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## BDS Seller Special Tooling Requirements

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**Timothy R. Ditch has Quality Ownership RAA**

([timothy.r.ditch@boeing.com](mailto:timothy.r.ditch@boeing.com))

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Authorization for Release

AUTHOR:	William J. Petry	3H1	Sept 03, 2008
		Org. Number	Date
CHECK:	Joseph M. Hale	815S	Sept 03, 2008
		Org. Number	Date
CONCURRENCE:	Frank M. Foeller	D101	Sept 03, 2008
		Org. Number	Date
CONCURRENCE:	Michael W. Yarwood	D78E	Sept 03, 2008
		Org. Number	Date
CONCURRENCE:	Daryl E. Yochum	D70	Sept 03, 2008
		Org. Number	Date
CONCURRENCE:	Christopher B. Rudolph	091	Sept 03, 2008
		Org. Number	Date
APPROVAL:	Thomas J. Spiegel	D500	Sept 03, 2008
		Org. Number	Date
DOCUMENT RELEASE:	Scott B. Pace	G-823A	Sept. 3, 2008
		Org. Number	Date

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## Table of Contents

1. Introduction and General Requirements .....	6
1.1 Introduction .....	6
1.2 General Requirements .....	6
1.2.1 Seller–Subcontractor General Requirements .....	7
1.3 References .....	7
2. Definitions of General Terms .....	9
3. ST Categories, MOI Definitions, and Inspection Requirements .....	12
3.1 ST Category I .....	12
3.2 ST Category II .....	12
3.3 ST Category III .....	12
4. Seller ST Capability .....	14
4.1 Scope .....	14
4.2 Requirements .....	14
5. Configuration Management .....	17
5.1 Scope .....	17
5.2 Requirements .....	17
5.2.1 Boeing-defined ST .....	17
5.2.2 Seller-defined ST .....	17
5.2.3 Boeing Fabricated, Reworked, and Modified ST .....	17
5.2.4 Seller Fabricated, Reworked, and Modified ST .....	17
5.2.5 Seller Periodic Tool Inspections and ST Acceptance .....	18
6. ST Engineering Definition .....	19
6.1 Scope .....	19
6.2 Requirements .....	19
7. ST Fabrication, Rework, and Modification .....	20
7.1 Scope .....	20
7.2 Requirements .....	20
8. ST Acceptance .....	22
8.1 Scope .....	22
8.2 Requirements .....	22
8.2.1 CMS Procedure .....	24
9. Each Use Condition Check .....	27
9.1 Scope .....	27
9.2 Requirements .....	27

---

10. Periodic Tool Inspection .....	29
10.1 Scope .....	29
10.2 Requirements .....	29
10.3 Periodic Tool Inspection Instructions.....	32
11. ST Data Elements.....	34
11.1 Scope .....	34
11.2 Requirements .....	34
11.2.1 ST Specification/Engineering Definition Requirements .....	34
11.2.2 ST Identification .....	34
11.2.3 ST Usage Instructions.....	35
* 12. Manufacturing Work Instructions .....	36
12.1 Scope .....	36
12.2 Requirements .....	36
13. First Article Inspection and ST Relationship .....	37
13.1 Scope .....	37
13.2 Requirements .....	37
13.2.1 Communication Requirements .....	37
14. ST Maintenance .....	38
14.1 Scope .....	38
14.2 Requirements .....	38
15. ST Protection.....	40
15.1 Scope .....	40
15.2 Requirements .....	40
15.2.1 ST in Use .....	40
15.2.2 ST not in Use .....	40
16. ST Nonconformance .....	41
16.1 Scope .....	41
16.2 Requirements .....	41
16.3 Seller ST Nonconformance Reporting to Boeing.....	42
17. Potential Product Impact .....	43
17.1 Scope .....	43
17.2 Requirements .....	43
18. Receiving and Shipping .....	44
18.1 Scope .....	44
18.2 Requirements .....	44
18.2.1 Receiving .....	44
18.2.2 Shipping.....	45

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19. ST Use for Post-production and Spares .....	46
19.1 Scope .....	46
19.2 Requirements.....	46
Appendix A Supplier Tooling Requirements Document Map .....	47
Appendix B Document Revision Record .....	49

### List of Tables

Table 1 ST Category Description and Inspection Requirement Summary.....	12
Table 2 Seller Capability Level and Requirements.....	15

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# 1. Introduction and General Requirements

## 1.1 Introduction

This document supplements and clarifies established Special Tooling (ST) requirements contained in D6-82479, Boeing Quality Management System Requirements for Suppliers, Appendix A: AS9100, Quality Management Systems – Requirements for Aviation, Space and Defense Organizations; AS9102, Aerospace First Article Inspection Requirement; and Federal Acquisition Regulation, Part 45 and 52.245-1, Government Property.

This document applies to ST that is Boeing-owned or Government-owned and accountable to Boeing. This document does not address, nor is it intended to contradict, the Property Management requirements for ST. Seller must formally address any conflict of requirements with Buyer’s authorized procurement agent.

This document applies to all ST types, to include mylar type layouts except as defined below. ST types (subcategories of special tools, not to be confused with property management special test equipment) that are excluded from this document include:

1. Special Test Equipment (e.g. pressure test, continuity check, and software test tools). (reference section 2)
2. Overhead Mechanical Handling Equipment. (reference section 2)
3. Capital Equipment (reference section 2)
4. General Purpose Tools (reference section 2)
5. Seller Owned ST (for unique applicability see section 6.2 Requirements) (reference section 2)
6. Shop Aid Type Tools (reference section 2)

## 1.2 General Requirements

This document applies to all Boeing and Government-owned (hereafter referred to as Government) and Boeing-owned ST used by Seller and its subcontractors in the performance of purchase contracts from Boeing Defense, Space and Security (BDS). This includes Boeing provided ST Engineering Definition being used to realize Seller owned and Seller accountable ST used to produce Boeing products (reference section 6). When imposed contractually, Seller must comply with the requirements of this document.

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Seller must maintain documented procedures, processes, training and equipment to implement and maintain the requirements of this document, this includes any Seller capability used to realize, conform, configure, or accept ST. Seller internal audit process must include the requirements of this document and be performed in accordance with existing Quality Management System requirements.

