programs/projects and may be warranted by operations to be performed at the Center.

*NOTE: MPR 7123.1 defines the purpose and criteria for the TRR. The program/project may, and typically does, elect to perform their TRR in conjunction with the facility/operation TRR. A TRR is not typically required for tests which consist of routine hazardous operations for which the hazards have been mitigated to the low or minimal level of risk through existing operating procedures that have been approved by the test organization and Center's Safety Office.*

5.6.5 An informal review can be performed for facility/operations that are similar to previous pre-start-up reviews that have already undergone a higher-level readiness review and propose no additional risks. The decision to perform an informal review shall be approved by the same authority(s) that approved its previous higher-level readiness review and documented in accordance with NRRS 8, Program/Project Records.

5.6.5.1 An informal level of review is intended to alert employees of the hazardous conditions that may be encountered, the cautions that need to be taken, and to discuss each employee’s specific role and responsibility in performing the operation. The informal pre-startup review is a lower-level review than an ORR or TRR, and requires no formal documentation, only approval by the supervisor that the facility/operation can be operated safely. This approval may be accomplished by the supervisor performing and documenting safety inspections and visits to the area and determining the facility/operation can be operated in an acceptable safe manner.

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## 5.7 Performing a Readiness Review

5.7.1 An Appointment Letter shall be signed by the Appointing Official before a readiness review officially begins. (See section 5.5.2 of this MWI for more information.)

5.7.2 The facility/operation shall not be authorized for startup/restart until the readiness review has been completed.

5.7.3 A walk-down of the facility/operation shall be performed by the readiness review members in the early stages of the review.

5.7.4 A formal briefing from the facility/operation owner shall be provided to the readiness review members in the early stages of the review to gather general information about the facility/operation within the scope of the review.

5.7.4.1 This briefing is intended to provide the readiness review members with the information necessary for them to obtain a full understanding of how the facility operates or how the operation is performed.

5.7.5 All areas within the scope of the review shall be thoroughly reviewed. (See Appendices J and K of this MWI for more information.)

5.7.6 Findings and recommendations shall be documented in the manner defined by the readiness review Chairperson. (See Appendix I of this MWI for more information.)

5.7.6.1 Documenting findings and recommendations may be accomplished by the use of a form generated by the readiness review or be of a narrative type. MSFC Form 3739 may also be used.

5.7.7 All readiness review members shall be present during the finding and recommendation rating process.

5.7.8 All findings and recommendations shall be reviewed with the facility/operation owner.

5.7.8.1 It is recommended to keep the facility/operation owner informed of any findings and recommendations as they are initially identified during the readiness review by having daily debriefings/contact with the facility/operation POC.

5.7.9 Findings and recommendations shall be documented in writing.

5.7.10 Findings, when rated as a constraint, shall identified if they apply to the entire facility/operation or only a portion of it.

5.7.11 Findings and recommendations shall be written as follows:

5.7.11.1 Against a specific item or activity.

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5.7.11.2 Are concise and stated clearly.

5.7.11.3 Identify the hazards and risks if the problem is left uncorrected.

5.7.11.4 Include a proposed corrective action.

5.7.11.5 Include a proposed timeline showing when the problem is to be corrected.

5.7.12 Finding and recommendation shall be assigned a unique control number for tracking and closure by the readiness review members.

5.7.12.1 Findings may be written against a part of or the entire facility/operation.

5.7.13 Each finding and recommendation shall be rated as one of the following:

5.7.13.1 Constraint – A majority vote by all readiness review members is needed.

5.7.13.2 Non-constraint.

5.7.13.3 Further study needed.

5.7.13.4 Rejected – A finding entered by a readiness review member, but rejected during the rating process by the readiness review members.

5.7.14 All findings and recommendation closures shall be reviewed by the readiness review Chairperson and provide approval or disapproval of the closure rationale.

## 5.8 Readiness Review Report

5.8.1 A written Readiness Review Report and an Authorization to Startup/Restart a facility/operation shall be prepared by the readiness review members. (See Appendices L, M, and N of this MWI for more information.)

5.8.2 The Readiness Review Report shall be routed through all readiness review members and the Appointing Official for concurrence prior to making a formal presentation to the Approving Authority.

5.8.2.1 The readiness review presentation to the Approving Authority, at a minimum, shall include the items and activities that were reviewed, general observations, areas considered to be of a high or moderate risk, and current status of each finding and recommendation.

5.8.3 The Readiness Review Report shall be provided to the Approving Authority for signature after the readiness review formal presentation.

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5.8.3.1 A formal Readiness Review Report shall only be required for an ORI/SRT. Meeting minutes that state the facility/operation is safe to operate can serve the same purpose as the Readiness Review Report for an ORR or similar level readiness review, unless a more in-depth review is performed. (See Appendix L of this MWI for more information.)

5.8.4 The Readiness Review Report shall be concurred with or rationale provided by the Approving Authority for non-concurrence.

5.8.5 The Readiness Review Report shall be provided to the facility/operation owner to correct findings and recommendations, as needed.

5.8.6 The risks associated with the startup/restart of the facility/operation are lowered or controlled to a level where they are at a level of accepted risk and may be acceptable by management. (See NPD 8700.1 and Appendix E of this MWI, Table 1 for more information.)

#### 5.9 Tracking Readiness Review Findings and Recommendations

5.9.1 A method to document and track to closure the findings and recommendations identified by the readiness review shall be selected by the Appointing Official and the readiness review Chairperson.

5.9.1.1 Tracking the readiness review findings and recommendations may be accomplished by any method selected by the Appointing Official and readiness review Chairperson. Common tracking methods include the use of a Review Item Discrepancy (RID) (See MSFC Form 3739) or by the development of a Corrective Action Plan (CAP).

5.9.1.2 The method to document and track the closure of findings and recommendations shall be appropriate for the level of readiness review performed.

5.9.2 The tracking method selected shall identify the following:

5.9.2.1 Actions necessary to correct each finding or implement each recommendation.

5.9.2.2 Assignees for the actions.

5.9.2.3 Expected completion dates for each assigned action.

5.9.3 The facility/operation owner shall be notified of the method selected to track readiness review findings and recommendations.

5.9.4 Ensure a request for relief is initiated by the facility/operation owner when a hazardous condition cannot be corrected prior to facility/operation startup/restart, when determined necessary.

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5.9.4.1 See NPR 8715.3 and MPR 8715.1 for the process to request for relief to safety-related requirements.

5.9.5 The Appointing Official and readiness review Chairperson concurrence shall be obtained prior to implementing any corrective actions for findings and recommendations identified by the readiness review.

5.9.6 Readiness review findings and recommendations shall be implemented and verified by the facility/operation owner prior to submitting them to the readiness review Chairperson for closure.

