

# Guidance for Efficient Resolution of Post-Contract Award MA Requirement Issues

June 30, 2012

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Systems Engineering Division

Prepared for:

Space and Missile Systems Center  
Air Force Space Command  
483 N. Aviation Blvd.  
El Segundo, CA 90245-2808

Contract No. FA8802-09-C-0001

Authorized by: Space Systems Group

Developed in conjunction with Government and Industry contributions as part of the U.S. Space Programs Mission Assurance Improvement Workshop.

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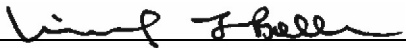
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## **Executive Summary**

It is generally recognized that requirements changes or nonconforming product dispositions will take place after formal agreement award and during a program's development and production cycles. There can be many reasons for the changes. A simple example would be the substitution of a better inspection technique for one which was specified in the original formal agreement due to advancement in inspection technology. Requirement change and nonconforming product disposition can most often be managed through existing program structures. For example, a change in part specification or a part requirement waiver can be handled through a program's Parts, Materials and Processes Control Board (PMPCB).

Sometimes issues which are difficult to resolve require a knowledgeable group of stakeholders and decision makers to sort through. This document provides a best practice to address those requirements concerns for which normal program processes are inefficient or inadequate. These types of concerns should be addressed through the formation of a persistent stakeholder working group that serves as a mechanism to rapidly identify and efficiently resolve requirement issues, referred to in this paper as the Mission Assurance Working Group (MAWG).

The MAWG supports MA Requirements Lifecycle Management in three ways. The first is in support of planning to identify the most efficient path to resolution of requirement issues. The second is in facilitating the completion of actions, and the third is in documenting the decisions and actions to provide a permanent record of the decision and agreements made.

The MAWG may be a standing group which programs utilize when the need arises, or it may be an ad-hoc group which is chartered to deal with specific issues. It is not the purpose of the MAWG to reduce requirements or to reduce the involvement of appropriate program boards and responsible parties. MAWG processes emphasize early understanding of the source of the requirement in question, the identification of the correct stakeholders, and using the most efficient adjudication path. The goal is to decrease inefficiencies due to misunderstanding; inefficient requirements change (or disposition) management strategies, or the lack of appropriate decision maker's participation at critical stages of the change process.

U.S. Space Programs should establish this working group to affect cost and schedule efficiencies in interpreting and managing the resolution of complex requirements related issues.





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## 1. Introduction

The Post Award Mission Assurance (MA) Requirements Lifecycle Management team was chartered for the 2011-2012 Mission Assurance Improvement Workshop (MAIW) cycle. The MAIW was formed in 2007 by the U.S. space community to develop and codify the best practices to meet key challenges to U.S. Space Program mission assurance. Each year SME topic teams are formed to work on key topics. The teams typically produce or enhance guidance documents that may evolve into written standards, best practice guides, and/or contractual compliance documents. The MA Requirements Management topic team met weekly via teleconference and periodically in person during the ten month project cycle. Significant contributions to this product were provided by members of the team from industry, government, and academia.

In starting this project, requirement management and modifications examples were collected from contractors (industry) and customers (government) to identify requirements management inefficiencies. In examining the example issues, the greatest opportunities for improvement were found to be in developing a consistent general, top-level approach to post award management of requirements and in recommending the development of a Mission Assurance Working Group (MAWG) to help organizations manage issues that do not fit cleanly into one of the existing post award requirements management processes.

In developing solutions, the definitions of key terms and the current processes for managing post-award requirements [e.g., Parts Materials and Processes Control Board (PMPCB), Material Review Board (MRB)] were also reviewed. These processes were found to be primarily common and relatively effective across the industry. A recommended set of standard definitions is provided in Section 2 and a limited treatment of key success factors for these common processes is included in Section 5. The role and functioning of an MAWG are described in Section 5.2

This document provides guidance to organizations in efficiently managing post contract award requirements lifecycle management. These recommendations cover the entire path from identification of ambiguous, contentious, or unresolved requirements through formal agreement and, if needed, document change completion.



## 2. Definitions

A set of common definitions are used in this document. These definitions are intended to provide a basis for a common understanding and use of terms across U.S. Space Programs.

Table 1. Definitions

Term/Acronym	Definition
Adjudication Process	The process of review, concurrence, and approval of a request for relief from or clarification of a requirement. A request is adjudicated when all steps in the process are complete. (NASA-STD 8709.20)
Adjudication or Decision Authority	The management official (or group) who has the authority to approve interpretation or modification of a requirement
Derived Requirement	A requirement which is extracted or formulated from a higher level requirement.
Directed Requirement	A requirement which is mandated to be flowed down verbatim (e.g., OSHA and Department of Transportation Regulations)
Deviation	A specific written authorization to depart temporarily from a particular performance or design requirement of a specification, drawing, or other formal agreement document for a specific number of units or a specified period of time. (SMC-S-002)
Engineering Change Proposal (ECP)	A request for a change to the formal agreement requirements
Exception	A written authorization granting permanent relief from a specific, non-applicable requirement. (NASA-STD 0005)
Mission Assurance (MA)	The disciplined application of general systems engineering, quality, and management principles towards the goal of achieving mission success, and toward this goal, provides confidence in its achievement. MA focuses on the detailed engineering of the acquired system, and toward this objective, uses independent technical assessments as a cornerstone throughout the entire concept and requirements definition, design, development, production, test, deployment, and operations phases. Mission Assurance Guide (MAG)
Mission Assurance Requirements	Those requirements needed to achieve mission success and mission assurance at key decision points (KDP) and during operations and disposal. These requirements may be imposed by the MA organization or other project management. They exclude technical requirements conveyed in specifications and drawings. MA requirements are usually contained in Statements of Work, Product Assurance Documents, and other reference documents.
Non-conformance	The state or situation of not fulfilling a requirement. NPR 8735.1B, Appendix A
Prime	The organization that is the lead integrator for an item or service and has the responsibility for delivery of that item or service.
Source Document	The publication where a requirement is specified.
Stakeholder	A person or group that has an interest or actionable responsibility in the outcome.

Term/Acronym	Definition
Sub	The organization that is producing an item or providing a service for a prime.
Supplier	An organization contracted to provide piece parts, materials, or off the shelf items to a prime or sub.
Tailor or Tailoring	(Refers to Pre-Contract Award) To make, alter, or amend for a particular end or purpose. In performance-based contracting, the process by which sections, paragraphs, and sentences of specifications, standards, and other requirements and tasking documents are evaluated to determine the extent to which they are applicable to a specific acquisition formal agreement and then modified to balance performance, cost, schedule, and risk. (NASA-STD 8729.1)
Waiver	A written authorization to accept an item, which during manufacture, or after having been submitted for government inspection or acceptance, is found to depart from specified requirements, but nevertheless is considered suitable for use "as-is" or after repair by an approved method. Military-Standard (MIL-STD-973)

## **3. Examples**

### **3.1 Introduction / Methodology**

In defining the charter for this product, the MAIW Steering Committee provided example problems which had created delays and cost growth in programs. The topic team augmented this list with examples from our collective experience. Essential elements of information about each example were collected to allow the group to compare examples and observe trends. A brief explanation of the purpose and definition of each factor collected in the examples is included in Appendix A.

### **3.2 Examples**

#### **3.2.1 Assembly-Level Issue Example (Part Level Performance)**

The customer and prime flowed down higher level performance requirements for the assembly that the subcontractor will provide. The subcontractor then writes a specification document which includes detailed requirements that are derived from the higher level requirements. For example, the customer or prime may specify the performance requirements for the assembly while the subcontractor's detailed specification document would include current and voltage output characteristics of the assembly that are required to meet the higher level requirements. The subcontractor encounters continual minor test discrepancies against performance parameters that require MRB action to disposition.

Since the requirement is a derived requirement that has been flowed down through multiple layers from system to subsystem to box to part, and the program is in the manufacturing phase, the subcontractor's MRB may not understand the actual original basis for the requirement and may not have access to a prime level Engineering Review Board that could actually make a requirement clarification or adjustment that would alleviate the repetitive MRB process associated with the minor test discrepancies. So, the subcontractor continually cycles the issue through their own MRB since that process is understood. This can be a costly approach if the subcontracted assembly is going to be manufactured in large quantities and each one has the same minor test discrepancies.

A better solution would be to determine if the minor test discrepancies could be resolved through a derived requirement change while still maintaining the higher level requirement. The ability to maintain the higher level requirement while changing the derived requirement is not an unusual situation. Sometimes the derived requirements are written too tightly and there is margin to the original higher level performance requirement.

The root cause of the continual cycle through MRB is that the appropriate Engineering Review Board and appropriate stakeholders up through to the source requirement holders were not engaged to solve the problem. The result was increased paperwork, cost, and schedule due to an ineffective MRB. One reason for the breakdown is the time lag between the pre-CDR requirement flow-down and identification of the issue in production. Program personnel during production may be unfamiliar with how, why, or by whom the requirement originated.