Boeing reserves the right to conduct surveillance at Seller's facility to determine Seller's compliance to the requirements of this document. Boeing also reserves the right to make the final determination of the Seller's ST engineering definition, fabrication, acceptance, maintenance, inspection and usage capability. Seller's recognized ST capabilities are documented and maintained in Boeing's supplier quality data system.

Boeing accountable ST provided in support of Boeing contracts must be used for product realization and must be controlled in accordance with this document. Sellers identifying alternate methods of product realization in lieu of Boeing accountable ST, must obtain formal authorization from Buyer's Authorized procurement agent. ST not in use must be processed per contract closeout requirements or formally submitted as excess ST to Buyer's authorized procurement agent for resolution.

### 1.2.1 Seller – Subcontractor General Requirements

Seller must impose contractually and flow down the requirements contained in this document to all subcontractors where Boeing accountable ST is transferred and used in support of Boeing contracts. Seller is responsible for subcontractor conformance to the requirements of this document. This includes interdivision ST transfers where interdivision quality system is independent and a Boeing recognized ST capability is not active.

Seller's subcontractors ST capability determination must be the responsibility of the Seller and must be in compliance with this document. Seller must demonstrate to Boeing with objective evidence that the seller's subcontractor controls/approvals are acceptable with regard to ST capability and compliance evaluations. If Seller's subcontractors are not capable of performing a required function, Seller must formally contact Buyer's authorized procurement agent for resolution.

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## 1.3 References

D6-82479, Boeing Quality Management System Requirements for Suppliers

D6-51991, Quality Assurance Standard for Digital Product Definition at Boeing Suppliers

D950-11288-1, Product Definition Template (PDT) Requirements, Validation and Verification Processes, and Handling Instructions for Plot Centers and Supplier Use

Build Record Form References: (See Section 8.2 B)

MAC1147S - Tool Build Log Summary

MAC1147DA - Tool Build Log Detail Accountability

MAC1147CS - Tool Build Log Construction Point Sketch

MAC1147DB - Tool Detail Information

MAC1147E - Tool Build Log Hole Pattern

MAC1147D - Tool Build Log Documentation

MAC5420 - Quality Calibration Log

AM0044 - Laminate Tool Build Log



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## 2. Definitions of General Terms

**Boeing-defined:** Any Boeing ST definition, fabrication order, inspection plan, periodic tooling inspection plan, work authorization, contract requirements formally released to the Seller.

**Boeing-defined ST:** Boeing controlled ST definition, fabrication standards / requirements for Boeing accountable ST.

**Capital Equipment:** Instruments, power sources, etc. of a general-purpose nature, which are not charged to a specified contract or are Boeing accountable.

**Coordinate Measurement Systems (CMS):** Also known as Computer Aided Inspection (CAI) and Computer Aided Measurement Systems (CAMS). Measurement equipment such as Coordinate Measuring Machines (CMM), Portable Coordinate Measurement Machine (PCMM), Laser Tracker, Laser Radar, Photogrammetry and numerical controlled machinery which are used to support inspection activity.

**Configuration Alignment:** The process of ensuring the ST configuration is consistent with product engineering revision levels as defined by contract requirements.

**Configuration Management:** A management process for establishing and maintaining ST configuration(s) throughout the tool life cycle/contract.

**General Purpose Tools:** Items that are not unique to any specific contract or purchase order and is used to support production of parts or assemblies on multiple products and/or programs. As such these tools are Seller-owned assets and are not accountable to Boeing under a Property Management procurement clause.

**Media of Inspection (MOI):** ST designated for use in verifying product features or characteristics of parts or assemblies are in compliance with engineering definition requirements where designated ST is the only means being used for acceptance.

**Overhead Mechanical Handling Equipment:** Any device used for lifting materials, assemblies, fixtures, equipment, etc., that are made wholly or partially of materials such as alloy steel chain, wire rope, metal mesh, synthetic webbing, welded adapters or any combination thereof.

**Periodic Tool Inspection (PTI):** ST inspections performed and recorded on a prescribed inspection plan at a periodic interval. Periodic Tool Inspections include physical dimensional measurements and/or visual verifications.

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Post-production and spares: Refers to the phase of a products life cycle after delivery to a Boeing customer that includes post - delivery support and re-procurement of parts and assemblies.

Potential Product Impact (PPI): A process of ST nonconformance analysis for the potential impact to product features established or checked by the ST that may result in nonconforming product.

Seller-defined: Any Seller ST definition, fabrication plan, inspection plan, periodic tooling inspection plan, work authorization and physical ST controlled by sellers Quality Management System. Seller controlled ST definition, fabrication standards / requirements for Seller accountable ST.

Seller Owned Special Tooling (ST): Seller ST that is not unique to any specific contract or purchase order and is used to support production of Boeing parts or assemblies on multiple products and/or programs. As such these tools are seller-owned assets that are not accountable to Boeing under Boeing Property Management procurement requirements. Configuration control and condition of seller's tools remain the responsibility of the Seller and must be maintained in accordance with applicable Sellers quality and procedure system requirements.

Shop Aid Tools: A shop-made device to assist a particular assembly/fabrication operator to do an operation more efficiently but is not required to do the job every time. A shop aid is a non-designed, non-certified expendable item fabricated and used by the factory during the manufacturing process that are consumed or expended during a specific manufacturing process for which it was fabricated. Shop Aids must not include any items that fall under the descriptions of equipment, special tooling, special test equipment, or material. Shop aids are:

- Control is dictated by functional/using department,
- Generally a low cost item (e.g.: less than \$1,000.00),
- Not required to do a job,
- Not called out in work instructions,
- Not used to control a design feature of a part or manufacturing process,
- Never used for work acceptance of parts or processes,
- Never used to control interchangeable features or replaceable parts,
- Never used as a lifting device or test aid of any kind,
- Never used as a safety item or for ergonomics, and
- Never retained for follow-on use after completion of the specific manufacturing process for which it was fabricated.

Serviceability: In good working condition, without damaged or missing components, excessive wear, or other conditions preventing ST from performing its intended function.

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Special Tooling (ST): Jigs, dies, fixtures, molds, patterns, other equipment and manufacturing aids, all components of these items, and replacement of these items, which are of such a specialized nature that without substantial modification or alteration their use is limited to the development or production of particular services or parts thereof or to the performance of particular services. It does not include material, special test equipment, facilities (except foundations and similar improvements necessary for installing ST), general or special machine tools, or similar capital items.