#### 5.10 Approval to Startup/Restart

5.10.1 After the CAP is closed, the facility/operation owner shall be notified and made aware of the approval to startup/restart the facility/operation.

5.10.2 The approval to startup/restart the facility/operation shall be noted in the Readiness Review Report or by a formal startup/restart letter. (See Appendices L, M and N of this MWI for more information.)

## 6. CANCELLATION

MWI 8715.17D-2, Hazardous Operations Readiness Review Program, dated July 29, 2015.

*Electronically approved by*

Steven C. Miley for  
Jody Singer  
Director

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## **APPENDIX A DEFINITIONS**

**Abatement Plan** A documented plan for the correction of a hazard that cannot be corrected within 30 days and includes, as a minimum, the following information: (1) a reason why the condition cannot be corrected within 30 days; (2) the actions necessary to permanently correct the condition; (3) the interim actions taken to protect employees from being adversely exposed to any hazards created by this condition; and (4) an expected completion date of when the actions will be implemented to correct the condition. (See 29 CFR Part 1960.30 and 34, and NPR 8715.1 CH 2 for more information.)

**Accepted Risk** A hazard whose residual risk has been accepted and documented by the facility/operation owner's level of management/approving authority identified in Appendix E of this MWI, Table 1.

**Appointing Official** The manager that nominates the committee membership to perform a readiness review of a facility/operation. In some cases, serves as the level of management that approves the readiness review report, and can also serve as the Approving Authority.

**Approving Authority** The level of management identified in Appendix E of this MWI, Table 2 as necessary to accept the level of risk identified by the readiness review committee and approve the startup/restart of a facility/operation. The Approving Authority may also serve in role of the Appointing Office with concurrence from the Center's Director of SMA or designee.

**Center** NASA owned property that has been designated as a NASA Center. In this MWI, the Center is MSFC or MAF.

**Center's Environmental Office** The Center Office/Department/Branch that provides insight, oversight, and coordination of environmental-related issues with internal and external organizations to ensure compliance is maintained with all applicable Federal, State, and local environmental regulations, NASA and Center environmental requirements, and environmental-related Executive Orders, in accordance with NPD 8500.1. At MSFC, these functions are performed by the Office of Center Operations/ Environmental Engineering and Occupational Health (EEOH)/AS10. At MAF, these functions are performed by the MAF Environmental Lead/AS60 and the Synergy Achieving Consolidated Operations and Maintenance (SACOM) Environmental Services who ensure all environmental-related day-to-day functions identified in this MWI for EEOH are performed.

**Center's Facility Management Office (FMO)** The Center Office/Department/Branch that provides insight, oversight and coordination of facility operation and maintenance-related issues with internal and external organizations to ensure compliance is maintained with all applicable facility-related Executive Orders, federal, state, local, NASA, and Center regulations in accordance with NPR 8831.2. At MSFC, these functions are performed by the Office of Center Operations/FMO/AS20. At MAF, these functions are performed by the MAF Operations

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Office/AS60 and the SACOM Facilities Management Office Department (FMOD) who ensure all facility-related day-to-day functions identified in this MWI for FMO are performed.

Center’s Occupational Health Office The Center Office/Department/Branch that provides insight, oversight and coordination of occupational health-related issues with internal and external organizations to ensure compliance is maintained with all applicable occupational health-related Executive Orders, federal, state, local, NASA, and Center regulations in accordance with NPD 1800.2 and NPR 1800.1. At MSFC, these functions are performed by the Office of Center Operations/EEOH/AS10. At MAF, these functions are performed by the MAF Emergency Management/Protective Services Office (PSO) Operations Manager/AS50 and the SACOM Safety and Health Services who ensure all occupational health-related day-to-day functions identified in this MWI for EEOH are performed.

Center’s Quality Office The Center Office/Department/Branch that provides insight, oversight, and coordination of quality-related issues with internal and external organizations to ensure compliance with applicable quality-related regulations and requirements. At MSFC, these functions, depending on the type supported needed, may be performed by the SMA Directorate/Quality Assurance Branch (QAB)/QD11, Mission Systems Assurance and Technical Support Department/QD20 or Vehicle Systems Department/QD30. At MAF, these functions are performed by the MAF SMA Manager/QD10 and the SACOM Quality Assurance Services who ensure all quality-related day-to-day functions identified in this MWI for SMA are performed.

Center’s Safety Office The Center Office/Department/Branch that provides insight, oversight, and coordination of safety-related issues with internal and external organizations to ensure compliance is maintained with all applicable safety-related Executive Orders, Federal, State, local, NASA and Center regulations in accordance with in NPR 8715.1 and NPR 8715.3. At MSFC, these functions are performed by the SMA Directorate/Industrial Safety Branch (ISB)/QD12. At MAF, these functions are performed by the MAF SMA Manager/QD12 and the SACOM Safety and Health Services who ensure all safety-related day-to-day functions identified in this MWI for SMA and ISB are performed.

Constraint Finding A finding that affects the entire or only a portion of the facility/operation and involves a credible risk of mishap or operational problem that could cause loss of life, personnel injury/illness, or major damage to property or the environment, and is required to be corrected prior to startup/restart of the facility/operation.

Controls Means of reducing the probability of the undesired event from occurring and/or reducing the potential severity if the undesired event did occur by physical, design, structural, and engineering features (engineering controls); safety guards and warning devices (safety management programs); operating procedures, training, and the use of personal protective equipment (administrative controls); and other controls necessary to provide adequate protection from exposure to the hazards. These mechanisms can also be implemented to eliminate, reduce, or minimize the potential effect of material loss or impact to program schedules.

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Corrective Action An action taken to eliminate or control identified hazards in order to reduce the risk to personnel, equipment, and facilities.

Corrective Action Plan (CAP) A specific and documented plan for the correction of findings and includes the following: defines each deficiency; describes the actions to be taken; assigns responsibility for the actions; describes how the actions are to address and correct the findings; and specifically, the dates by which the actions are to be completed.

Electronic Project Online Risk Tool (ePort) A Center risk management tool used to document and track institutional risks.

Facility Buildings, structures, and other real property including utility systems and collateral equipment. A facility can involve a single operation or multiple operations being performed within the same building or structure. This term does not include operating materials, supplies, special tooling, special test equipment (STE), or non-capitalized equipment.

Finding A documented deficiency/discrepancy discovered during a readiness review and is classified by the review committee as either constraint or non-constraint.

Hazard A state or a set of conditions, internal or external to a facility or operation, that has the potential to cause an undesired event.

Hazard Analysis (HA) A term used to describe a method or technique used to identify hazards, the hazard cause, the hazard effect (undesired event), and their associated risks for a given facility or operation and for providing the corrective actions to mitigate these hazards and their risks. This level safety assessment is typically performed for facilities/operations identified to have an overall level of risk of high or moderate.