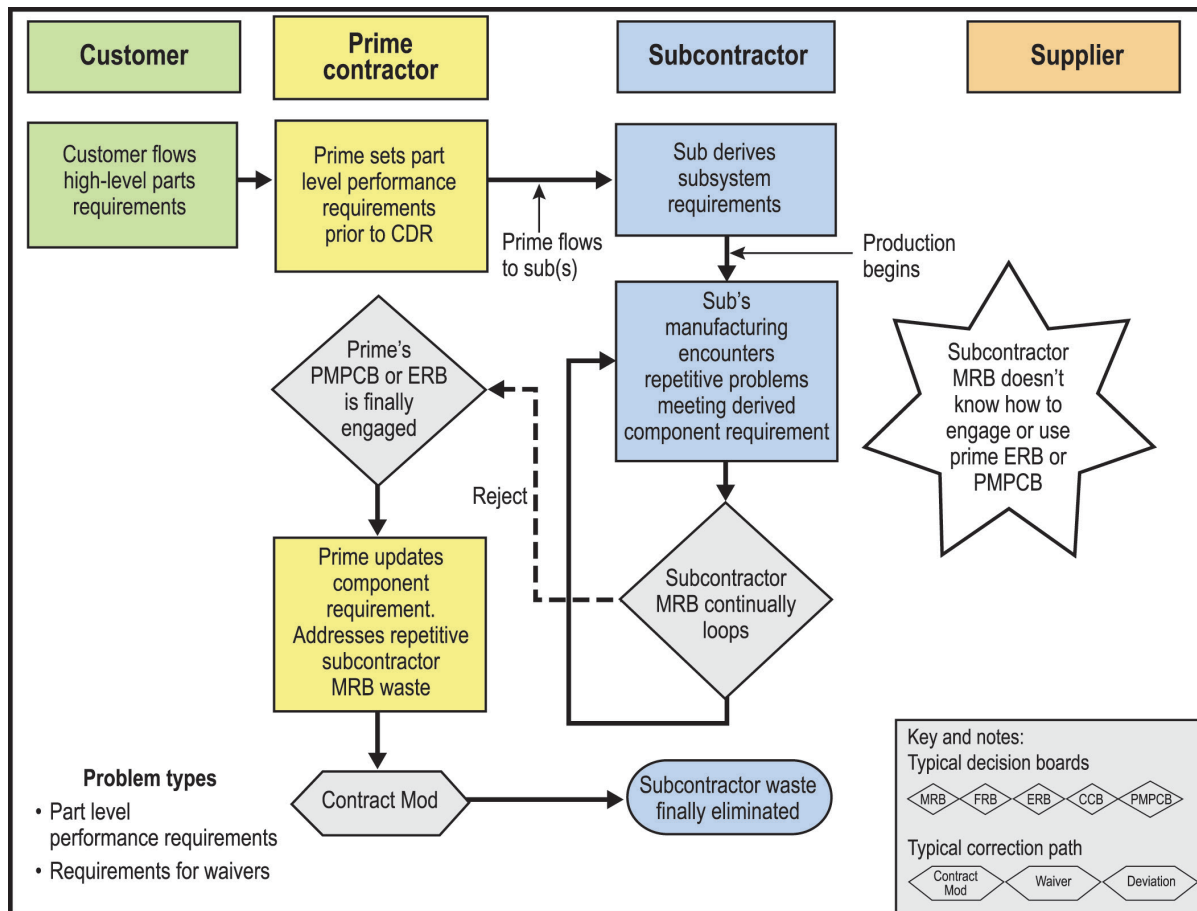


Figure 1. Assembly level discrepancy.

### 3.2.2 Requirement Change Process Example (Requirement Change)

This general category captured eight of the example problems identified. Figure 2 identifies several of those problems. In each of these examples a requirement changed and in each case the resolution of the requirement change resulted in additional cost and delay. In general the source of the requirement is found in the formal agreement. The stakeholders can include parties from the end customer down to the suppliers. Typical adjudication processes are slow, resulting in lagging changes which impact program cost and schedule. In extreme cases, these late changes can contribute to latent test or operational failures. Example 10 in Appendix A (Corona and Multipaction Requirements) is descriptive of a requirement change problem. Ultimately the breakdown is a communication/definition not provided in a timely manner to pro-actively stop the problems from occurring. Refer to Appendix A for more detail on each of these eight problems analyzed.

### 3.2.3 Resolution of Requirement Non-Compliance (Non-Compliant Hardware)

Figure 3 is an example of a typical problem encountered with requirement non-compliance. The distinction is that this is a process non-compliance and the risk is that more than one piece of hardware may be involved. In this case the customer flowed specific MRB requirements to the prime and the prime flowed them to the subcontractor. The subcontractor manages a supplier to produce the particular hardware. The supplier has a different definition for Rework and Repair operations than intended by the customer/prime. The supplier produces hardware which requires repair, but unknowingly takes this action without subcontractor approval. The result is potential non-conforming hardware produced with a repair operation. The downstream problems are more substantial. The red



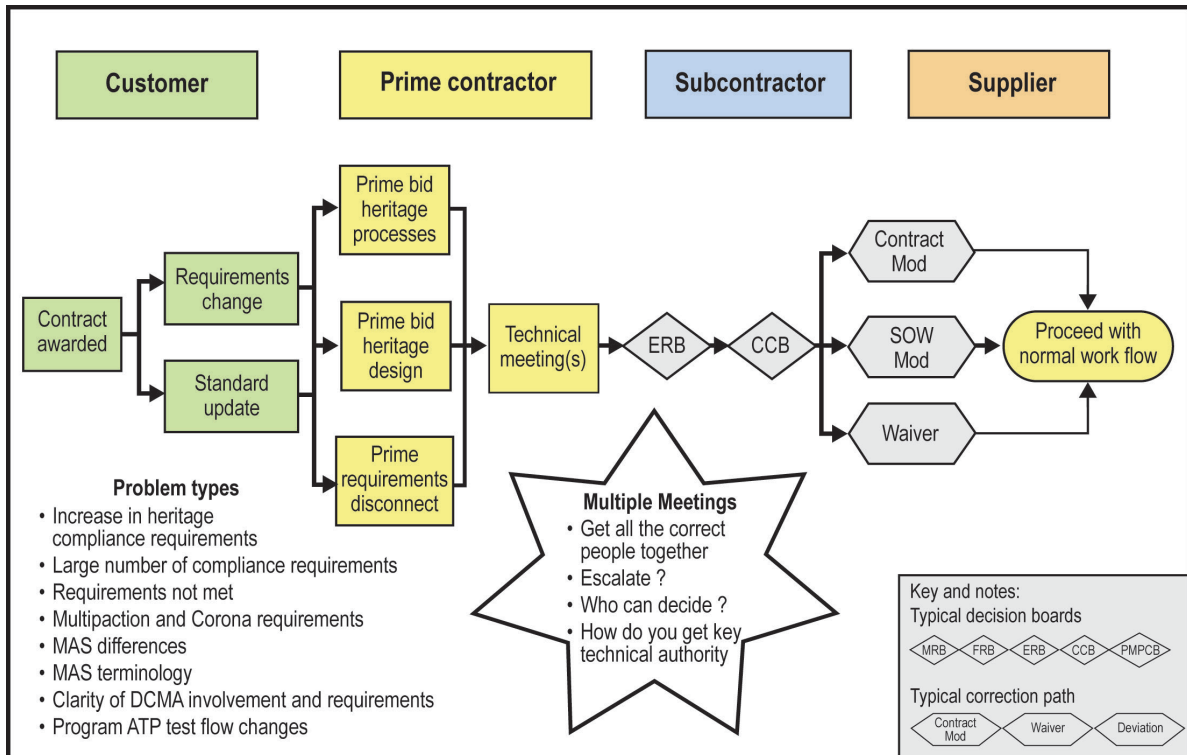


Figure 2. Requirement change flow.

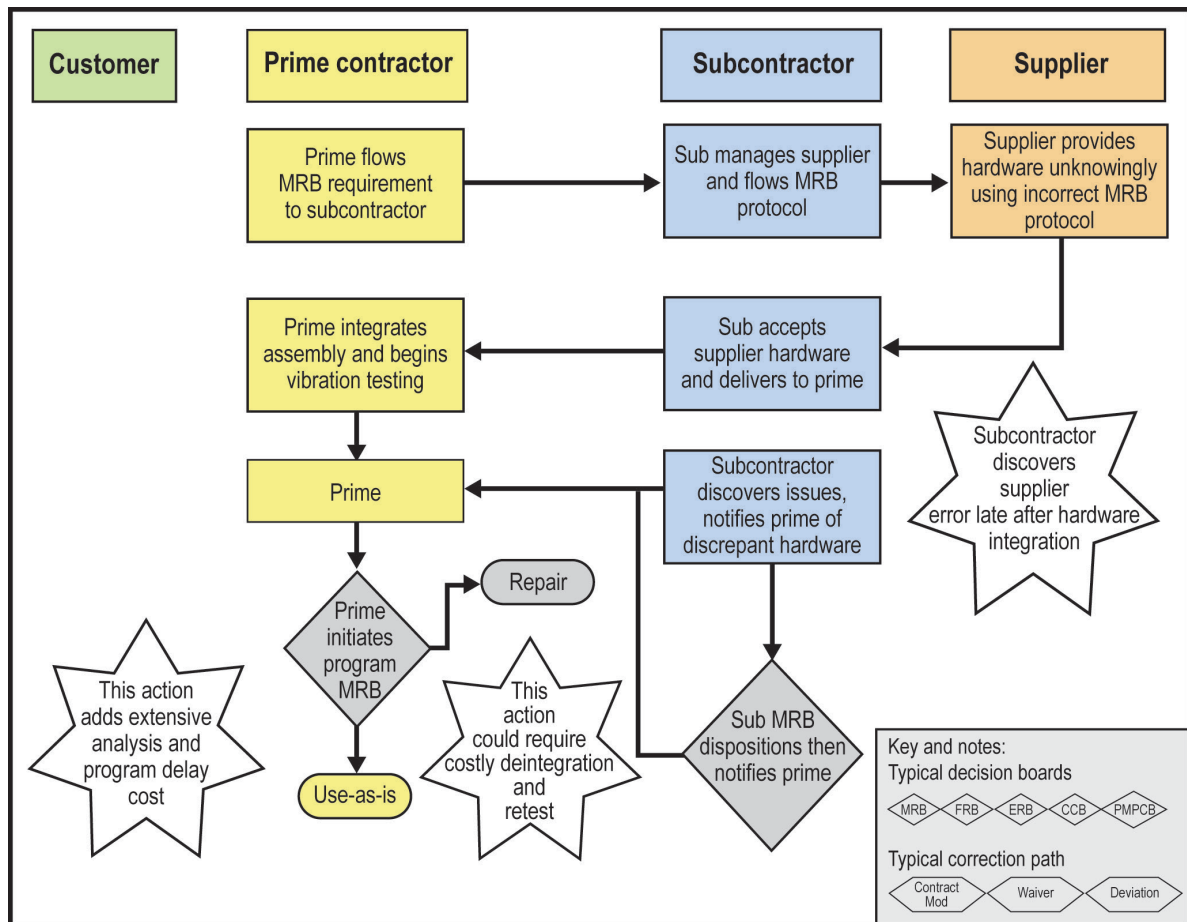


Figure 3. Requirement non-compliance-MRB.

stars shown in Figure 3 highlight the problem and costly downstream effects. For a large program these effects will always be very costly in terms of program delay, additional analysis, or testing required accepting or de-integrating the non-conforming hardware. This illustrates the classic case where early issue detection and resolution is critical.