Special Test Equipment (STE): Single or multipurpose integrated test units engineered, designed, fabricated, or modified to accomplish special purpose testing in performing a contract. It consists of items or assemblies of equipment including foundations and similar improvements necessary for installing special test equipment, and standard or general purpose items or components that are interconnected and interdependent so as to become a new functional entity for special testing purposes. Special test equipment does not include material, special tooling, real property, and equipment items used for general purposes or property that with relatively minor expense can be made suitable for general purpose use.

Special Tooling (ST) Code: A designator, typically a prefix of the ST number, used to describe the ST type.

Special Tooling (ST) Specification: A document containing specific requirements for the engineering definition, fabrication, inspection, and maintenance of ST. Typically authored by Boeing and provided to Seller for the purpose of ST identification of critical functionality, including but not limited to, definition development, fabrication, use, control, maintenance and accountability.

ST Validation: Process of validating ST functions properly and as intended. ST validation consists of three types: minor validation; major validation assembly ST, and major validation fabrication ST. (See section 8 for details of each type.)

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### 3. ST Categories, MOI Definitions, and Inspection Requirements

#### 3.1 ST Category I

Program master tools or datasets, may include reference tools and or tooling data, which establish or control of fabrication and production ST.

Visual Inspection Requirement: Visual inspections performed at each use.

#### 3.2 ST Category II

Any end item ST used in verifying product features or characteristics of parts or assemblies where designated ST is the only means being used for acceptance. Typically considered MOI (MOI – Type 1 & Type 2, for PTI definition see section 10).

#### 3.3 ST Category III

Category III includes ST other than those tools covered by Categories I and II.

Visual Inspection Requirement: Visual inspections performed at each use. (See section 9).

If Seller has any questions regarding ST category designation or MOI type designation, contact Buyer’s authorized procurement agent for resolution. Boeing reserves the right to final determination to MOI designation regardless of ST category.

ST Category	Description	Periodic Inspection Requirement
Category I	Program master tools, which typically include reference tools and tooling data that establish or control production ST.	Visual at each use, no special records required or as identified in ST definition.
Category II	ST used in verifying product features or characteristics of parts or assemblies where designated ST is the only means being used for acceptance. Typically referred to as MOI.	Requires a periodic tool inspection that satisfies MOI type I physical dimensional inspection and/or Type II visual inspection. (See MOI types Section 10).

ST Category	Description	Periodic Inspection Requirement
MOI Type 1	End-item ST where tool degradation to the initial build can only be determined via physical measurement or master tool coordination and visual inspection (typically referred to as recycle, routine, or periodic tool inspections).	Physical measurement or coordination to a master tool (Category I), recorded on a prescribed inspection plan at a periodic interval.
MOI Type 2	End-item ST where tool degradation to the initial build can be verified via visual inspection.	Visual inspection, recorded on a prescribed inspection plan at a periodic interval.
Category III	ST not covered by Categories I and II.	Visual at each use, separate records not required (manufacturing work instructions establish the record).
All ST used to accept product or process must have evidence of acceptance prior to use. All Cat II ST must meet requirements of section 10.		

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## 4. Seller ST Capability

### 4.1 Scope

This section defines a consistent method of determining the technical capability of a Seller relative to the ST engineering definition, fabrication, acceptance, maintenance, inspection, and usage.

### 4.2 Requirements

- A. Seller's capabilities to perform necessary elements of ST management throughout the life cycle of ST must be evaluated, assessed, and tracked by Boeing.
- B. Seller must be required to demonstrate proficiency to Boeing using the capability requirements defined in Table 2 - Seller Capability Level and Requirements, and any specific ST requirements defined in purchase contract, before performing a function listed below:
  - 1. ST engineering definition. (reference section 6)
  - 2. ST fabrication, rework, or modification. (reference section 7)
  - 3. ST physical measurement or coordination. (reference section 10)
  - 4. ST visual inspection. (reference section 10)
  - 5. ST each use condition check. (reference section 9)
- C. Seller is required to formally communicate to Buyer's authorized procurement agent for evaluation of capability impact when changes to Seller's organizational structures, staffing levels, training, processes, procedures or equipment occur.
- D. If Seller or its subcontractors are not capable of performing a required function, Seller must formally contact Buyer's authorized procurement agent for resolution.

Table 2 Seller Capability Level and Requirements

Seller Capability Level	ST Engineering definition	ST Fabrication, rework, or modification	ST Physical measurement	ST Visual inspection	ST Each use condition check
Capability Requirement					
<b>Tool Engineering Organization</b>	X				
Procedures/specifications	X				
Drawing/computer-aided design system	X				
Documented ST engineering definition release/delivery process	X				
Personnel/training	X				
<b>Tooling Organization</b>		X	X		
Procedures/specifications		X	X		
Equipment/certification		X	X		
Personnel/training		X	X		
<b>Tooling Quality Organization</b>		X	X		
Procedures/specifications		X	X		
Configuration control process		X	X		
Equipment/certification		X	X		
Personnel/training		X	X		
<b>Equipment Maintenance Organization</b>				X	
Procedures/specifications				X	
Equipment/certification				X	
Personnel/training				X	
<b>Production Users Organization</b>				X	X
Procedures/specifications				X	X
Personnel/training				X	X
<b>Production Quality Organization</b>				X	X
Procedures/specifications				X	X
Configuration control process				X	X
Personnel/training				X	X
<b>Records</b>		X	X	X	X
Method of controlling		X	X	X	X
Accountability/retention		X	X	X	X
<b>Equipment</b>		X	X	X	
Basic maintenance		X	X	X	

Table 2 Seller Capability Level and Requirements

Seller Capability Level	ST Engineering definition	ST Fabrication, rework, or modification	ST Physical measurement	ST Visual inspection	ST Each use condition check
Precision measurement		X	X	Tailored	
Computer-aided manufacturing/digital measurement		X	Tailored		
<b>ST Processes</b>		X	X		
Welding		Tailored			
Nondestructive inspection		Tailored	Tailored		
Digital measurement		Tailored	Tailored		
Machining		Tailored			
Plastic/composite tooling		Tailored			
Tailored: custom process and capability based on ST type/features					
X: Seller must demonstrate all identified criteria before being deemed capable at that level					
<p><u>How to read table</u></p> <p>Top row defines level of capability</p> <p>Left Column defines requirements to meet capability levels</p> <p>Seller uses this table to understand what seller will be required to demonstrate to be deemed capable at a given level</p> <p>Boeing will evaluate seller against this table based on:</p> <p>1) responsibilities defined by contract</p> <p>2) capability negotiated between Boeing and seller</p> <p>3) capability desired by seller</p>					



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## 5. Configuration Management

### 5.1 Scope

This section defines configuration management requirements relative to ST. It covers all categories of Government- and Boeing-owned ST involved with the manufacture of parts/assemblies in possession of a Seller or part/assembly installations by the Seller.