Hazardous Facility/Operation Any facility/operation containing hazards or risks of such a level that if not properly mitigated has the potential to cause an undesired event to occur.

High Risk An overall level of risk determined to present a significant level of probability to cause an undesired event and is considered as “Highly Undesirable.” This level of risk can only be performed after receiving documented approval from the EMC. This level of risk also includes undesired events that have the potential for the severity of damage to equipment or property to be classified as a Type A Mishap in accordance with NPR 8621.1. This level of risk is identified by the color “red” in Appendix E Table 1 of this MWI and is sometimes referred to as RAC 1.

Industrial Safety Branch (ISB) The MSFC organization with responsibility for ensuring potentially-hazardous facilities/operations are identified, assessed for hazards and risks, and that a thorough readiness review is performed.

Low Risk An overall level of risk determined to present no greater than normal level of probability to cause an undesired event and is considered as “acceptable.” This level of risk can

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be performed after receiving documented approval from the supervisor directly responsible for operating the facility or performing the operation. This level of risk also includes undesired events that have the potential for the severity of damage to equipment or property to be classified as a Type C Mishap in accordance with NPR 8621.1. This level of risk is identified by the color “green” in Appendix E Table 1 of this MWI and is sometimes referred to as RAC 3.

Minimal Risk An overall level of risk determined to present a less than normal level of probability to cause an undesired event and is considered as “acceptable.” This level of risk requires no documented approval, but an informal review performed by the supervisor directly responsible for operating the facility or performing the operation is highly recommended. This level of risk also includes undesired events that have the potential for the severity of damage to equipment or property to be classified as a Type D Mishap in accordance with NPR 8621.1. This level of risk is identified by the color “white” in Appendix E Table 1 of this MWI and is sometimes referred to as RAC 4.

Mitigate The actions taken to eliminate, reduce, or control a hazard in order to reduce the risk of the hazard causing an undesired event to occur.

Moderate Risk An overall level of risk determined to present a greater than normal level of probability to cause an undesired event and is considered as “undesirable.” This level of risk can only be performed after receiving documented approval from the facility/operation owner’s Department/Laboratory/Office Manager or designee(s). This level of risk also includes undesired events that have the potential for the severity of damage to equipment or property to be classified as a Type B Mishap in accordance with NPR 8621.1. This level of risk is identified by the color “yellow” in Appendix E Table 1 of this MWI and is sometimes referred to as RAC 2.

Non-Constraint Finding A finding that involves risk of minor property damage or operational problems where immediate actions are not required and can be corrected after startup/restart of the facility/operation if agreed to by the readiness review chairperson, Approving Authority, and facility/operation owner.

Operation A process or series of acts involved in a particular form of work, job, or task. It can involve personnel, equipment, the entire facility, or only a section of a facility.

OpsTrak A MSFC SMA database that lists facilities/operations identified to have an increased level of risk (high, moderate and low) to cause/contribute to an accident, injury, illness, or damage to property or environment due to the nature of the work being performed, provides the ability to maintain documentation associated with the facility/operation and assists in the development of safety assessments for the facility/operation. (See MWI 8715.15 for more information.)

Operational Readiness Inspection (ORI) A high level readiness review performed primarily for facilities/operations assigned a high level of risk of a mishap which might cause loss of life, personal injury/illness, or serious damage to equipment, test articles, buildings, adjoining areas, or the environment.

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Operational Readiness Review (ORR) A low level readiness review performed primarily for facilities/operations assigned a low level of risk of a mishap which might cause loss of life, personal injury/illness, or serious damage to equipment, buildings, adjoining areas or the environment.

Overall Level of Risk The overall level of risk is a general term used to describe the potential level of risk of an undesired event occurring while operating a facility or performing an operation. The level of risk is normally selected based on: (1) the complexity, structure, purpose and function of the facility/operations; (2) the visibility and/or value of the facility/operation; and (3) the potential for the facility/operation to cause an undesired event. The level of risk can also be selected by using the highest residual risk listed in an HA or a general consensus between the facility/operation owner and ISB of the appropriate level of risk for the facility/operation. The overall level of risk is the level of risk entered into OpsTrak for a facility or operation by the owner or for a building into the Electronic Project Online Risk Tool (ePORT) database by ISB.

Owner The organization identified to have primary responsibility for the facility/operation.

Probability The likelihood that an undesired event can occur. There are 5 classifications of probability – frequent, probable, occasional, remote, and improbable. (See Appendix E Table 4 of this MWI for more information.)

Readiness Review A disciplined, systematic and documented review of facilities/operations where there is a level of risk of a mishap which might cause loss of life, personal injury/illness, or serious damage to equipment, buildings, adjoining areas, or the environment.

Residual Risk The level of risk that remains from a hazard after all of the corrective actions, mitigation, and controls (administrative and engineering) have been applied to eliminate, reduce, and control the hazard. This risk is sometimes referred to as remaining risk.

Request for Relief A written authorization for relief from a specific requirement(s) and can be a deviation or waiver. (See NPR 8715.3 and MPR 8715.1 for more information.)

Risk The combination of (1) the probability (qualitative or quantitative) of experiencing the occurrence of an undesired event; (2) the consequences, impact, or severity that can result from the undesired event occurring; and (3) the uncertainties associated with the probability and consequences.

Risk Assessment Code (RAC) A numerical expression of a level of risk associated with a condition that is determined by an evaluation of both the severity of the condition (worse potential consequence) and the probability of its occurrence. (See Appendix E Table 1 of this MWI for more information.)

Safety Assessment A disciplined, systematic approach to analyze and evaluate a facility/operation to determine its potential to affect the safety and health of personnel or its potential to cause damage to the environment, equipment or adjacent facilities/operations. A

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safety assessment is a general term that covers the total spectrum of identifying hazards and the actions necessary to eliminate, reduce and control them. Safety assessments include all types of hazard analysis, job hazard analysis, job safety analysis, safe plan of action, workplace safety assessment, operating procedures, and readiness reviews.

Safety Critical Term describing any condition, event, operation, process, equipment, or system that could cause or lead to severe injury, major damage, or mission failure if performed or built improperly, or allowed to remain uncorrected.

Safety Review Team (SRT) A moderate level readiness review performed primarily for facilities/operations assigned a moderate level of risk of a mishap which might cause loss of life, personal injury/illness, or serious damage to equipment, test articles, buildings, adjoining areas or the environment, or to review additions or modifications to existing facilities/operation that result in a change to existing hazard levels.

Scope The boundary, limit, and range identified as the extent of the review for any given facility/operation and can be identified by the use of drawings, procedures, or any method necessary.