The problem breakdown actually occurs well upstream of problem detection. Again refer to Figure 3. The breakdown occurs between the subcontractor and supplier. The subcontractor assumes the supplier has thorough knowledge of the expected Material Review Board (MRB) protocol and process. He may very well have flowed down formal agreement language which he understands clearly. The supplier obviously has his understanding of the MRB requirements, but the breakdown is that a complete understanding is not in place between subcontractor and supplier. Both the supplier and the subcontractor believe that they are clear. This type of problem compares with the Requirement Change and Part Issue problem classes but there are contrasting details.

In this category of problem there is generally no issue with the actual requirement, a changing requirement, or a derived requirement in the case of a part issue. This is a case of a breakdown in human understanding of how to meet a requirement. In large measure this class of problem can be attributed to inadequate communication between the subcontractor and supplier and lack of standard feedback checks and balances in the procurement process. There are critical assumptions made with regards to the clarity of the MRB process execution and its outputs, and likely insufficient interaction between the subcontractor and supplier.

## 4. Process Guidance

After reviewing the problem types addressed in the prior section an approach was developed to guide future programs past the common hurdles encountered. The general approach outlined in this section is applicable regardless of level within formal agreement hierarchy (government to prime, prime to subcontractor, subcontractor to supplier, etc.).

In any formal agreement there are two parties: the giver, the one who is providing a service or product to the other party; the receiver, one who establishes the agreement with the giver to define the nature of the service or product to be delivered. Both parties can introduce terms in the agreement that clarify expectations. Mission assurance requirements are often derived from external parties (government standards, contractor command media, derived requirements from another formal agreement terms, etc.).

Figure 4 illustrates a notional formal agreement hierarchy, with multiple giver-receiver relationships. The figure depicts a four level linear hierarchy. More levels or more complex relationships may exist on a program. The arrows represent the requirements flowing down from the top-level. Products flow from the bottom up. The product provider is the “Giver” noted in the diagram. As part of any requirements change process, a full understanding of the source and rationale for the requirements is required.

Figure 5 is the recommended process for managing requirements changes. It is developed from best practices across the industry. Each row represents a “swim lane” of responsibility with the parties responsible identified in the far left column. The boxes in each “swim lane” represent the key activities to be performed in resolving requirement issues. The gold box represents the process step where the adjudicating body for the issue is determined. A more complete description for each activity is provided in the following sections. The number in the box corresponds to the paragraph providing detail on that process step.

### 4.1 ID Requirement Issue within Formal Agreement

The first step is to identify the requirement that is at issue. Typically the giver or receiver identifies an issue with a requirement. However, an issue may also be identified at a higher stage of the supply chain. Issues can include:

- a requirement cannot be met and approval for a deviation is necessary (Deviation)
- a request for acceptance of a discrepancy from requirement (Waiver)
- a requirement cannot be met and an engineering change is required (ECP)
- a missing or TBD/TBR requirement needs to be resolved
- a difference in interpretation of a requirement needs to be resolved
- New requirement is levied and impact needs to be determined

### 4.2 Determine Requirement Source

Correct identification of the source of a requirement and understanding of the rationale for its existence is required for effective resolution. Once identified, the party that originates the requirement in the formal agreement is responsible for tracing the requirement back to its source. The source may not be immediately obvious. For example, in reference to Figure 4, in the case of a supplier agreement with a vendor, there may be flowed-down or derived requirements that need to be identified in tracing back to the original customer’s terms or standards. It is possible for terms to be

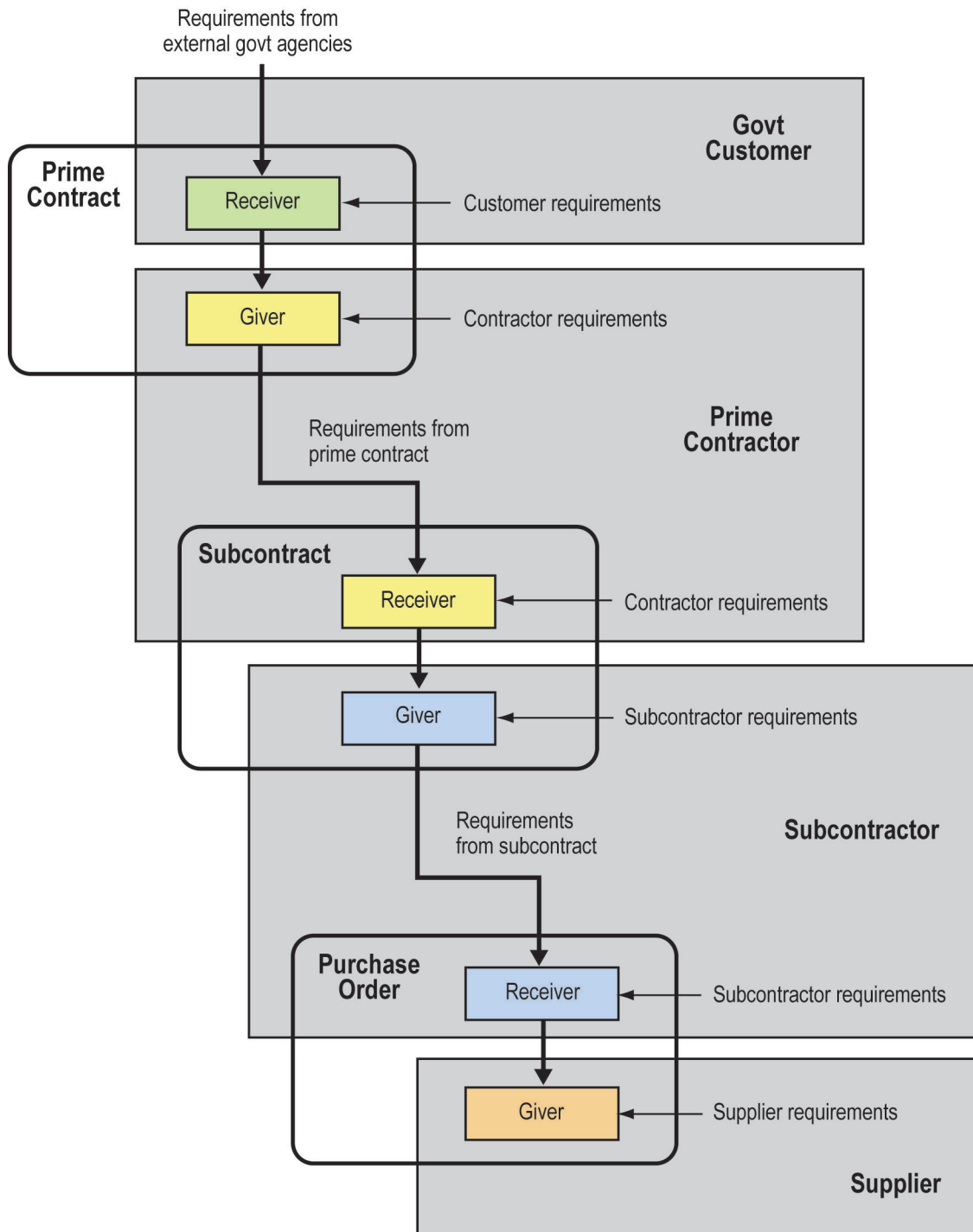


Figure 4. Program giver receiver hierarchy.

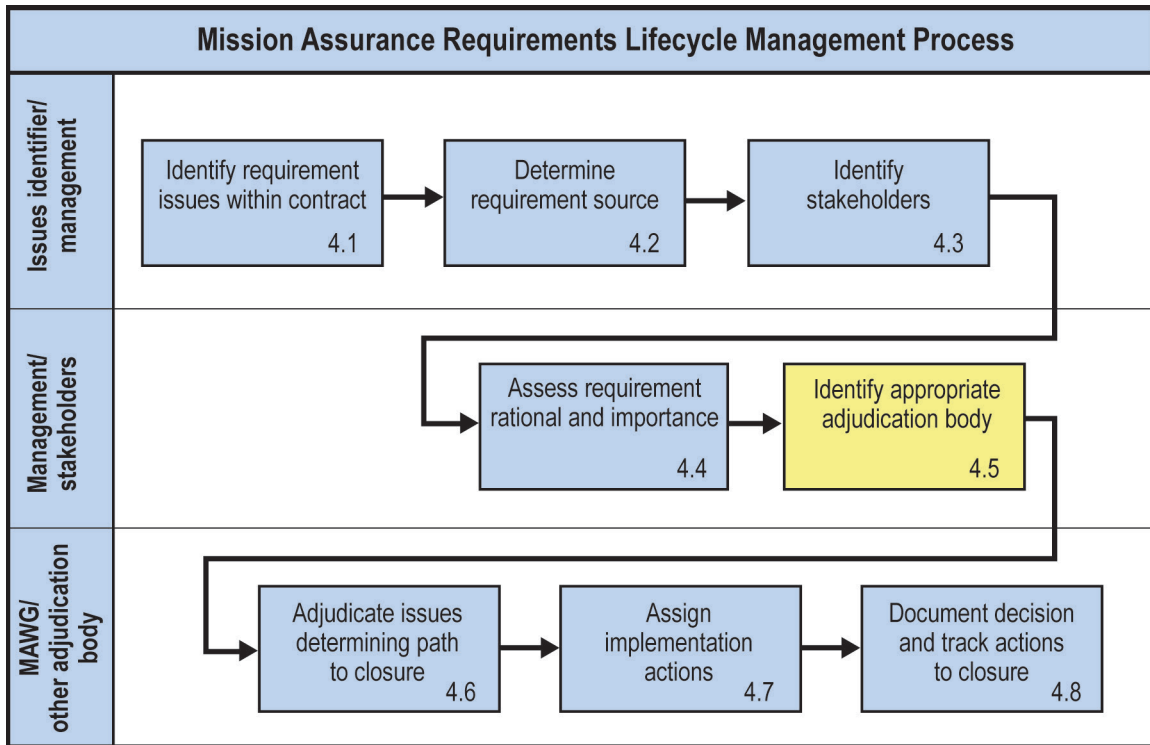


Figure 5. Process guidance.

modified or added to at varying levels in the nesting of formal agreements. All the changes to the terms with their respective rationales must be understood in order to assess the impact of the non-compliance or non-conformance.