### 5.2 Requirements

Seller must ensure that all ST is at the designated configuration levels/revisions for the part or assembly being produced, or the installation being performed. When appropriate, Seller must initiate coordination and negotiation with a Buyer's authorized procurement agent for proper configuration alignment.

#### 5.2.1 Boeing-defined ST

Seller must implement, at the designated effectivity or incorporation point, Boeing-initiated ST configuration levels/revisions including ST engineering definition, ST usage instructions, and ST inspection instructions.

If Boeing-defined ST definition is not available at Seller or their subcontractors the Seller must formally coordinate with Buyer's authorized procurement agent to obtain contractual instruction for resolution.

#### 5.2.2 Seller-defined ST

Seller must ensure configuration levels/revisions are integrated into the ST family to support the designated effectivity or incorporation point.

#### 5.2.3 Boeing Fabricated, Reworked, and Modified ST

Seller must, regardless of capability level, take action upon notification of a configuration revision, to ensure configuration level revision incorporation at the designated effectivity or incorporation point with no impact to Boeing production schedules unless otherwise coordinated with Buyer's authorized procurement agent.

#### 5.2.4 Seller Fabricated, Reworked, and Modified ST

Seller must, based on capability level, initiate actions to incorporate appropriate configuration levels/revisions into ST at the appropriate effectivity or incorporation point. Seller must initiate coordination and negotiation with Buyer's authorized procurement agent for proper configuration alignment.

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### 5.2.5 Seller Periodic Tool Inspections and ST Acceptance

- A. Seller must ensure the correct configuration of ST, including multi-configuration capable ST, is used during the manufacture of Government and Boeing products.
- B. When configuration alignment issues arise during periodic tool inspection and ST acceptance, Seller must immediately and formally submit request to Buyer's authorized procurement agent for resolution.
- C. If Seller is unable to verify ST configuration, perform ST validation and ST PTI the Seller must immediately and formally submit request to authorized buyer's procurement agent for contractual instructions when:
  - 1. ST engineering definition is not available. (i.e. Category 1 ST, ST digital definition, or ST engineering drawings).
  - 2. Provided ST engineering conflicts with current product engineering.

Typical contractual instructions may include but are not limited to the following:

- 1. Formal contract exception for ST configuration responsibility (i.e. contracts letter, statement of work, etc.).
  - 2. Specification Outside Processing (SPECO) instructions for ST controls including ST configuration.
- D. When necessary, Seller must initiate a nonconformance and identify, document, and segregate the ST from manufacturing use until a resolution or alternative method is authorized in accordance with this document. When correction of nonconformance exceeds Seller capability, Seller must formally contact Buyer's authorized procurement agent for resolution.

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## 6. ST Engineering Definition

### 6.1 Scope

This section addresses ST engineering definition requirements for Government- and Boeing-owned Seller-defined ST. It provides Seller requirements for the creation of initial and revised ST engineering definitions including all media forms (e.g., text files, 2D drawings, 3D models, data sets, numerically controlled programs).

### 6.2 Requirements

- A. Seller must be capable of creating initial and revised ST engineering definition.
- B. The ST initial and revised definitions must conform to controlled product engineering definition.
- C. Sellers using digital product definition data for any phase of ST definition, fabrication, rework, modification, and acceptance (including the use of digital product definition with CMS) must meet the requirements of D6-51991.
- D. Seller must obtain approval from Boeing's authorized procurement agent for any initial ST engineering definition and/or revisions when:
  - a. Any Seller-defined ST engineering definitions for Category I and II ST controlling Boeing owned ST.
  - b. Seller owned ST is controlled by means of Boeing-defined ST engineering definition specifically provided by contract.
- E. ST engineering definition must meet tolerance requirements per ASME Y14.5 and must be capable of providing adequate requirements for ST to produce engineering compliant article.
- F. All ST requires a process plan/order (work authorization) for all initial ST engineering definitions and revisions. Work authorization may be provided by Boeing or Seller.
- G. The initial and revised ST definition history must be recorded and retained. ST definition must maintain traceability to product definition. These ST definition records must be available upon request.
- H. Seller must produce and maintain ST engineering definitions in compliance with all ST specification requirements as required. Requirement revisions must be approved by Boeing and made available upon request.
- I. ST specification (engineering definition requirement) is generated when
  1. The ST produces or supports an end item.
  2. The ST interfaces with other major ST.
  3. The ST product interfaces with ST at Boeing.
  4. Technical or program requirements for interface, fit-up, or structural integrity warrant it, regardless of the above.

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## 7. ST Fabrication, Rework, and Modification

### 7.1 Scope

This section defines Seller requirements for Seller performed initial fabrication, rework, and modification of Government and Boeing owned ST.

### 7.2 Requirements

- A. Seller must be deemed capable by Boeing prior to performing fabrication, rework, and modification.
- B. All ST requires a work authorization (e.g. process plan, work order, tool order, etc.) for all fabrication, rework and modification. Work authorization must be provided by Boeing or Seller when required by contract.
- C. Seller must maintain an ST fabrication, rework, or modification records, which includes at a minimum:
  - 1. ST identification.
  - 2. ST definition.
  - 3. ST feature, dimension, and process inspection results.
  - 4. ST fabrication, rework, and modification/configuration history, which must include relevant authority documentation.
  - 5. ST inspection/release status.
  - 6. ST validation.
- D. Seller must maintain the following:
  - 1. Documented fabrication, rework, and modification processes and procedures.
  - 2. Certified equipment, including Coordinate Measurement Systems (CMS). For CMS not D6-51991 qualified, see section 8.2.1 for minimum requirements.
  - 3. A trained/skilled workforce.
  - 4. Records accountability and retention of Boeing authorization to perform fabrication, rework or modification (in accordance with applicable contract requirements).