Severity The potential results if an undesired event if it did occur. Severity has four (4) classifications - catastrophic, critical, marginal, and negligible. (See Appendix E Table 3 of this MWI for more information.)

Test Readiness Review (TRR) A pre-test review of all risks associated with a specific hazardous test to determine whether the test facilities, support systems, test procedures, operational personnel, and the test article itself demonstrate an adequate degree of readiness to provide a reasonable expectation that the test objectives can be met without unacceptable risk of property damage or personnel injury. A TRR does not take the place of an ORI, SRT, or ORR, but is used in conjunction with these reviews, if they are required.

Undesired Event An event or series of events which unleashes the potential inherent in a hazard and either directly or indirectly results in: (1) injury/illness or death to personnel or the public; (2) damage to or loss of facilities/equipment; or (3) detrimental impact to the environment and the surrounding community.

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## **APPENDIX B ACRONYMS**

AS - Organization code for Office of Center Operations

CAP - Corrective Action Plan

CFR - Code of Federal Regulations

COR - Contracting Officer Representative

EEOH - Environmental Engineering and Occupational Health

EMC - Engineering Management Council

ePORT - Electronic Project Online Risk Tool

FMO - Facilities Management Office

FMOD - Facilities Management Office Department (applicable to MAF)

HA - Hazard Analysis

ISB - Industrial Safety Branch

JHA - Job Hazard Analysis

MAF - Michoud Assembly Facility

MPR - Marshall Procedural Requirement

MSFC - Marshall Space Flight Center

MWI - Marshall Work Instruction

NASA - National Aeronautics and Space Administration

NFPA - National Fire Protection Association

NAMS - NASA Application Management System

NPD - NASA Procedural Directive

NPR - NASA Procedural Requirement

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NRRS - NASA Records Retention Schedule

OpsTrak - Operations Tracking System

ORI - Operational Readiness Inspection

ORR - Operational Readiness Review

OSHA - Occupational Safety and Health Administration

POC - Point of Contact

PSO - Protective Services Office

Pt - Part

QAB - Quality Assurance Branch

QD - Organization code of Safety and Mission Assurance Directorate

RAC - Risk Assessment Code

RID - Review Item Discrepancy

SDS - Safety Data Sheet

SHE - Safety, Health, and Environmental

SMA - Safety and Mission Assurance

SRT - Safety Review Team

STE - Special Test Equipment

SACOM - Synergy Achieving Consolidated Operations and Maintenance

TRR - Test Readiness Review

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**APPENDIX C  
VERIFICATION MATRIX**

| Section | Brief Description                                      | Verification |          |      | Comments |
|---------|--|--------------|----------|------|----------|
|         |  | Inspection   | Document | Test |          |
| 5.1     | General  |              |          |      | NA       |
| 5.2     | Notification to Begin a Readiness Review               |              | x        |      |          |
| 5.3     | Level of Readiness Review                              |              | x        |      |          |
| 5.4     | Level of Management Approval                           |              | x        |      |          |
| 5.5     | Forming a Readiness Review                             |              | x        |      |          |
| 5.6     | Types of Readiness Reviews                             |              |          |      | NA       |
| 5.7     | Performing a Readiness Review                          |              | x        |      |          |
| 5.8     | Readiness Review Report                                |              | x        |      |          |
| 5.9     | Tracking Readiness Review Findings and Recommendations |              | x        |      |          |
| 5.10    | Approval to Startup/Restart                            |              | x        |      |          |

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**APPENDIX D  
RECORDS**

| <b>RECORD</b>  | <b>REPOSITORY</b>   | <b>RETENTION</b>   |
|--|---|--|
| <p>Drawings, manuals, schematics and other data needed to support, operate and maintain the facility/operation.</p> <p><i>NOTE: This does not include the building drawings maintained by FMO.</i></p>   | <p>Maintained by the operation owner in accordance with NRRS 8, Program/Project Records.</p>  | <p>The exact retention used will be dependent on whether the specific program/project meets the criteria in NRRS 8/101 or not.</p> |
| <p>ORI/SRT records</p> <p><i>NOTE: These records include, but are not limited to, the following: Committee Appointment Letter, meeting minutes, safety assessments, number of action items and status, remaining and accepted risks, conclusion and recommendations of Committee, presentation charts, directly-related correspondence, Executive Summary, CAP, and Authorization to Startup/Restart a Facility/Operation.</i></p> | <p>Maintained by the organization performing the review or the Program/Project with primary responsibility for the facility/operation in accordance with NRRS 8, Program/Project Records.</p> | <p>The exact retention used will be dependent on whether the specific program/project meets the criteria in NRRS 8/101 or not.</p> |
| <p>ORR records</p> <p><i>NOTE: These records include, but are not limited to, the following: meeting minutes stating the facility/operation is safe to operate; any documentation required</i></p>   | <p>Maintained by the organization with primary responsibility for the operation in accordance with NRRS 8, Program/Project Records.</p>   | <p>The exact retention used will be dependent on whether the specific program/project meets the criteria in NRRS 8/101 or not.</p> |

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| <i>by the organization<br/>performing the review.</i>  |  |  |
| <p>TRR records</p> <p><i>NOTE: These records include, but are not limited to, the following: meeting minutes stating the facility/operation is safe to test; any documentation required by the organization performing the review.</i></p> | Maintained by the test organization performing the review.   | In accordance with their record retention schedule identified in their organizational instruction or Program/Project Plan record retention requirements. |
| Request for relief to safety-related requirement   | Maintained by the organization requesting the relief in accordance with NRRS 8, Program/Project Records. | The exact retention used will be dependent on whether the specific program/project meets the criteria in NRRS 8/101 or not.                              |
| Copies of ORI, SRT, ORR and TRR  | At MSFC, Maintained by SMA   | NRRS 8/108 as temporary, then destroyed/deleted when no longer needed.   |