### 4.3 Identify Stakeholders and Decision Authorities

It is necessary to identify all decision authorities and stakeholders early. The issue identifier working with management is responsible for identifying the relevant parties. Since changes to the original requirement may be influenced by multiple parties through multiple agreements, decision authorities and stakeholders must be identified at each level. All rationale for the requirement at issue needs to be documented. Each rationale will need to be addressed to create an acceptable resolution.

### 4.4 Assess Requirement Rationale and Importance

Once the source and the rationale for the requirement have been identified, the importance of the rationale must be understood. Mission assurance requirements often revolve around proven technical practices that embody lessons learned from various parties' experiences. For example, a company may require a particular margin or design practice because they have encountered failure when such practices were not followed. Additionally, the government or other external customer may require a technical practice be followed due to painful experiences learned across multiple programs. Departure from proven practices must be very carefully considered. Without understanding the rationale of the requirement, the same failure could be repeated. Stakeholders must have a full understanding of the rationale for the requirement in order to properly adjudicate the impact. If the requirement source is at a different level of the supply chain than the issue, the adjudication processes at the requirement source level may need to be engaged. Coordination and approval from appropriate stakeholders should be factored into the closure path.

#### **4.5 Identify Appropriate Adjudication Body**

The parties trying to resolve an issue need to determine the most appropriate adjudication body/bodies. The typical program adjudication bodies and their roles are detailed in Section 5 of this document. A number of factors have to be considered when selecting the appropriate adjudication bodies. These factors include: the urgency of resolving the issue; and the nesting of adjudication bodies across supply chain levels. The urgency of the issue may influence the adjudication closure path recommended. It may not be possible to resolve the issue in a serial fashion through multiple layers of reporting through multiple nested agreements. The MAWG, which includes all stakeholders, can be invoked to bring issues to the surface, determine the appropriate closure path, and facilitate and track tasks to bring the issue to closure.

Due to proprietary concerns of various stakeholders, the parties may not be willing to share their respective rationales which impact the requirement at issue. These concerns may drive a serial approach. In this case the MAWG can coordinate the resolution of the issue through all levels of the supply chain, while privacy and proprietary information is protected.

#### **4.6 Adjudicate Issue Determining Path to Closure**

The adjudication body assesses the issue with respect to the rationale for the requirement. The adjudication body establishes a resolution path that is acceptable and implementable.

#### **4.7 Assign Implementation Actions**

The adjudication body proposes a closure path. The closure path needs to clearly identify all actions and those responsible for their closure. In addition, the path should clearly identify all required approvals, and the schedule required to accomplish tasks, considering all approval interdependencies. Often in multiple supply chain level agreements, approvals must be requested and granted in a hierarchical order. Identifying approval relationships is crucial to developing a successful closure path. The MAWG may manage the adjudication and closure process.

#### **4.8 Document decision and Track Actions to Closure**

Part of the adjudication process should include the formal documentation of the decisions and closure path. Formal agreements should be modified to reflect the agreement as necessary at all levels.

## **5. Adjudication Bodies**

The intent of this section is to provide guidance in assuring that the proper adjudication body has been selected once all of the determining factors have been assessed as discussed from Section 4. The adjudication bodies described below are the typical formal bodies that are established within organizations that will evaluate and take on actions for the issues presented. The MAWG introduced in Section 4.1 is further described in Section 5.3.

It is important to note that in every case the contractual and/or other regulatory agency requirements that apply to the issue being reviewed must be clearly understood. For example, different mission classes (A through D), formal agreement types (firm fixed price or cost-plus, etc.) or software requirements may have a direct impact on board membership or functionality. Direct requirements such as customer participation in any of the boards may also have an impact on who must attend, review, or approve dispositions. Also, there should not be any misunderstandings of the issue based on poor or missing documentation of an issue.

### **5.1 Existing Adjudication Bodies**

Each of the adjudication bodies and their descriptions in Table 2 has been reviewed by the MAIW team. The descriptions should be considered general information. For each board, a definition, typical issues adjudicated, inputs needed for adequate decision making, standard outputs, and typical minimum membership are described. Note: Membership to each of these boards will vary depending on the specific item under adjudication as well as potential contractual requirements.

Table 2. Standard Adjudication Bodies

Adjudication Process	Typical Definition	What are the Typical Issues Adjudicated by this Board?	Typical Inputs Needed to Adequately Address the Issue	Typical Outputs Produced by this Board that Provide a Record and/or Require Follow-on Activity	General Comments or Points of Information about this Board
Material Review Board (MRB)	A formal board established to review, evaluate, and disposition specific nonconforming materials, supplies, and services to ensure the implementation of corrective actions. MRB membership is typically determined by specific programs or projects via their signature authority.	Nonconforming hardware, software, or processes identified during internal manufacturing operations, supplier manufacturing operations, receiving inspection and testing operations, internal inspection and testing operations, issues identified during technical reviews issues and/or issues identified post delivery. <ul style="list-style-type: none"> <li>Review and approval of Standard Repair Procedures.</li> </ul>	<ul style="list-style-type: none"> <li>Nonconformance documentation/reports that have been reviewed for clarity and accuracy of the issue prior to submission to the MRB.</li> <li>Approved standard repair procedures.</li> </ul>	<ul style="list-style-type: none"> <li>Nonconforming hardware, software, or process dispositions including Return to Supplier, Repair, Rework, Scrap, or Use As Is.</li> <li>Approval for use of approved standard repair procedures.</li> </ul>	<ul style="list-style-type: none"> <li>Typical MRB membership will not include customer participation unless otherwise contractually defined.</li> </ul>
Failure Review Board (FRB)	A formal board established to provide oversight, direction and evaluation of failures detected during qualification, acceptance, system validation or operational testing. Led by senior personnel with authority to formally review and direct the course of a root-cause investigation and the associated actions that address the failed system. FRB serves as the governing board that steers the investigation efforts.	Failures that occur during acceptance testing, qualification, or proto-qualification of a flight element, in which the initial investigation of the anomaly has not isolated the cause to test equipment, test procedure, or operator error.	Complete documentation associated with test failures (the UUT does not meet minimum performance requirements), test anomalies (unplanned or unexplained condition that deviates from expectations), and electrical, mechanical, and thermal overstress.	<ul style="list-style-type: none"> <li>Determination of failure root cause.</li> <li>Basis of investigation results documented via selected root cause analysis tool.</li> <li>Residual risk assessment developed commensurate with understanding and basis for failure cause.</li> <li>Remedial actions and corrective actions.</li> <li>Identification of potential impact to similar components, subsystems and/or systems on the same and other programs.</li> <li>Forward plans and actions.</li> <li>Recommend corrective and/or preventive actions for Enterprise consideration.</li> </ul>	<ul style="list-style-type: none"> <li>FRB membership will typically include customer participation unless otherwise contractually defined.</li> </ul>



Adjudication Process	Typical Definition	What are the Typical Issues Adjudicated by this Board?	Typical Inputs Needed to Adequately Address the Issue	Typical Outputs Produced by this Board that Provide a Record and/or Require Follow-on Activity	General Comments or Points of Information about this Board
Engineering Review Board (ERB)	A formal board established to review all significant technical changes. Responsibilities include ensuring technical validity of the proposed changes, identifying all technical impacts (including cost and schedule), and validating formal agreement scope determination. Board membership includes the Chief Engineer, Engineering technical leads, System Engineering, Mission Assurance and supporting SMEs based on the technical change being addressed.	Significant program and/or enterprise technical changes. Examples: Baseline design change that effects product fit, form, or function. <ul style="list-style-type: none"> <li>Methodology changes to include modeling, analysis, risk assessment.</li> <li>Changes to baseline testing requirements, testing sequences, or TLYF assumptions.</li> </ul>	Documentation associated with the proposed change to include technical, cost, schedule, and contractual impacts.	Developing change recommendations for CCB implementation.	
Parts, Materials, Processes Control Board (PMPCB)	A formal board established to facilitate the selection and approval of parts, materials, and/or processes that are used for flight hardware. The typical membership will include project representatives and subject matter experts in the areas of parts, materials, and processes along with representatives from engineering.	<ul style="list-style-type: none"> <li>Evaluation and disposition of in-house and subcontractor parts, materials, and processes including screening and/or qualification, application, and waiver/deviations.</li> <li>GIDEP evaluations.</li> </ul>	<ul style="list-style-type: none"> <li>Rationale information/data for application usage.</li> <li>Proposed screening and qualification processes or procedures.</li> <li>Radiation application and review information.</li> <li>Listing of proposed parts, materials, and processes to be used.</li> <li>GIDEP advisory information.</li> </ul>	<ul style="list-style-type: none"> <li>Approval of proposed parts, materials, and/or processes.</li> <li>Recommended dispositions of PMPCB waivers/deviations.</li> <li>Disapproval of proposed parts, materials, and/or processes.</li> <li>CCB Action.</li> <li>Approved parts, materials, and processes listing.</li> <li>Inputs for GIDEP dispositions.</li> </ul>	Typical PMPCB participation does not include representatives from quality or mission assurance. They are invited to attend for informative reasons; however, they are generally not voting members on issues presented.