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- E. ST will be fabricated, reworked, and modified in conformance with the controlled ST engineering definition and/or product engineering definition. This includes all mylar type layouts (e.g. Electronically Produced Drawings (EPD), Engineering Washoffs, Master Layouts (MLO), Computer Aided Master Layout (CMLO), Photo Contact Master (PCM), Etc.) being used as ST definition and/or product acceptance and must be maintained per D950-11288-1.
- F. Seller must maintain ST fabrication, rework, and modification records.
- G. When Seller is not capable of performing ST fabrication, rework, and modification, the Seller must take the appropriate actions to ensure work is accomplished.  
Typical options include:
1. Shipping ST to Boeing for fabrication, rework, and modification.
  2. ST Fabrication, rework, and modification performed by Boeing at Seller's site.
  3. All Third-party ST fabrication, rework and modification arranged by Seller must meet the capability requirements per section 4 and sub-tier control requirements per section 1.2.1 of this document. If tool inspection is delegated by the Seller, this must be in compliance with section 8 of this document (excluding Boeing capability assessment, the Seller is responsible for having a documented process and determining third-party capability when engaging a third party) and any applicable Boeing contractual requirements.

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## 8. ST Acceptance

### 8.1 Scope

This section defines ST acceptance requirements for Seller and its subcontractors for initial fabrication, receiving and/or relocation verification, reworking, or modifying Government- and Boeing-owned ST.

### 8.2 Requirements

- A. Seller must be deemed capable by Boeing prior to performing acceptance of ST fabrication, rework, and modification.
- B. All ST requires a fabrication build/inspection record or log. These records will indicate fabrication and inspection status of both in-process (progressive) and final inspection of ST. Seller is responsible for using build record forms or equivalent Seller forms for all fabricated, reworked, or modified ST (See section 1.3 References for form information). Seller must formally contact Buyer's authorized procurement agent to request appropriate ST build log forms.

Before final acceptance of a ST, the Seller's tool inspection will:

1. Review the ST build/inspection record or log for completeness and accuracy, making sure all critical dimensions on the ST is recorded, acceptance stamped, and dated.
2. Verify that all loose and removable details are identified.
3. Ensure that all ST details with critical dimensions of +/- .015 and less are inspected and bare proof of quality acceptance, including all Geometric Dimensioning and Tolerancing (GD&T) features regardless of tolerance. (Ref. ASME Y14.5).
4. Ensure that all setting dimensions, feeler dimensions, gaps and etc., with a tolerance of + / - .015 or less are inspected and documented in the ST build/inspection record or log, including all Geometric Dimensioning and Tolerancing (GD&T) features regardless of tolerance. (Ref. ASME Y14.5).
5. Ensure all fabrication specification (e.g. material, heat treat, plating, welding etc.) and general notes are documented including certification as applicable.

All ST build records must be retained and made available upon request or provided as required per contract requirement. Seller must formally notify buyer authorized procurement agent for all issues involving development, submittal and retention of ST build records.

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C. Seller must apply one of the following ST validation types as part of ST acceptance:

1. **Minor Validation:** The most common process. Typically occurs when manufacturing uses a new or revised ST for the first time as defined in manufacturing work instructions. Typically applied to low-risk ST of basic to moderate complexity and may or may not control product configuration.

The ST is unconditionally released for production use upon completion of tool fabrication and acceptance. The initial product of the ST is independently inspected to validate the tool produces acceptable product. Should ST users encounter issues, the Seller's normal ST support process applies.

2. **Major Validation Fabrication Tools:** Process applied to tools that are designed or fabricated with intentional compensation from product nominal definition to accommodate manufacturing or material processing phenomena such as spring back or thermal behaviors. The ST is typically fabricated to definition requirements, accepted, and conditionally released for manufacturing use. The initial product of the tool is independently inspected to validate the tool produces acceptable product. Once an acceptable product is produced, the tool is unconditionally released for production use.
3. **Major Validation Assembly Tools:** Process typically applied to complex ST, including end item MOI ST and typically consists of streamlined forms for collecting issues identified during initial use and inspections. As a rule ST are fabricated to definition requirements, accepted, and conditionally released for Manufacturing use. Validation period may include more than one usage to verify the ST produces a part or assembly to product requirements. ST MOI type 1 periodic tool inspections (ref. section 10) may be conducted after production assemblies are produced to demonstrate tool stability (typically applied to very large assembly jigs and check fixtures that may experience foundation settling, base and end-gate settling, etc.)

D. Boeing reserves the right to determine the ST validation type. Should Seller have questions regarding selecting the appropriate ST validation level, formally contact Buyer's authorized procurement agent to obtain contractual instruction for resolution.

E. Boeing reserves the right to verify ST setup and acceptance. When Boeing verification of ST is identified, Seller must contact Boeing Procurement agent to coordinate Boeing attendance.

F. Seller must demonstrate acceptance evidence of ST by one of the two methods:

1. Physically on ST by permanent means such as impression stamping, chemical or mechanical etch, etc.
2. A documented alternate method containing the following characteristics when ST size, usage and environment does not permit physical evidence marking (e.g. unique identifier – color, marking, etc.).

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## 8.2.1 CMS Procedures

Sellers using CMS for fabrication and/or inspection of Boeing ST must document and control their processes. Sellers must comply with the product acceptance software, measurement equipment, inspection media and training requirements for CMS.

All CMS measurements must meet the following requirements unless uniquely identified in a Boeing provided or approved fabrication, manufacturing, periodic, or inspection plan.

- A. Additional CMS requirements are stated below and require capability approval by Boeing or Nadcap per paragraph 8.2.1 C.
- B. The Seller and its subcontractors utilizing CMS must have documented user level processes or documented procedures that provide asset care, equipment setup, operation, training, and Quality Assurance procedural methods to perform acceptance of measurements.

Seller must determine the applicability and document the criteria to perform the following and any exclusion must be coordinated with Buyer's authorized procurement agent to obtain contractual instruction for resolution.