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**APPENDIX E  
RAC**

| <b>Table 1 RAC</b>    |                           |                       |                       |                         |
|-----------------------|---------------------------|-----------------------|-----------------------|-------------------------|
| <b>Probability</b>    | <b>Severity</b>           |                       |                       |                         |
|                       | <b>1<br/>Catastrophic</b> | <b>2<br/>Critical</b> | <b>3<br/>Marginal</b> | <b>4<br/>Negligible</b> |
| <b>A – Frequent</b>   | <b>1A</b>                 | <b>2A</b>             | <b>3A</b>             | <b>4A</b>               |
| <b>B – Probable</b>   | <b>1B</b>                 | <b>2B</b>             | <b>3B</b>             | <b>4B</b>               |
| <b>C – Occasional</b> | <b>1C</b>                 | <b>2C</b>             | <b>3C</b>             | <b>4C</b>               |
| <b>D – Remote</b>     | <b>1D</b>                 | <b>2D</b>             | <b>3D</b>             | <b>4D</b>               |
| <b>E – Improbable</b> | <b>1E</b>                 | <b>2E</b>             | <b>3E</b>             | <b>4E</b>               |

| <b>TABLE 2 Level of Risk and Level of Management Approval</b> |  |
|---|--|
| <b>Level of Risk</b>  | <b>Level of Management Approval/Approving Authority</b>  |
| <b>High Risk<br/>(RAC 1)</b>                                  | Highly Undesirable. Documented approval from the MSFC EMC or an equivalent level independent management committee.   |
| <b>Moderate Risk<br/>(RAC 2)</b>                              | Undesirable. Documented approval from the facility/operation owner’s Department/Laboratory/Office Manager or designee(s), or an equivalent level management committee.   |
| <b>Low Risk<br/>(RAC 3)</b>                                   | Acceptable. Documented approval from the supervisor directly responsible for the operating the facility or performing the operation.   |
| <b>Minimal Risk<br/>(RAC 4)</b>                               | Acceptable. Documented approval not required, but an informal review performed by the supervisor directly responsible for operating the facility or performing the operation is highly recommended. Use of a generic JHA posted on the SHE InsideMarshall SharePoint site is recommended, if a generic Job Hazard Analysis (JHA) has been developed. |

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| <b>Marshall Work Instruction<br/>QD01</b>                |                               |                      |
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| <b>TABLE 3 Severity Definitions – A condition that can cause:</b> |  |  |   |
|---|--|--|---|
| <b>Description</b>  | <b>Personnel Safety and Health</b>               | <b>Facility/Equipment</b>                          | <b>Environmental</b>  |
| 1 - Catastrophic  | Loss of life or a permanent-disabling injury.    | Loss of facility, systems or associated hardware.  | Irreversible severe environmental damage that violates law and regulation.  |
| 2 - Critical  | Severe injury or occupational-related illness.   | Major damage to facilities, systems, or equipment. | Reversible environmental damage causing a violation of law or regulation.   |
| 3 - Marginal  | Minor injury or occupational-related illness.    | Minor damage to facilities, systems, or equipment. | Mitigatable environmental damage without violation of law or regulation where restoration activities can be accomplished. |
| 4 - Negligible  | First aid injury or occupational-related illness | Minimal damage to facility, systems, or equipment. | Minimal environmental damage not violating law or regulation.   |

| <b>TABLE 4 Probability Definitions</b> |   |  |
|--|---|--|
| <b>Description</b>                     | <b>Qualitative Definition</b>   | <b>Quantitative Definition</b>             |
| A – Frequent                           | High likelihood to occur immediately or expected to be continuously experienced.        | Probability is > 0.1                       |
| B – Probable                           | Likely to occur or expected to occur frequently within time.                            | $0.1 \geq \text{probability} > 0.01$       |
| C – Occasional                         | Expected to occur several times or occasionally within time.                            | $0.01 \geq \text{probability} > 0.001$     |
| D – Remote                             | Unlikely to occur, but can be reasonably expected to occur at some point within time.   | $0.001 \geq \text{probability} > 0.000001$ |
| E – Improbable                         | Very unlikely to occur and an occurrence is not expected to be experienced within time. | $0.000001 \geq \text{probability}$         |

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**APPENDIX F  
EXAMPLE READINESS REVIEW PREREQUISITE CHECKLIST**

This example checklist is not intended to be all inclusive for every facility/operation. It is only intended to give the readiness review members, Center’s Safety Office and facility/operation owner an idea of the issues that need to be verified to be available prior to declaring a facility/operation ready for a readiness review to begin.

|     |  |  |
|-----|--|--|
| F.1 | Can documentation or rationale be provided to define and clearly identify the scope of the review (i.e., drawings or procedures)?  | YES <input type="checkbox"/> NO <input type="checkbox"/> NA <input type="checkbox"/> |
| F.2 | Can documentation or rationale be provided to clearly describe why the facility/operation was shut down (i.e., maintenance, modification, or safety concerns) if the facility/operation was previously operated?   | YES <input type="checkbox"/> NO <input type="checkbox"/> NA <input type="checkbox"/> |
| F.3 | Can a HA or other safety assessment documentation be provided?   | YES <input type="checkbox"/> NO <input type="checkbox"/> NA <input type="checkbox"/> |
| F.4 | Can documentation or rationale be provided that ensures all support/infrastructure services necessary to operate this facility/operation have been verified as operational and can provide the support necessary to ensure the safe operation of the facility/operation?     | YES <input type="checkbox"/> NO <input type="checkbox"/> NA <input type="checkbox"/> |
| F.5 | Can documentation or rationale be provided that ensures all designs, modifications, operating procedures, safety assessments, and other supporting documentation have been reviewed and approved by the Center organization that has primary responsibility for the process? | YES <input type="checkbox"/> NO <input type="checkbox"/> NA <input type="checkbox"/> |
| F.6 | Can documentation or rationale be provided that ensures all facility/operation controls, equipment interfaces, warning systems and other supporting systems have been verified as operational prior to the start-up of the facility/operation?                               | YES <input type="checkbox"/> NO <input type="checkbox"/> NA <input type="checkbox"/> |

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|      |  |  |
|------|--|--|
| F.7  | Can documentation or rationale be provided that ensures all facility/operation operators have received training and certification, when required, to ensure the safe operation of the facility/operation? The documentation or rationale includes operators receiving on-the-job and proficiency training. | YES <input type="checkbox"/> NO <input type="checkbox"/> NA <input type="checkbox"/> |
| F.8  | Can rationale be provided for any request for relief (deviation/waivers) that are needed to be initiated for the facility/operation?   | YES <input type="checkbox"/> NO <input type="checkbox"/> NA <input type="checkbox"/> |
| F.9  | Can documentation or rationale be provided to ensure all inspections, calibrations, and preventative maintenance requirements have been performed and verified prior to start-up of the facility/operation?  | YES <input type="checkbox"/> NO <input type="checkbox"/> NA <input type="checkbox"/> |
| F.10 | Can documentation be provided for Pressure System Certification or an approved request for relief (deviation/waiver) or abatement plan for operations that include the use of pressure systems?  | YES <input type="checkbox"/> NO <input type="checkbox"/> NA <input type="checkbox"/> |

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| <b>Marshall Work Instruction<br/>QD01</b>                |                               |                      |
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## **APPENDIX G**

### **EXAMPLES OF READINESS REVIEW MEMBER FUNCTIONS AND ROLES**

#### **G.1 Readiness Review Chairperson**

G.1.1 Call meetings of the readiness review members.

G.1.2 Chair the meetings.