Adjudication Process	Typical Definition	What are the Typical Issues Adjudicated by this Board?	Typical Inputs Needed to Adequately Address the Issue	Typical Outputs Produced by this Board that Provide a Record and/or Require Follow-on Activity	General Comments or Points of Information about this Board
Configuration Control Board (CCB)	A formal board established to control the hardware and software baseline configuration of a program/project. The CCB will typically consist of representatives from various disciplines and organizations of the program/project typically including engineering, configuration management, and mission assurance.	<ul style="list-style-type: none"> <li>• Review and release of baseline product definition.</li> <li>• Review and disposition of proposed changes to the product definition.</li> </ul>	<ul style="list-style-type: none"> <li>• Engineering Change Notices or Requests (ECN/ECR).</li> <li>• Engineering documentation including Interface Control Documents, design drawings, engineering specifications, project plans, software coding, and other products,</li> </ul>	<ul style="list-style-type: none"> <li>• Baselined and revised baselined products for hardware and software as described under the Inputs.</li> <li>• Action by the Configuration Management processes to implement approved changes.</li> </ul>	

## **5.2 Mission Assurance Working Group**

In the following sections, we will describe the recommended top level process for managing Mission Assurance Requirements and describe the role of various boards in the requirements process. In preparation, we are introducing the concept of a Mission Assurance Working Group (MAWG). MAWGs can play a key role in the successful execution of both the top level planning process and in many cases the detailed management of specific MA requirements issues.

The MAWG can be used across all levels of the supply chain. Its purpose is to provide a schedule and cost-efficient process to resolve MA requirements issues.

Programs should setup an MAWG for a number of reasons. First, it is a mechanism to rapidly identify and efficiently resolve requirement issues. Second, its construct supports the involvement of relevant stakeholders. Third, it ensures the engagement and efficient use of the program's decision authorities. Finally, it promotes efficiency by minimizing the number of meetings needed to resolve requirement issues.

The Mission Assurance Working Group performs three primary functions. The first is preparation of complex requirement issues for appropriate adjudication bodies. For example if the source of a requirement is not easily understood or is many levels removed from where the issue occurs, the MAWG can assist in identifying the original source and the pathway to adjudication. The second is management of adjudication of requirement issues that do not clearly belong to an existing adjudication body. The third is to resolve requirement interpretation issues.

## **5.3 MAWG Characteristics**

In resolving issues efficiently it is important to identify and engage all the stakeholders, as well as the decision authority. All these entities may not normally participate in one of the standard adjudication processes found on most programs. In these situations it may be more efficient to setup a special board or process that allows issues to be discussed once (or twice) by all the "right" people rather than to have many meetings that end in indecision.

Table 3. Mission Assurance Working Group Characteristics

Adjudication Process	Typical Definition	What are the typical Issues Adjudicated by this Board?	Typical Inputs Needed to Adequately Address the Issue	Typical Outputs Produced by this Board that Provide a Record and/or require Follow-on Activity	General Comments or Points of Information about this Board
Mission Assurance Working Group (MAWG)	The Mission Assurance Working Group performs three primary functions. The first is preparation of complex requirement issues for appropriate adjudication bodies. The MAWG can assist in identifying the original source and pathway to adjudication. The second function is management of adjudication of requirement issues that do not clearly belong to an existing adjudication body. The third function is to resolve requirement interpretation issues.	<ul style="list-style-type: none"> <li>• Resolving differences in requirements interpretation.</li> <li>• Management of complex issues that span across levels in the supply chain.</li> </ul>	<ul style="list-style-type: none"> <li>• Relevant Stakeholders.</li> <li>• Requirements Source.</li> <li>• Requirements Rationale.</li> </ul>	<ul style="list-style-type: none"> <li>• Management of adjudication processes.</li> <li>• Determination of Closure path.</li> <li>• Documentation of issue adjudication.</li> </ul>	The MAWG is a working group, not a formal board.

## 5.4 Mission Assurance Working Group Adjudication Process

Figure 6 depicts the general processes and roles associated with a Mission Assurance Working Group (MAWG).

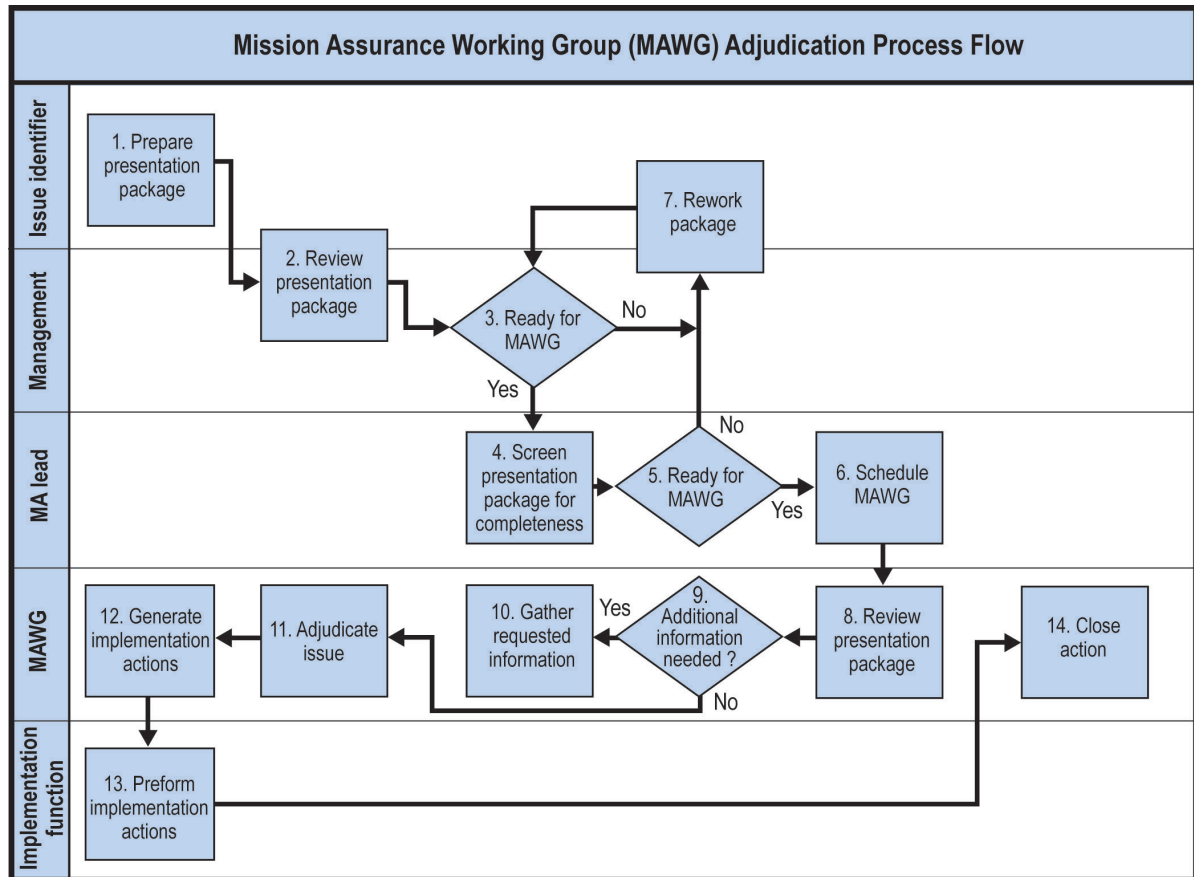


Figure 6. Mission assurance working group adjudication process.

The MAWG can function as a body which provides guidance and helps to determine the best path to follow in adjudicating and resolving a MA requirements issue. It can also function as the adjudication body when it is determined to be best suited to resolve an issue, due to its composition and authority. The process flow depicted in Figure 6 illustrates the steps that are followed when the MAWG is functioning as an adjudication body.

### A. Preparation

The process starts with an issue being identified by a party, and that party creating a presentation package to be used to bring the issue before the working group (Step 1). A standard template should be developed and followed. The template should include at a minimum a description of the issue, the applicable MA requirement, the requirement owner, the rationale for the requirement, the proposed solution or requirement change, and potentially impacted documents.

### B. Management Review

The issue identifier reviews the presentation package with management to ensure that the issue being raised and the proposed solution have been properly coordinated. They also ensure that the package includes adequate supporting data (Step 2). If management believes additional information is needed

in the presentation, it will work with the issue identifier to obtain the information and update the package (Step 7). Once it's determined that the presentation package is ready for the MAWG (Step 3), it is sent to the MA Lead for the program or function, depending on the nature of the issue.

### C. MA Lead Review and Scheduling

The MA Lead is the gate keeper for the MAWG and is usually its co-chairperson along with a customer counterpart. To ensure that the issue presentation package is ready to be adjudicated by the MAWG, the MA Lead reviews it for completeness (Step 4). If deemed not to be a complete package (Step 5), it is returned to the issue identifier and management to be reworked (Step 7). Otherwise, the MA Lead places the issue on the agenda for the next MAWG meeting (Step 6). When placing the issue on the agenda the MA Lead ensures that the necessary stakeholders are invited and prepared to discuss and adjudicate the issue.

### D. MAWG Adjudication

At the MAWG meeting, the issue identifier or his delegate presents the issue to the working group (Step 8). If, after discussion, it is determined that additional information is needed (Step 9), that information is requested from the appropriate party (Step 10). In some cases this information may need to be obtained from an external entity. Once the information is received, the MA Lead will place the issue back on the MAWG agenda for an upcoming meeting.

Given a complete presentation package the working group discusses the issue and proposed solution and determines the best path to closure (Step 11) and the actions that must be taken to implement the closure plan (Step 12).

### E. Decision Implementation

Implementation of the closure plan defined by the MAWG may involve one or more functions, e.g., Contracts, ERB/CCB, or PMPCB. The assigned program or Enterprise function carries out the MAWG actions (Step 13). When the action is complete the evidence is presented to the MAWG and the action is closed (Step 14). The MAWG has the responsibility to document the adjudication decisions, actions, and action closures. It also has the responsibility to get back to the original source of the requirement issue and inform them of the issue and resolution so that corrective action can be taken.