- a) Purpose / Scope – Overview or statement of specific equipment and its intended use.
- b) Calibration – Seller must define calibration intervals and maintain a system for periodic maintenance of measurement equipment. The seller must document inventory of all specific components used for CMS measurement that could affect the integrity of data collection. This inventory should include and not be limited to CMM reference sphere and Laser Tracker target accessories (e.g. bushings, adapters, sphere mounts, bar/rod, probing, drift nest, supports, etc.), all reflector types, and weather station equipment.
- c) Product Acceptance Software – Seller must perform Product Acceptance Software testing (reference D6-51991).
- d) Field Checks / Probe Calibration / Set up – Establish criteria for field checks / probe calibrations / set up to ensure data and system accuracy prior to collecting measurement data.
- e) Drift Points / Stability – When environmental conditions, vibration, or stability of the product being measured could affect measurement data, drift point analysis is required. A record of drift points measured and acceptance tolerance used, before and after measurements is required as objective evidence.



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- f) Temperature Compensation / Scale Factors – dimensional characteristics being verified must meet the engineering definition requirements at 68 degrees Fahrenheit as defined in ANSI/ASME Y14.5, ANSI B89.6.2. When characteristics are measured in an uncontrolled environment a documented process to compensate for thermal effects on the objects being measured is required. Objective evidence is required for temperature compensation when using scale bars, artifacts or temperature calculation. Seller must document their temperature compensation process which includes planning for pre, post and during measurement survey analysis. Although scale bars and artifacts are not required for all applications they can be an effective tool for verification of temperature change in the object if object and scale bar temperature are monitored closely throughout the measurement survey.
  - g) Establish Coordinate System – Establish criteria for changing the coordinate system from a local coordinate system to a tool coordinate system. (e.g. tolerances, datum targets, datum features, tooling holes, tool enhanced reference system or best fit). Establishment of coordinate systems must be in accordance with customer engineering definition and ANSI/ASME Y14.5 as applicable. Best Fit alignment must not be used for special tooling acceptance unless contractually authorized by Boeing Tool Engineering and evidence of authorization must accompany final inspection reports.
  - h) Multiple Station Set-up Criteria – When moving CMS equipment from one location to another, or combining CMS equipment during a survey, Seller must document their process and acceptance tolerance. A minimum of seven adequately distributed common points used as reference for repositioning/adding the CMS equipment during a survey must be verified and recorded as objective evidence.
  - i) Data Collection Parameters – Establish measurement guidelines and specific collection parameters for the CMS equipment prior to collecting measurement data. (E.g. point density, point labels, time/distance separation parameters, apex angles, distance limitations).
  - j) Data Analysis – Establish guidelines for the evaluation of 3D point data to tool engineering, engineering datasets, point maps or drawings.
  - k) Reports – Establish standard process for CMS reports must include job information, coordinate system establishment (alignment verification), object temperature, data analysis and measured results, point maps. When products are measured in an uncontrolled environment CMS reports must include scale bars and drift points. Reports must be in English and in inches unless directed otherwise by customer contract.
  - l) Record Retention – Establish standard process for all inspection and test records to be archived and retained per customer contract requirements and provided to the customer upon request.
  - m) Training – seller must define training requirements to assure competence and maintain employee training records, including on-the-job-training, for all CMS users per section 1.2.

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C. Boeing will recognize sellers approved by Nadcap for Measurement and Inspection (M&I) approvals in addition to or in lieu of Boeing approvals for the following Nadcap accreditations:

Nadcap Approval	Boeing D6-51991 Approval
AC7130, AC7130/1 – Nadcap accreditation for Coordinate Measurement Machines	Fixed CMM
AC7130, AC7130/2 – Nadcap accreditation for Laser Trackers	Laser Tracker
AC7130, AC7130/3 – Nadcap accreditation for Articulating Arms	Articulating Arm

All other CMS equipment not under the Nadcap accreditation will continue to be audited by the existing Boeing ST capability processes.

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## 9. Each Use Condition Check

### 9.1 Scope

All Government- and Boeing-owned ST requires each use condition checks prior to each usage.

### 9.2 Requirements

- A. A ST must only be used for the specific purpose for which it was intended.
- B. Users must, in their areas of responsibility, ensure that ST functions correctly and is properly maintained.
- C. Typical areas of consideration during each use condition check include but are not limited to the following:
  - 1. ST is properly identified and identification is legible.
  - 2. An acceptance stamp is on the identification tag or near the ST identification.
  - 3. The ST engineering definition/configuration level is identified.
  - 4. The instruction, direction, and caution/safety tags are securely attached and legible when applicable.
  - 5. All ST details/parts are available and in good condition:
    - a) “L” pins, hand knobs, scribes, step pins, etc. are in good condition.
    - b) Rubber cushions and protective pads are secure and in good condition.
    - c) Toggle clamps, straps, and other hold-down devices are in good condition.
    - d) There are no loose, cracked, or missing bushings.
    - e) There is no evidence of mushroom, damaged edges, or surfaces on part or assembly locating surfaces.
    - f) There is no corrosion or contamination on any part/assembly locating surfaces.
  - 6. Drill indicators, index holes, and surface stamping are clear and legible.
  - 7. There is no obvious degradation of tamperproof measures.

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- D. Any discrepancies found during each use condition check must be properly documented and addressed in accordance with Seller's documented maintenance and/or nonconformance processes.
  - E. If ST definition is not available at Seller or their subcontractors, the Seller must coordinate with Buyer's authorized procurement agent to obtain contractual instruction for resolution.

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## 10. Periodic Tool Inspection

### 10.1 Scope

This section covers all Government- and Boeing-owned Category II ST used to produce Government and Boeing products.

### 10.2 Requirements

- A. End item Category II ST used in verifying product features or characteristics of parts or assemblies requires periodic tool inspections in addition to each use condition checks; there are two specifically defined types of PTI's that are performed.
  - 1. MOI type 1 – Periodic Tool Inspection Requirement: Physical dimensional measurement or coordination to a program master tool (Category I) and visual inspection that must be recorded on a prescribed inspection plan at a periodic interval.
  - 2. MOI type 2 – Periodic Tool Inspection Requirement: Visual inspection that must be performed and recorded on a prescribed inspection plan at a periodic interval.
- B. Seller and its subcontractors must maintain a list of all Category II ST used to produce Government or Boeing products. The list must include the following:
  - 1. Government and Boeing owned ST supplied by Boeing.
  - 2. Government and Boeing owned ST provided by a Seller.
- C. When Seller has demonstrated capability to Boeing to perform periodic tool inspections, the following requirements must apply:

Seller may determine ST for use as MOI for Seller owned and Boeing accountable ST (i.e. category III). Seller's process for MOI determination must meet the following conditions:

- 1. Seller retains ST engineering definition.
- 2. Seller retains Product engineering definition to determine independent product verification.