G.1.3 Assign teams of one to three members to investigate, gather information and details needed about a particular area, and report to all readiness review members.

G.1.4 Ensure that other members perform their required tasks.

G.1.5 Ensure that the Executive Secretary is performing required functions.

G.1.6 Aid in the preparation of the final report and briefings, as required.

G.1.7 Present the results of the readiness review member's finding to the EMC or equivalent level management committee.

G.1.8 Sign any required facility operational certification documentation.

#### **G.2 Executive Secretary/Recorder**

G.2.1 Work under the direction of the Chairperson.

G.2.2 Coordinate the inspection with the facility's users and operators.

G.2.3 Develop an overall readiness review agenda and schedule.

G.2.4 Prepare notification for all readiness review meetings and other activities to be signed by the Chairperson.

G.2.5 Present the agenda and schedule at the first readiness review meeting.

G.2.6 Sit as an advisor in meetings held to prepare for the inspection.

G.2.7 Be prepared to answer questions relating to readiness review requirements for the inspection.

G.2.8 Assist in preparing requests for waivers, if required.

G.2.9 Document all proceedings of the readiness review.

G.2.10 Log, number, and file all findings, actions, waivers, deviations, etc. Be the prime mover in the preparation of the final report, briefings, and certification documentation.

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### G.3 Readiness Review Member

G.3.1 If a voting member, support the readiness review activities in area of expertise.

G.3.2 If an alternate to a voting member, support the readiness review activities in the voting member's area of expertise.

G.3.3 If not a voting member, support the readiness review as requested.

#### G.3.4 Organization Director/Manager responsible for the facility/operation being reviewed

G.3.4.1 Perform internal reviews to ensure all items are available at the time of the readiness review's first meeting. Failure to accomplish this can cause delay in the certification of facility/operation.

G.3.4.2 Serve as POC or appoint another person to whom authority is delegated to satisfy the functions of the POC.

#### G.3.5 POC for the organization responsible for the facility/operation being reviewed

G.3.5.1 Work within the division and with the readiness review executive secretary/recorder to ensure that all items required by the committee are available before its initial meeting.

G.3.5.2 Help the facility/operation owner organization manage the resources required to implement the readiness review's recommendations.

G.3.5.3 Process any waivers or deviations required and assure approvals are obtained.

G.3.5.4 Participate in the readiness review's activities, as requested by the Chairperson.

#### G.3.6 Manager directly responsible for the facility/operation being reviewed

G.3.6.1 Help the POC in assuring that all items required by the readiness review members are available.

G.3.6.2 Obtain required resources to implement the readiness review recommendations.

G.3.6.3 Prepare waivers or deviations, as required, for submission to the appropriate authority for approval.

G.3.6.4 Participate in the readiness review's activities, as requested by the Chairperson.

G.3.6.5 Ensure all records and reports of the readiness review's activities are maintained in accordance with Appendix D, RECORDS.

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## **APPENDIX H TYPICAL READINESS REVIEW MEMBERSHIP**

*NOTE: The typical membership for all readiness reviews includes the following, but may be modified as needed by the Appointing Authority with concurrence from SMA. See Appendix A of this MPR for the organizations that serve in the roles of the Center's Safety Office, Center's Occupational Health Office, Center's Environmental Office, Center's Facility Management Office and Center's Quality Office at MSFC and MAF.*

### **H.1 ORI**

H.1.1 The ORI membership generally consists of the following voting members, unless a different membership is agreed to by the Appointing Official and the Directorate/Office Executive or designee of the facility/operation:

H.1.1.1 A Chairperson (NASA employee that is normally a Division Chief level or designated representative, but can be a different level when agreed to by the Directorate/Office Executive or designee of the facility/operation and Appointing Official).

H.1.1.2 An Executive Secretary provided by the organization responsible for the operation under review to serve in the role of recorder.

H.1.1.3 Representatives from the Center's Safety Office and Center's Quality Office for safety and quality.

H.1.1.4 A representative from the Center's FMO.

H.1.1.5 A representative from Center's Environmental Engineering Office and Center's Occupational Health Office, if determined necessary by the Appointing Official.

H.1.1.6 A representative from the facility/operation owner, but independent from the facility/operation being reviewed.

H.1.1.7 Other supporting personnel or technical experts as deemed necessary by the ORI Chairperson and Appointing Official.

### **H.2 SRT**

H.2.1 The SRT membership generally consists of the following voting members, unless a different membership is agreed to by the Appointing Official and the Directorate/Office Executive or designee of the facility/operation:

H.2.1.1 A Chairperson (NASA employee unless agreed to be a non-NASA employee, normally a Branch Chief level or designated representative that has primary responsibility for the

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facility/operation. This can be a different level when agreed to by the Directorate/Office Executive or designee of the facility/operation and Appointing Official.)

H.2.1.2 A secretary provided by the organization responsible for the operation under review to serve in the role of recorder.

H.2.1.3 Lead engineer for the facility or operation.

H.2.1.4 Representatives from the Center’s Safety Office and Center’s Quality Office for safety and quality.

H.2.1.5 A representative from the Center’s FMO.

H.2.1.6 A representative from Center’s Environmental Engineering Office and Center’s Occupational Health Office if determined necessary by the Appointing Official.

H.2.1.7 A branch chief or technical manager from the facility/operation owner.

H.2.1.8 Other supporting personnel or technical experts as deemed necessary by the SRT Chairperson and Appointing Official.

### H.3 ORR

H.3.1 The ORR membership generally consists of following voting members:

H.3.1.1 Representatives from the Facility/operation owner;

H.3.1.2 Representatives from the Center’s Safety Office and Center’s Quality Office for safety and/or quality;

H.3.1.3 Representatives from the organization scheduled to operate the facility or perform the operation if different from the facility/operation owner; and

H.3.1.4 Other members that possess technical expertise of the facility/operation as necessary.

### H.4 TRR

H.4.1 The TRR membership generally consists of the following voting members, but is determined by the organization’s policies and requirements for performing a TRR:

H.4.1.1 A representative from the test facility/operation owner management structure.

H.4.1.2 Representatives from the Center’s Safety Office and Center’s Quality Office for safety and quality.

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H.4.1.3 A representative from the test requester management structure.

H.4.1.4 A representative from the Center’s FMO, as necessary.

H.4.1.5 Other supporting personnel or technical experts as deemed necessary by the TRR Chairperson and Director/Manager forming the TRR.