The MAWG process description here has focused on issue events that typically occur late in the program development cycle. For example, the type of situations it describes and the examples provided in the appendix refer primarily to problems occurring after the hardware has been built or tested. The MAWG should provide cost and schedule benefit in the efficient and timely resolution of these issues. Another use of the MAWG which provides even further cost and schedule benefit is in the up-front examination of the requirements flow-down and the resolution of the formal agreements across boundaries prior to hardware build.

## 6. Other Considerations

Fundamentally, this guideline provides examples of real world problems and potential solutions to those problems. In practice each and every program is different. This section addresses four typical differences between program type and situations, so that the practitioner can adjust the final approach used. There are other factors that can apply but this section considers these fundamental areas:

1. Program Type [e.g., development vs full rate mfg]
2. Program Formal agreement Structure
3. Program Risk posture
4. End Product Design considerations

### 6.1 Program Type

Program type consideration is one that should compare whether a program is a technical pathfinder, development program, one-of-a-kind national asset, or full rate production program. Some examples span from DARPA research and development program, very low on the Technical Readiness Level (TRL) and Manufacturing Readiness Level (MRL), to a one-of-a-kind spacecraft which has a mix of lower TRL components which may be integrated on a higher TRL spacecraft. Finally an example of a full rate production program is a volume missile system that has been developed and is under production for many years.

Typically in an R&D environment there is a close connection between the customer and provider. Usually formality of adjudication bodies will be lacking, but the same effect of those bodies should be considered. For example a process for Problem Resolution and Change Management (typically MRB and ECB) is essential between the customer and provider. Some form of tracking, documentation, and most importantly agreement, between customer and provider must still be in place. It is recommended that each of the typical adjudication bodies be evaluated and streamlined, first those between the customer and the provider, and then as much as possible, in an analogous way, throughout the supply chain. This should be captured in some form of documentation so that those examining the program structure are not left guessing, or worse, assuming no consideration was applied. The documentation of method doesn't need to be a formal agreement deliverable, but should be readily accessible by the customer and provider management teams.

In the case of a one-of-a-kind, high value program more formality and use of typical adjudication bodies should be used. Whenever a typical adjudication body is not used there should be a documented and compelling reason. In these program types much more consideration should be provided in actual communication of method. For example, in the case of problem resolution the program and its documentation should be clear how MRB is handled, what authority is granted, and how can it be applied. Finally, these types of programs must consider the actual knowledge and teamwork of each team member whether customer, contractor, sub-contractor or supplier. Team member interaction is best considered with a thorough treatment and documentation of roles and responsibilities by discipline, for each adjudication or process, and especially those specific program processes that tie it all together. Formal agreement language will always be weak on roles and responsibilities by nature, but must be established and recorded at the program management level.

Lastly, in the case of volume production programs the assumption will be that the design is complete, and the original program members' responsible for the design and its realization may no longer be available to consult. Again a consideration of how each typical adjudication method is to be applied is appropriate. For example, often overlooked is an Engineering Review Board. One of the problem examples cited in this document was of re-occurring Material Review Board actions. This occurred

because the team either didn't know or didn't have a method of engineering change. The program management team should again know and document roles and responsibilities even in the less used resolution methods. Program formal agreement structure is also a consideration.

## **6.2 Program Formal agreement Structure**

Formal agreement structure has a strong effect on the success of customer-to-provider resolution methodology. For example, using the same assumptions for a Cost Plus contract on a firm fixed price contract will certainly be problematic. Firm-Fixed-Price contracts rely on effective contractual language so the interaction between adjudication methods and the methods themselves should be very clear in a formal agreement. A firm fixed price provider is strongly motivated to minimize change to manage cost and if the customer expects a different resolution methodology than what is governed by the formal agreement the provider may ask for change fees if additional effort is required. Typically, in the firm fixed price environment, a provider will assume a reliance on his own adjudication processes and may hold the customer at arm's length when there is an issue between adjudication processes. This is not always the best outcome as in the end meeting customer expectations is the higher goal above delivering hardware that meets requirements. Often more customer-to-provider communication is beneficial in resolving inter-process breakdowns discussed in this guideline. Relationships between customer and provider MA teams, engineering teams, and formal agreement teams are very important and discussions which include roles and responsibilities should be done early preparing both customer and provider with a methodology to solve inter-process breakdowns. These relationships are also important in the Cost-Plus formal agreement structure but there is much more room to accommodate customer changes which may require additional funding. In an FFP environment the provider might not want clarification of the resolution method, but in reality the provider could be better served if clarification is obtained. The next consideration is overall program risk posture.

## **6.3 Program Risk Posture**

Mission class risk profiles [A, B, C, D] have been established by the national space agencies to categorize acquisitions into four risk levels:

- Class A – Minimum practical risk
- Class B – Low risk
- Class C – Moderate risk
- Class D – Higher risk

The risk profiles associated with these risk levels capture technical and quality issues that impact mission success. Different Mission Classes dictate a different program risk characteristic, and as with different program types an adjusted level of rigor as applied to adjudication board application and roles and responsibilities is appropriate. The reader should refer to Aerospace TOR Mission Risk Planning and Acquisition Tailoring Guidelines for National Security Space Vehicles TOR-2011(8591)-5 for a more complete description of each class profile. A summary from this TOR is provided in Table 3 below. The same kinds of consideration should be evaluated as with Program Type for program risk level. For example, a Mission Class A program which is Minimum Practical risk should have a high level of formality for not only individual adjudication boards but also the specific inter-process resolution methods the program will use, including specific roles and responsibilities. In fact, Class A programs are at a much higher risk for unnecessary cost increase as a result of the issues evaluated in this guideline. Consequently, they should use structured resolution method(s). These programs should receive more formal and well documented attention than a Mission Class D program that is typically a higher risk profile development or pathfinder program.



Table 4. Mission Class Profiles

Characteristic	Class A	Class B	Class C	Class D
<b>Risk Acceptance</b>	Minimum Practical	Low Risk	Moderate Risk	Higher Risk
<b>National Significance</b>	Extremely Critical	Critical	Less Critical	Not Critical
<b>Payload type</b>	Operational	Operational or Demo Op	Exploratory or Experimental	Experimental
<b>Acquisition costs</b>	Highest LCC	High LCC	Medium LCC	Lowest; LCC
<b>Complexity</b>	Very high – High	High – Medium	Medium – Low	Low - Medium
<b>Mission Life</b>	>7 years	≤7 years	≤4 years	< 1 yr
<b>Cost</b>	High	High to Medium	Medium - Low	Low
<b>Launch Constraints</b>	Critical	Medium	Few	Few - None
<b>Alternatives</b>	None	Few	Some	Significant
<b>Mission Success</b>	All practical measures	Stringent/minor compromises	Reduce assurance stds	Minimal assurance stds
<b>Typical Formal agreement Type</b>	CPAF*	CPAF-FFP	CP-FFP	FFP

\* Note that CPAF for Class A is for first of fleet, not once a production program is in place.

#### 6.4 Program Design Complexity

A last consideration is an evaluation of overall program design complexity. Program design complexity strives to ensure that the customer and provider consider the design complexity level, heritage level, and TRL of all subcomponents. In cases where a high TRL level product exists with assemblies being produced by proven and accepted manufactures less rigor may be necessary in communication of roles and responsibilities. It may be sufficient to verify that the same individuals are in places that are fluent in the adjudication processes and methods accepted for the previous program. In the case of complex designs with multiple team members who may be new to a program design much more work is needed to ensure the entire team up and down the program structure understands the adjudication methods and most importantly roles and responsibilities.



## 7. Summary and Recommendations

This document has described a process for adjudication of mission assurance requirements that can't be resolved or can't be efficiently resolved through normal program boards or mechanisms. The process involves the formation of a mission assurance working group (MAWG) that includes stakeholders and decision makers in order to efficiently, and in a timely manner, resolve issues. A number of examples were collected from actual experience of the team members and for a number of these examples, the team worked through the process described in this document in order to validate the sequence of the steps proposed. A number of criteria were developed for when a mission assurance working group might be needed, these are:

- Issue does not clearly fit into an existing adjudication body
- Issue crosses multiple giver/receiver boundaries
- Issue is complex
- There are multiple decision makers
- There are multiple or conflicting sources of the MA Requirement
- There is an MA requirement interpretation issue that needs to be resolved (e.g., varying SMEs have different opinions about the right approach)
- There is a need for communication across a broad base of stakeholders

The document also provides definitions for different types or conditions (e.g., deviation or waiver) which necessitate requirements change. In most cases, these definitions were taken from existing standards documents and to promote consistent understanding between participants in a program framework (e.g., customer, prime, supplier) it is recommended that these definitions be adopted as standards.

The process described in this document does not bypass existing program boards and resolution mechanisms. In fact, the process focuses initially on the identification of the requirement source and the determination as to whether or not the most efficient resolution would be through an existing board or through an MAWG. It is recommended that US space program participants adopt the process recommendations described herein and establish, when needed, an MAWG to deal with the mission assurance requirement issues that are not easily resolved through normal program structures.

### 7.1 Potential Follow-On Topics

The Life Cycle Mission Assurance Requirements Management Topic Team does not anticipate any follow-on topics.