For Seller's initial MOI determination all ST must meet ST Acceptance per section 8.2.C. or have evidence of ST Acceptance (i.e. physical acceptance stamp, etc.). After initial ST MOI determination MOI Type 1 or MOI Type 2 PTI may be implemented based upon ST complexity. Seller determination of ST MOI (i.e. category III) status must be controlled per section 10.

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- D. All Category II ST supporting active procurement including out of production spares procurement must maintain current periodic recall status.
1. Category II ST supporting recurring program procurement must maintain current periodic tool inspection recall regardless of ST status (i.e. Stored, in-active, etc.)
  2. For Category II ST supporting out of production (i.e. spares, etc.) procurement greater than one year, the periodic recall may be extended until such time as ST status changes due to additional procurement activity. See section 10.2 M and/or N.
  3. Category II ST exceeding exception status of one year must be submitted as excess ST per contract requirements.
- E. Seller must maintain specific inspection instructions, including initial interval between inspections (Boeing or Seller provided) instructions, by ST number, for the specific features to be verified during the periodic tool inspection. Category II type 1 PTI plans developed by the Seller must be submitted to the Buyer's authorized procurement agent for approval prior to implementation. In addition to specific features being verified, the following are typical areas considered during periodic tool inspections:
1. The tool is properly identified and identification is legible.
  2. An acceptance stamp is on the identification tag or near the tool identification.
  3. The instruction, direction, and caution/safety tags are securely attached and legible, when applicable.
  4. All ST details/parts are available and in good condition:
    - a) "L" pins, hand knobs, scribes, step pins, etc. are in good condition.
    - b) Rubber cushions and protective pads are secure and in good condition.
    - c) Toggle clamps, straps, and other hold-down devices are in good condition.
    - d) There are no loose, cracked, or missing bushings.
    - e) There is no evidence of mushroom, damaged edges, or surfaces on part or assembly locating surfaces.
    - f) There is no corrosion on any part/assembly and no contamination impacting the function of the ST.
  5. Drill indicators, index holes, and surface stamping are clear and legible.
  6. There is no obvious degradation of tamperproof measures.

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7. There is verification that the ST is at the correct configuration for its intended use in accordance with the tool usage instructions and/or manufacturing plan.
  8. There is visible evidence on the ST of its acceptance status.
- F. Any discrepancies found during periodic tool inspections must be properly documented and addressed in accordance with Seller's documented maintenance and/or nonconformance processes.
- G. Seller must maintain the results of preceding and current periodic tool inspections of Category II tools. The records must include:
1. Dimensions/features verified during the periodic tool inspection, including actual values or coordination to Category I ST.
  2. The date of the periodic check.
  3. The inspection authority of the individual who performed the check.
  4. The date of the next scheduled periodic check (expiration date).
  5. ST engineering definition used as inspection requirement.
  6. Verification of configuration level.
  7. Identification of the acceptance status of the ST.
- H. Seller must maintain a copy of all completed periodic tool inspection records and must send a copy to Buyer's authorized procurement agent within 30 days of completion of each periodic tool inspection.
- I. Seller must apply an easily recognizable indication (e.g., label) to the tool that bears the expiration date, acceptance status, and inspection authority of the individual applying the indicator.
- J. At a minimum, Seller must conduct periodic tool inspections every 12 months for Category II ST in use until sufficient data is available to adjust the frequency of inspection.
- K. Seller must review the interval of periodic tool inspections for adequacy and adjust intervals accordingly. Increasing or decreasing the interval must be accomplished using statistical methods and historical periodic tool inspection data.
- L. Seller-initiated changes to the MOI designation and periodic tool inspection interval must be approved by Buyer's authorized procurement agent prior to implementation. Boeing reserves the right to initiate changes to MOI designation regardless of category.

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- M. When Seller is not capable of performing periodic tool inspections, Seller must take the appropriate actions to ensure inspections are accomplished. Typical options include:
1. Shipping ST to Boeing for inspection.
  2. ST inspection performed by Boeing at Seller's site.
  3. All Third-party ST PTI inspection arranged by Seller must meet the capability requirements per section 4 and sub-tier control requirements per section 1.2.1 of this document. If tool inspection is delegated by the Seller, this must be in compliance with section 8 of this document (excluding Boeing capability assessment, the Seller is responsible for having a documented process and determining third-party capability when engaging a third party) and any applicable Boeing contractual requirements.
- N. If seller is unable to perform PTI at designated frequency due to production constraints or spare requirement seller must formally request PTI extension from Buyer's Authorized Procurement Agent prior to PTI expiration. Sellers must provide extension justification and estimated PTI performance date.
- O. Any ST that exceeds PTI frequency date, including customer rejection of ST PTI extension, must be documented and processed per seller's corrective action process. ST as a result of delinquent PTI may not be used for product acceptance until such time as the ST PTI is completed. Alternate ST usage and verification methods may be required per section 16.2 E & F.

### 10.3 Periodic Tool Inspection Instructions

- A. ST periodic tool inspection instructions are intended to provide requirements for Seller and are typically provided for Category II MOI Type 1 & 2 ST.
1. Seller-defined
    - a) Seller-defined ST inspection instructions of Boeing-defined or Seller-defined Category II ST and any documentation changes must be approved by Boeing.
    - b) Seller must maintain tool inspection instructions to the appropriate configuration level and make them available to Boeing upon request.
    - c) Seller-defined tool inspection instructions must be flowed to users performing periodic tool inspections, including Seller's subcontractors.



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## 2. Boeing-defined

- a) Seller must flow the Boeing-defined inspection instructions to users performing periodic tool inspections, including Seller's subcontractors.
- b) Seller-requested tool inspection instruction changes must be submitted to Boeing for review and approval prior to implementation.
- c) For Boeing-defined Government and Boeing-owned Category II ST where no inspection instructions have been provided, Seller must contact Boeing for formal contractual resolution prior to perform the periodic tool inspection.

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## 11. ST Data Elements

### 11.1 Scope

This section applies to all Government- and Boeing-owned ST. Data package elements enable Boeing and Seller to identify, define, use, and periodically inspect ST at Seller facilities.