*NOTE: See Appendix A of this MWI for the organizations that serve in the roles of the Center’s Safety Office, Center’s Occupational Health Office, Center’s Environmental Engineering Office, and Center’s Facility Management Office.*

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**APPENDIX I  
EXAMPLE FINDING/RECOMMENDATIONS FORM**

I.1 Control No.: (Unique to the Readiness Review and assigned by Readiness Review Secretary)

I.2 Facility/Operation Name:

I.3 Hardware/Equipment/System Affected:

I.4 Finding/Recommendation:

I.5 Proposed Classification:  Constraint  Non-Constraint

I.6 Reason:

I.7 Recommended by: \_\_\_\_\_ Date: \_\_\_\_\_

Committee Decision: (To be filled out by the Readiness Review Secretary) Date: \_\_\_\_\_

Constraint. Involving a credible risk of an undesired event occurring (e.g., accident, loss of life, personnel injury/illness, or damage to a test article, facility or the environment).

Response due date:

Non-Constraint. All other recommended actions, including safety upgrading, where the risk is limited to equipment damage and immediate action is not required.

Further study needed. Reason:

Rejected. Reason:

I.8 Corrective Action Taken:

I.9 Submitted for Closure by:

I.10 Approved for Closure (Appointing Official):

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## **APPENDIX J EXAMPLES OF AREAS TO CONSIDER DURING AN ORI/SRT/ORR**

### **J.1 Project Requirements**

J.1.1 A general review of the facility/operation is recommended to provide an overall understanding of the facility/operation. This list may be used to assist the user in determining which items are to be included in the review. This list does not limit the readiness review from considering other areas, but the items listed are typical areas to consider during the review. The readiness review Chairperson may use these descriptions to fill in the review matrix to use as a roadmap for the review.

### **J.2 Design**

J.2.1 The following are potential areas to review in the design process. If deemed necessary by the readiness review Chairperson, these items may be placed in the review matrix and indicated for the applicable facility/operation being reviewed.

J.2.1.1 Material compatibility and cleaning requirements – This includes instrumentation, components, and piping systems.

J.2.1.2 Equipment operating ranges and margins – This includes stress analysis, control functions, thermocouple ranges, pressure sensors, relief devices, and pressure vessels.

J.2.1.3 Data acquisition and control configuration – Review for single point failures and system safety interlocks.

J.2.1.4 Request for Relief (Deviations/Waivers) – Review existing approved deviation/waiver against the facility/operation being reviewed. The readiness review Chairperson may request the facility/operation owner to provide these deviation/waivers.

J.2.1.5 Configuration change control – Review the process that ensures all changes to the facility/operation are noted on drawings, operating procedures and other documentation.

#### **J.2.1.6 Safety Factors**

### **J.3 Construction**

J.3.1 The following are potential area to review in the construction process. If deemed necessary by the readiness review Chairperson, these items may be placed in the review matrix and indicated for the applicable facility/operation being reviewed.

J.3.1.1 Working hazards to personnel – This includes areas considered as confined spaces, tripping hazards, egress points and other areas where there are potential hazards to personnel.

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J.3.1.2 Construction processes – This includes areas that can have specific requirements, such as for welding, cleaning, and maintaining clean, and power installations.

#### J.4 Activation/Operations

J.4.1 The following are potential areas to review in the activation/operation process. If deemed necessary by the readiness review Chairperson, these items may be placed in the review matrix and indicated for the applicable facility/operation being reviewed.

J.4.1.1 Personnel qualifications – Verification that the team proposed to do the work has been trained and/or has the experience to safely operate the facility or perform the operation. This includes Center safety certifications, when required.

J.4.1.2 Operating procedures – Review of operating procedures used to operate the facility or perform the operation. This can be a sampling to verify the process for the correct integration between all organizations involved in operating the facility or performing the operation. Include procedures during emergency conditions that include assurance of communicating requirements and situation status.

J.4.1.3 Configuration control – Review of the process for change control and configuration control of the facility/operation that includes hardware and software.

J.4.1.4 Redline system – Review of any process used to redline drawings or operating procedures and the integration of these redlines into approved drawings and operating procedures.

J.4.1.5 Support systems – For each system identified for review, interaction should occur between the support system and the facility/operation.

J.4.1.6 Provisions to monitor and control the facility/operation in a safe manner.

#### J.5 Safety Systems

J.5.1 The following are potential areas to review in the safety system process. If deemed necessary by the readiness review Chairperson, these items may be placed in the review matrix and indicated for the applicable facility/operation being reviewed.

J.5.1.1 HA – Review of the HA process and subsequent closure of the items identified in the HA.

J.5.1.2 Operating procedures – Verification that operating procedures are developed and approved for facilities/operations that require operating procedures in accordance with MWI 8715.15.

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J.5.1.3 Compliance with Occupational Safety and Health Administration (OSHA), National Fire Protection Association (NFPA), NASA, MSFC and local safety regulations.

## J.6 Specific System Review Areas

J.6.1 The following is a list of typical systems that can be included as part of a facility/operation. This does not limit the readiness review Chairperson from considering other systems, but the listed items may be included in a typical readiness review if they are part of a facility/operation.

J.6.1.1 Propellants – These include, but are not limited to, liquid oxygen, liquid hydrogen, and hydrogen peroxide.

J.6.1.2 Pneumatics – These include, but are not limited to, air, gaseous nitrogen, gaseous hydrogen, gaseous helium, and gaseous oxygen.

J.6.1.3 Miscellaneous Systems that support the facility/operation – These include, but are not limited to, hydraulics, fire/deluge, electrical systems, lasers, and emergency systems.

J.6.1.4 Overall safe operation of the facility/operation – This includes any factors that may have a direct or indirect bearing on the safe operation of the facility, equipment, or processes, or ability to support critical program/project needs.

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## **APPENDIX K EXAMPLES OF AREAS TO CONSIDER DURING A TRR**

K.1 The TRR is performed following the processes described in MPR 7123.1.

K.1.1 Review the operational requirements and determine the ability of the facility to meet requirements. Ascertain that adequate configuration control has been implemented. Review test team staffing plans and training/certification.

K.1.2 Review the safety assessment and evaluate the effectiveness of steps taken to mitigate hazards. Summarize the risks in three separate categories and judge the acceptability of incurring these risks to accomplish objectives:

K.1.2.1 Risk of major damage to the facility;

K.1.2.2 Risk of damage to the test article; and

K.1.2.3 Risk to personnel.

K.1.3 Determine the adequacy of safety procedures and shutdown modes.

K.1.4 Review the list of all procedures needed to perform the test operation.

K.1.5 Review test procedures to the extent necessary.

K.1.6 Determine the adequacy of quality controls requirements and their implementation, which affect safety.

K.1.7 Ensure pressure systems are certified, or have an approved deviation/waiver or abatement plan in accordance with MPR 8710.1. Contact the Center's Pressure Systems Manager for more information on this process.

K.1.8 Review any open action items and ensure their closure. Assign action items as needed.

K.1.9 Decide whether or not to perform test operations.