Table 6. Mission Assurance Working Group Guidance

<p><b>Guideline: Mission Assurance Working Group (MAWG)</b></p> <p><b>Recommendation:</b> Establish a persistent stakeholder working group that serves as a mechanism to rapidly identify and efficiently resolve requirement issues.</p>
<p><b>Evaluation Criteria:</b> MAWG active in all stages of acquisition cycle.</p>
<p><b>Milestone:</b> All</p>
<p><b>Rationale:</b> MAWG is a mechanism to rapidly identify and efficiently resolve requirement issues. MAWG ensures the engagement and efficient use of the program's decision authorities while promoting efficiency by minimizing the number of meetings needed to resolve requirement issues.</p>
<p><b>Stakeholders/Actions:</b></p> <ul style="list-style-type: none"> <li>• Acquisition Organization/Program Office: Serve as a resource to the MAWG on requirement rationale and requirement sources.</li> <li>• Contractor: Provide appropriate SMEs with knowledge of requirements with the capability and authority to efficiently resolve requirement issues.</li> <li>• MAWG: The first action is preparation of complex requirement issues for appropriate adjudication bodies. The MAWG can assist in identifying the original source and pathway to adjudication. The second action is management of adjudication of requirement issues that do not clearly belong to an existing adjudication body. The third action is to resolve requirement interpretation issues.</li> </ul>

## 8. Acronyms

Acronym	Definition
CCB	Configuration Control Board
CDR	Critical Design Review
CPAF	Cost Plus Award Fee (Type Of Formal agreement)
DARPA	Defense Advanced Research Projects Agency
ERB	Engineering Review Board
FFP	Firm Fixed Price (formal agreement)
FRB	Failure Review Board
JHAPL	Johns Hopkins Applied Physics Laboratory
KDP	Key Decision Points
LCC	Lifecycle Cost
MA	Mission Assurance
MAG	Mission Assurance Guide
MAIW	Mission Assurance Improvement Workshop
MAWG	Mission Assurance Working Group
MRB	Material Review Board
MRL	Manufacturing Readiness Level
NASA	National Aeronautic and Space Administration
NPR 8735.1B	NASA Policy/Procedural Requirements
NRO	National Reconnaissance Office
PDR	Preliminary Design Review
PMPCB	Parts Materials and Processes Control Board
SMC	Space and Missile Systems Center
TBD	To Be Determined
TBR	To Be Resolved
TOR	Technical Operating Report
TRL	Technical Readiness Level



## 9. Reference Documents

NASA Standard, NASA-STD-0005, *NASA Configuration Management(CM) Standard*, 29 September 2008 Document provides the NASA procedures for developing and maintaining CM of a project.

NASA Procedural Requirement (NPR) 7120.5, *NASA Program and Project Management Processes and Requirements (Interim update issued as NID 7120-97: 8/25/2010)*

*\*Use of this document is mandatory for all NASA facilities and programs/projects*

- Chapter 3 provides the NASA policy on the governance of the Engineering and SMA Technical Authorities and their roles in the management of their respective requirements. Chapter 3 provides the requirements for granting waiver/deviation to Engineering requirements and provides a pointer to the similar SMA process.

NASA Standard, NASA-STD 8709.20, *Management of Safety and Mission Assurance Technical Authority (SMA TA) Requirements*, 6 August 2010

*\*Use of this document is mandatory for all NASA facilities and programs/projects per NPR 8715.3 paragraph 1.13.*

- Chapters 3 & 4 and Appendices A, B, & C provide requirements and process for requesting and granting relief from SMA Requirements
- Chapter 5 defines the process in flowdown of SMA requirements
- Chapter 6 defines how mandatory SMA standards are determined

NASA Standard, NASA-STD 8709.22, *Safety and Mission Assurance Acronyms, Abbreviations, and Definitions*, 8 December 2010

This document provides a comprehensive listing of terms and acronyms used within NASA SMA activities.

NASA Procedural Requirement, NPR 8715.3, *NASA General Safety Program Requirements (Revision C with Change 7: 25 February 2011)*

*\* Use of this document is mandatory for all NASA facilities and programs/projects*

- Paragraph 1.13 defines the process and policy for requesting relief from SMA Requirements.

NASA Policy Directive ([NPD\) 8730.5](#), *NASA Quality Assurance Program Policy (Revision B: 10/27/2005 with NASA Interim Directive (NID) 8730-98 modification: 10/17/2011)*

*\* Use of this document is mandatory for all NASA facilities and programs/projects*

This document provides the Agency level requirements for NASA oversight of a contractor quality program.

NASA-Handbook, NASA-HDBK 8739.18, *Procedural Handbook for NASA Program and Project Management of Problems, Nonconformances, and Anomalies*, 29 April 2008

This document provides an overview of procedures and best practices associated with establishing and maintaining a problem reporting and corrective action system.

Space and Missile Systems Center Standard, SMC-S-001, *Systems Engineering Requirements and Products*, 12 July 2010

This document provides information on Engineering Review Board, Change Control Board and Failure Review Board.

Space and Missile Systems Center Standard, SMC-S-013, *Reliability Program for Space Systems*, 13 June 2008

Provides guidance on Failure Review Board charter, roles, responsibilities, and membership.

The Aerospace Corporation Technical Operating Report, TOR-2007(8546)-6018 Rev A, *Mission Assurance Guide*, 1 July 2007

Provide practical guidance to personnel of The Aerospace Corporation and, in general, National Security Space (NSS) program office personnel, who are responsible for executing mission assurance functions.

The Aerospace Corporation Technical Operating Report, TOR-2008(8583)-8215, *Space and Missile Systems Center Compliance Specifications and Standards*, 15 August 2008

Listing of SMC compliance specifications and standards as of 2008.

The Aerospace Corporation Technical Operating Report, TOR-2011(8591)-19, *Failure Review Board Guidance Document*, 10 June 2011

MAIW 2011 focus team product that covers all aspects of Failure Review Boards.

MDA-QS-001-MAP, Missile Defense Agency Assurance Provisions (MAP), 9 January 2004

A set of safety, quality, and mission assurance requirements for mission and safety critical items in support of MDA-procured systems.

The Aerospace Corporation Technical Operating Report, TOR-2007(8546)-6018, *Mission Assurance Guide*



## Appendix A. Lifecycle Requirements Change Examples

The section below describes the methodology used to analyze issues that illustrated inefficiencies. Below the methodology explanation are examples of each of the general types of issues identified. A complete set of issue examples used by the team for analysis is contained in Appendix A.

*What is the requirement at issue? **The first task was to correctly identify the Mission Assurance Requirement that needs to be reconciled. Without understanding the requirement and naming it, the ambiguity could continue without resolution and the ability to evaluate which standard adjudication method is appropriate.***

**What is the issue with the requirement?** This section was used to capture the issue or concern with the requirement. It was meant to capture each party's interpretation of the requirement, and the perceived non-compliance.

**What is the source of the requirement?** This section captured the source document where the mission assurance requirement derives its authority. The formal agreement is not necessarily the original source of the requirement. The intent was to find where external factors or authorities mandated the requirement be included in the formal agreement. A contractor's command media or a government standard might be the source document for the MA requirement in question.

**Who are the stakeholders? (Decision Authority).** Given the source of the requirement, identify the stakeholders that have ultimate authority over compliance with the requirement. Many mission assurance requirements define proven technical practices that are often imposed on the agreement by external parties. The external parties or stakeholders may have decision authority over how a requirement may be adjudicated. Understanding these external stakeholder roles and authorities are essential to correctly and efficiently adjudicating any differences in applying and interpreting mission assurance requirements.

**Adjudication Processes Involved or Should Have Been Involved.** For the given example, identify the adjudication process used to reconcile the differences between the two parties that were trying to resolve the mission assurance requirement issue. This step allowed the topic team to see what processes were employed either successfully or unsuccessfully. Additionally, by seeing the adjudication process employed, the group could see whether the appropriate stakeholders and decision authorities were included in the adjudication process.

**Problem Description.** This section allowed a brief narrative of the timeline and how the problem developed.

**Impact.** This section identified the consequences to the program due to delay or cost growth that resulted from the effort to reconcile the mission assurance requirement.

**Why or What was the Breakdown?** This section captured where or how the process of adjudication caused delays or cost growth.

By analyzing each of the specific examples brought forward, the team identified three logical groupings: adjudication of subsystem requirements, the requirement change process, and resolution of requirement non-compliances. Below are examples that illustrate each of the general types of inefficiencies the team identified. In Appendix A, all the examples are shown in tabular form.

	What is the requirement at issue?	What is the discrepancy with the requirement?	What is the source of the requirement?	Who are the Stakeholders? (Decision Authority)	Adjudication Processes involved or should have been involved	Problem Description	Impact	Why or What was the breakdown?	Comments / Notes	PART Issue	Requirement "Change"	Requirement Noncompliance	Other
1	Part level performance requirements.	Continual minor test discrepancies against performance parameters that require MRB action to disposition.	Derived requirement. Flowed down through multiple layers from system to subsystem to box to part.	Manufacturing and test, RDE, system engineering.	ERB action to change part level requirement or spec.	Manufacturing floor personnel have rare interaction with the individuals who generated the performance and derived requirements. Perceived or actual difficulty in getting ERB concurrence leads to continual MRB action for all similar parts.	Increased paperwork, cost, and schedule.	One reason for the breakdown is that the requirement flow down occurs pre-CDR, prior to the actual start of production. Going back up the chain after production start may require a lot of effort by personnel unfamiliar with how, why, or by whom the requirement originated.	ERB/CCB PMPCB  Recognize that there is an issue with continuous MRB processing of this issue (Floor Person, MRB Person, RDE or CAB – Issue Identifier 4.2.1. Part Spec Requirement (Issue Identifier with help of Management). 4.2.2 (Floor Person, MRB Person, RDE or CAB – Issue Identifier). 4.2.3 include identifier + the requirement source. Management engages requirement source to determine rationale and importance of requirement 4.2.4. Who is the decision authority and what adjudication body do they participate in 4.2.5. ERB is decision authority. ERB adjudicates the issue. Do we need someone to assist in working this through adjudication 4.2.6, Assign Implementation Actions. 4.2.7 Document Decision and Track to Closure.	X			
2	Increase in compliance requirements on heritage hardware.	Heritage was designed and built to different requirements.	Changes in program compliance documents.	Decision Authority is procuring agency. Other Stakeholders, RDE, Mfg. and Test, System Engineering, Program Management, government support organizations.	Technical Shoulder to Shoulder, ERB and CCB at multiple levels.	Time consuming, inefficient and inconsistent attempts to reach compromise.	Increased cost, delays, perceived cost overruns that are the result of additional work.	Government PM could assume they are Decision Authority. At technical or readiness review, you have exceeded authority.  Prime & Customer resolve issue (ERB CCB).  Sub & Prime (ERB CCB).	ERB/CCB  4.2.1 Difference in MilStd or mission requirements from Heritage baseline. Unacknowledged impact of change. Compliance Issue Subcontractor to Prime. Person at subcontractor who identifies the issue (Difference between compliance and what they have done) 4.2.2 Notifies the Prime. Who owns compliance document? Prime determines this is a compliance requirement from the customer. Customer needs to determine the root source.				