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| <b>Marshall Work Instruction<br/>QD01</b>                |                               |                      |
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## **APPENDIX L EXAMPLE READINESS REVIEW REPORT FORMAT AND CONTENT**

The product of a readiness review is the final report. It documents the logic of the readiness review, conveys the results, and provides the conclusions and findings from the readiness review along with the process by which they were developed. The readiness review final report is the basis for the facility/operation being acceptable to begin or resume safe operations.

L.1 The final report normally contains the following information:

L.1.1 A summary of the readiness review activities;

L.1.2 Identification of the number of findings, action items to be completed and their status;

L.1.3 Identification of residual risks that remain;

L.1.4 Identification of any recommendations;

L.1.5 Identification of any request for relief (deviations and waivers); and

L.1.6 Conclusions.

L.2 Basic format of an ORI Review Final Report:

L.2.1 Title Page: State the subject and date of the review. The report cover is to be as clean as possible, and not contain any extraneous information, data, graphs, or pictures.

L.2.2 Signature Page: Contains the signatures of readiness review members. It signifies the agreement of the members as to the report content and conclusions in their assigned area(s). If the member signature cannot be obtained due to logistical considerations, the readiness review leader may gain their concurrence via fax or telecon, and sign for them.

L.2.3 Table of Contents: Self-explanatory.

L.2.4 Executive Summary: A one-to-three page synopsis of the readiness review, findings, and readiness determination. It is to introduce information and direct readers to those portions of the report that provide more detail concerning the information. Some suggested points to be considered include:

*NOTE: A brief synopsis of the readiness review activities that provide information concerning the committee's evaluation of readiness.*

L.2.5 Introduction: Provide information and background regarding the facility/operation being reviewed, the reason(s) for shutdown (if a restart), the purpose of the review, and the scope of the

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facility/operation being evaluated. Other information that can be provided includes a brief discussion of:

L.2.5.1 The overall objectives of the review;

L.2.5.2 The assessment process and methodologies used in the review;

L.2.5.3 The team composition; and

L.2.5.4 Definitions applicable to the assessment.

L.2.6 Assessment Evaluation: List all findings and provide details of each finding such as constraint/non-constraint, the corrective actions and status, and the readiness review's final conclusion subject to closure of identified constraints.

L.2.7 Lessons Learned: The report can identify Lessons Learned that can be applied to design, construction, operations, and decommissioning similar facilities and to future reviews. The report can address the problems and successes encountered in the readiness review (what worked and what did not).

L.2.8 Appendices: Provide for the data that supports the readiness review. Supporting data to include:

L.2.8.1 A copy of the Appointing Letter establishing the readiness review;

L.2.8.2 Authorization to activate signed by the Approving Authority;

L.2.8.3 Readiness review meeting minutes;

L.2.8.4 Review Preparation Plan (include Prerequisite Checklist);

L.2.8.5 Evaluation and review criteria;

L.2.8.6 Readiness review presentation charts;

L.2.8.7 Any correspondence directly related to the review; and

L.2.8.8 Any additional information the readiness review members deem is needed to support the review and recommendations.

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| <b>Marshall Work Instruction<br/>QD01</b>                |                               |                      |
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**APPENDIX M  
EXAMPLE AUTHORIZATION TO STARTUP/RESTART A HIGH OR MODERATE  
RISK FACILITY/OPERATION**

April 26, 1999

TO: ED01/Director

FROM: ET10/Chairman, Safety Readiness Review

SUBJECT: 250K Hybrid at Test Stand 161

The Safety Review Team (SRT) has completed its review of Test Stand 161 in preparation for the testing of the 250K Hybrid motor. Currently, there are 10 Findings/Recommendations listed in the SRT Report that remain open and affect the 250K Hybrid motor testing. The open Findings/Recommendations are as follows: 001, 002, 003, 004, 005, 006, 011, 012, 015, and 021. The Findings/Recommendations are attached. On the closure of these open Findings/Recommendations to the satisfaction of the SRT, it is recommended that Test Stand 161 be authorized to begin operations of the 250K Hybrid motor testing.

XXXXXXXX  
Test Laboratory

cc:  
ET10/ XXXXXXX  
ET20/ XXXXXXX  
ET40/ XXXXXXX

Concurrence:

\_\_\_\_\_  
XXXXX  
Supervisor/Test Laboratory

\_\_\_\_\_  
Date

|  |                               |                      |
|--|-------------------------------|----------------------|
| <b>Marshall Work Instruction<br/>QD01</b>                |                               |                      |
| <b>Hazardous Operations Readiness<br/>Review Program</b> | <b>MWI 8715.17</b>            | <b>Revision: E</b>   |
|  | <b>Date: October 30, 2020</b> | <b>Page 44 of 46</b> |

**APPENDIX N  
EXAMPLE AUTHORIZATION TO STARTUP/RESTART A LOW RISK  
FACILITY/OPERATION**

Asbestos Abatement and re-insulation of Autoclave outside room 128 building 4707.

The paint selected to be applied to the autoclave is high-temperature paint, product code 1027 from Hi-Temp Coatings Technology, 629 Massachusetts Avenue, Boxborough, MA 01719. The SDS for this paint identified the physical/chemical characteristics as having a flash point of 65<sup>0</sup> F/18.33 °C and a vapor density heavier than air.

An operational readiness review of the projected work was held to discuss the hazards associated with this paint and agree with the controls measures necessary to reduce these hazards to a safe working level. It was agreed that the hazards associated with the work would fall into the low risk level per MWI 8715.15. A Safety Assessment was performed using a Job Hazard Analysis (enclosure 1) to identify the potential hazards and the recommended control actions.

This work is projected to start April 25-26, 2009. The following signatures confirm that all recommendations or equivalent control actions to eliminate or control each identified concern of the attached Safety Assessment have been implemented and agree the projected work can proceed.

Center Facilities Management Office COR for this job:

\_\_\_\_\_ date \_\_\_\_\_

EM Supervisor responsible for this area:

\_\_\_\_\_ date \_\_\_\_\_

Construction Superintendent/Foreman for this job:

\_\_\_\_\_ date \_\_\_\_\_

Center Safety Office representative for this job:

\_\_\_\_\_ date \_\_\_\_\_

|  |                               |                      |
|--|-------------------------------|----------------------|
| <b>Marshall Work Instruction<br/>QD01</b>                |                               |                      |
| <b>Hazardous Operations Readiness<br/>Review Program</b> | <b>MWI 8715.17</b>            | <b>Revision: E</b>   |
|  | <b>Date: October 30, 2020</b> | <b>Page 45 of 46</b> |

**APPENDIX O  
EXAMPLE OF A TYPICAL TIMELINE FOR A READINESS REVIEW**