	What is the requirement at issue?	What is the discrepancy with the requirement?	What is the source of the requirement?	Who are the Stakeholders? (Decision Authority)	Adjudication Processes involved or should have been involved	Problem Description	Impact	Why or What was the breakdown?	Comments / Notes	PART Issue	Requirement "Change"	Requirement Noncompliance	Other
									<p>4.2.3 Specific Working Group or Body that owns the requirement including SMEs. + Prime +Subcontractor.</p> <p>4.2.4 Stakeholders determine the rationale and 4.2.5 appropriate Decision Authorities and adjudication bodies. If adjudication body doesn't exist, establish a MAWG.</p> <p>Prime &amp; Customer resolve issue (ERB CCB) Sub &amp; Prime (ERB CCB). If there is coordination required, (complicated &amp; nested issue) MAWG is appropriate. Management Decision at highest level involved in decision. Remaining steps follow standard process.</p>		X		
3	Large number of compliance requirements in compliance documents	Differentiating between requirements that need to be tracked and traced and those that do not.	Program compliance documents	Decision Authority is procuring agency. Other Stakeholders, RDE, Mfg. and Test, System Engineering, Program Management, government support organizations.	Technical Shoulder to Shoulder, ERB and CCB at multiple levels.	Time consuming, inefficient, and inconsistent attempts to reach compromise.	Increased cost, delays, perceived cost overruns that are the result of additional work.		ERB/CCB		X		
4	Requirements Not Met	Micrometeoroid and Orbital Debris (MMOD) protection could not be met during design development.	Contracts	Government/ Customers	Subject Matter Experts (SMEs) not involved with the original development of the requirement.	Failure to develop the requirement properly and subsequent confusion on how the process of changing the requirement was handled and the government response.	Increased cost, delays, perceived cost overruns that are the result of additional work.	Unknown	ERB/CCB		X		
5	Requirements Flowdown	APL flows MRB requirements down to supplier X. Supplier X has a different definition of "rework" and "repair" than APL, causing confusion over approval authority for certain MRB actions.	Contracts	Customers	Clarity needed to be provided in the beginning as to what constitutes "Rework" versus "Repair".	Parts were "Repaired" and never received customer approval prior to installation into higher assemblies.	Latent MRB/Added Risk	Communication/ definition not provided.	<p>Root Cause appears to be definitions not clear. Could clarify definitions in requirement docs.</p> <p>MRB Subcontract Change?</p>			X	

	What is the requirement at issue?	What is the discrepancy with the requirement?	What is the source of the requirement?	Who are the Stakeholders? (Decision Authority)	Adjudication Processes involved or should have been involved	Problem Description	Impact	Why or What was the breakdown?	Comments / Notes	PART Issue	Requirement "Change"	Requirement Noncompliance	Other
6	Requirements for Waivers	Project establishes its parts requirements. Over the lifecycle, parts are reviewed by the Parts Control Board, which can approve variances from project parts requirements. It is sometimes unclear if a waiver needs to be prepared and approved if the PCB approves a screening and qualification approach for a particular part that is not in full compliance with the project parts requirements.	Contracts	PCB/Customer	Processes/ communication requirements must be clear to provide guidance to boards such as PCB as to when waivers are required even though they are granted limited MRB authority.	Parts were approved using a screening and qualification approach not approved by the customer.	Potential parts failures/added risk	Communication/ definition not provided	Unclear what documentation needed to approve change (PMPCB approval, Waiver).  ERB/CCB	X			
7	Requirements Flowdown	A project establishes quality and mission assurance requirements, and the developer agrees to follow the requirements. Not all of the requirements are recorded on assembly drawings for electronics (for example). While there is typically sufficient oversight to ensure the customer requirements are met when the work is done in house, if not fully coordinated, it is possible that a customer-imposed requirement may not be followed if the assembly of a particular piece of electronics is outsourced.	Subcontracts/ Purchase orders/ Engineering Drawings	Engineering	Drawings and/or procurement documents must contain all relevant details to assure all requirements are fully met.	Not all customer requirements were incorporated during the procurements of a product or service.	Defective product/latent MRB/added risk	Failure of engineering and/or procurement to incorporate all requirements	Procurement issue; not a change to requirements.				X
8	Configuration Management	A project establishes quality and mission assurance requirements and a developer prepares plans detailing how it will comply with the requirements. The plans are treated as uncontrolled plans and are not maintained over the project's life cycle. The developer does not actually follow the plans due to various factors, causing uncertainty if the project mission assurance requirements were actually met.	Configuration Management Plan	Project Management	Not all documentation was properly considered when decisions were made for what is required to be controlled through CM and the plans, since they affected the processes, should have been included.	Processes used in the final product or service were not fully documented to be the as-built result.	Traceability risk/ un-met documentation requirements	Poor decisions/ communications	Compliance plans not controlled or adhered to.				X

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9	Requirements Flowdown	A developer outsourced assembly of an electronics board. The supplier was given the bare board and the parts to install. The supplier was not given the parts suppliers' assembly recommendations and the drawing did not detail the parts suppliers' assembly recommendations, so the supplier assembled the board per their standard processes. This resulted in damage to some of the electrical components.	Subcontracts/ Purchase orders/ Engineering Drawings	Engineering	Engineering and/or procurement documents must include critical manufacturing details to ensure processes employed are not adding risk.	Detail manufacturing information that was critical to the safety of the components was not included in the engineering/ procurement documents.	Defective product/latent MRB/added risk.	Missing critical engineering information	Assemble requirements not flowed.				X
10	Multipaction and Corona Requirements in EMI/EMC TOR	Multipaction design and verification margins and conditions are different than contractor standard process. Corona requirements are not specified; basically "TBD".	Mission Assurance Standard (EMI/EMC TOR) under contract	Contracting office	Discussions with contract office who consults with technical SMEs (Aerospace).	Requirement defines specific analysis and test conditions that are not standard for contractor; contractor has acceptable alternative definition.	Complying with requirement as written would drive additional cost, and may introduce unnecessary risk to hardware by using a test method which is not standard for contractor.	Tailoring process. During initial MAWG tailoring contractor's multipaction and corona SMEs were not consulted. Review performed by EMI/EMC SME who does not typically deal with these types of requirements.	Requirements change needed.		X		
11	Mission Assurance Standard references another document that is not under contract.		MA standard under contract	Contracting office	Discussions with contract office who consults with technical SMEs (Aerospace).	Requirement points to another document that is not a contractual document.	Uncertainty on how to comply. Risk of interpreting requirement as being not applicable.	Tailoring process. Initial tailoring was performed by functional area pre-contract. Post contract award more thorough review of MAWG conducted by engineer responsible for delivering hardware.	Requirements change needed.		X		
12	Mission Assurance Standard terminology is written generally; not specific to hardware under contract.		MA standard under contract	Contracting office	Discussions with contract office who consults with technical SMEs (Aerospace).	There is a need to clarify requirement so that it is not misinterpreted .	Risk of misinterpretation leading to non-compliance and potentially unacceptable risk.	Tailoring process. Initial tailoring was performed by functional area pre-contract. Post contract award more thorough review of MAWG conducted by engineer responsible for delivering hardware.	Requirements change needed.		X		

	What is the requirement at issue?	What is the discrepancy with the requirement?	What is the source of the requirement?	Who are the Stakeholders? (Decision Authority)	Adjudication Processes involved or should have been involved	Problem Description	Impact	Why or What was the breakdown?	Comments / Notes	PART Issue	Requirement "Change"	Requirement Noncompliance	Other
13	Clarity of DCMA Involvement on the program	After contract award DCMA delegation is issued from Contracting office. Then interpreted by DCMA local team and a DCMA quality plan is written. Interpretation caused extensive additional inspection costs. Specific example was bond joint inspections. Many bonds were in subcontracted hardware at supplier without onsite DCMA support and DCMA inspection must be called in.	Derived contracting office requirement for meeting oversight desirements.	Contracting office	Discussions with contract office which eventually resulted in agreed upon changes to local DCMA plan.	Broad interpretation of Mandatory Inspection points caused extensive (>\$1M) cost growth for limited risk reduction. Proposed risk mitigation process which resulted in effective inspection at a reduced cost took months of discussion, frustration to reach conclusion, and implementation.	Project delays, and team frustration resulting in reduced team performance.	Process to resolve DCMA flow-down questions unclear in terms of clear roles and responsibilities of the decider, technical input, and plan to resolve not effective.	Need to adjudicate the number and scope of DCMA inspections.			X	
14	Program ATP test flow changes.	Change process for approved Acceptance Test Plan changes not defined.	Derived from contractual requirement to approve ATP.	Multiple contracting offices, Prime, subcontractor, Aerospace technical resources, NASA technical resources.	A clear method to modify and gain approval for changes to ATP test flow was developed.	New instrument development that identified an appropriate change and ATP flow. Many technical and government resources were involved. All could say NO but no one could effectively say YES approved.	Project delays, and team frustration resulting in reduced team performance.	Process to resolve derived ATP changes in terms of clear roles and responsibilities of the decider, technical input, and resolution plan was not in place and/or not effective.	ATP test flow changes needed; decision authority unclear. Change desired in Acceptance test flow. 4.2.1 Person who is proposing change in flow identifies requirement issue with test sequence change. What was the requirement that determined the order of the test? 4.2.2 What is the source? (internal or external) A number of different compliance documents involved. 1540 Requirement and aspects that come from Corporate Command Media. 4.2.3 Contractor functional Process Owner SMEs, Customer SMEs. 4.2.4 SMEs provide rationale/justification for the requirement. 4.2.5 If ERB CCB has right stakeholders and authority, address issue. If not, then form MAWG to address issue.		X		