### 11.2 Requirements

The following are data requirements for ST identification, engineering definition (e.g., drawings, models, digital data, etc.), usage instructions, and inspection instructions. Based on the data element change to the ST, Seller must take appropriate action.

#### 11.2.1 ST Specification/Engineering Definition Requirements

Seller must integrate and incorporate ST specification/engineering definition (Boeing- or Seller-defined), original and change data, as appropriate, including ST category and MOI type.

#### 11.2.2 ST Identification

- A. ST identification must meet contract requirements.
- B. Unless otherwise specified by contract the ST identification and changes must include but are not limited to the following:
  - 1. Special Tooling (ST) code (e.g. CKF, WF, AT, FAJ, etc.).
  - 2. The basic ST number must include the basic engineering part or production assembly number including revision / configuration.
  - 3. Boeing lifetime, program, or contract serial number, when applicable.
  - 4. ST unit/duplicate (dup) number, when applicable.
  - 5. Loose/removable ST components must be identified and traceable back to the parent tool identification number.
  - 6. Additional information may be required by contract or property requirements.
- C. Upon ST acceptance for production use the ST number (items 1 thru 5 above) must not be changed without notification and concurrence from Buyer's authorized procurement agent.

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### 11.2.3 ST Usage Instructions

A. ST usage instructions include technical and process related information for ST users. They are typically provided when ST is highly complex, have critical indexing methods, have multiple configuration settings, or when ST usage cannot be easily communicated on the ST or within the manufacturing work instructions.

#### 1. Seller-defined

- a) Seller-defined ST usage instructions, including revisions, must be flowed to the users of tools within Seller's manufacturing work instruction method.
- b) Seller must maintain ST usage instructions to the appropriate configuration effectivity/level and make them available to Boeing upon request.
- c) Seller must maintain a record of all changes to Seller-defined Category II ST usage instructions and must make them available to Boeing upon request.

#### 2. Boeing-defined

- a) Seller must flow Boeing-provided ST usage instructions including revisions to the tool users through Seller's work instruction methods. Seller must ensure and verify users are working to latest ST usage instruction.
- b) Seller requested ST usage instruction changes must be submitted to Buyer's authorized procurement agent for review and approval prior to incorporation.

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## 12. Manufacturing Work Instructions

### 12.1 Scope

This section covers all categories of Government- or Boeing-owned ST involved with the manufacture of Government or Boeing products. It defines Seller requirements for Seller manufacturing work instructions or plans that require usage of ST.

### 12.2 Requirements

- A. Seller must ensure ST used for the manufacture of Boeing products is documented on appropriate Seller's and its subcontractors' manufacturing work instructions.
- B. When separate ST usage instructions exist, Seller must document the ST usage instruction, in addition to listing the ST in the manufacturing work instructions and make them available to users.
- C. Seller must ensure ST is used in accordance with Seller work instructions and ST usage instructions.
- D. When compliance issues or Seller methods and processes come into conflict with the ST engineering definition, Seller manufacturing work instructions, ST usage instructions, or configuration alignment, Seller is required to follow its nonconformance/corrective action process and coordinate with Buyer's authorized procurement agent to obtain contractual instruction for resolution.

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## 13. First Article Inspection and ST Relationship

### 13.1 Scope

This section covers Government- and Boeing-owned ST as related to First Article Inspection (FAI) of parts or assemblies. The FAI requirements must continue to apply even after initial compliance.

### 13.2 Requirements

- A. ST used during FAI for product acceptance must show evidence of acceptance status prior to use.
- B. The following ST-related events must require a partial or complete re-accomplishment of the FAI for the subject part or assembly:
  - 1. ST engineering definition, including ST coded N/C programs changes potentially affecting fit, form, or function of parts or assemblies.
  - 2. Manufacturing changes to ST configuration controlling or verifying features potentially affecting fit, form, or function of the product.
  - 3. Natural or man-made disaster (e.g., earthquake, flood, tornado) where ST is potentially affected.
- C. ST related events that do not invoke the FAI process include the following:
  - 1. ST maintenance (e.g., cleaning, dressing index features, replacement of pins, etc.).
  - 2. Returning ST to previously accepted definition configuration.
  - 3. ST definition revisions or modifications to ST features not affecting configuration of part or assembly (e.g., lightening holes, clearance issues, operator access issues, etc.).

#### 13.2.1 Communication Requirements

- A. When Boeing initiates actions that require a partial or complete re-accomplishment of FAI due to ST-related events, the requirements must be communicated to Seller. Seller is required to communicate the requirement to any affected Seller's subcontractors.
- B. When Seller initiates actions that require a partial or complete re-accomplishment of FAI due to ST-related events, Seller must communicate with Boeing prior to implementation for Boeing determination/approval and coordination of appropriate FAI actions.

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## 14. ST Maintenance

### 14.1 Scope

The section covers the scope of ST maintenance, which includes all Government- and Boeing-owned ST in Seller's and its subcontractors' possession. Normal wear is expected during ST use, and maintenance is expected. The basic elements of ST maintenance are each use condition checks and periodic tool inspections.

Unless specified in the purchase contract, Seller must only be responsible for rework to ST resulting from excessive wear, damage, or inappropriate storage. Any deviation or exceptions will be subject to negotiation between Boeing procurement agent and Seller.

### 14.2 Requirements

Seller and their subcontractors must have a documented ST maintenance process and must keep ST in a serviceable condition.

- A. Seller must monitor ST features for excessive wear and take actions to address worn ST before the ST becomes nonconforming to ST definition requirements.
- B. If ST definition is not available at Seller or their subcontractors, the Seller must formally coordinate with Buyer's authorized procurement agent to obtain contractual instruction for resolution. (ref: 18.2.1 A4).
- C. At a minimum, Seller must place special emphasis on ST used in situations that may subject the ST to excessive wear. These situations include but are not limited to:
  - 1. Exposure to cutting (e.g., routing, drilling, reaming) cycles.
  - 2. Exposure to force and load cycles.
  - 3. Exposure to vibration, striking, or impact cycles.
  - 4. Exposure to thermal cycles.
  - 5. Exposure to chemicals and fluids.
  - 6. Exposure to corrosive environment.

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- D. ST features may become damaged or lost during normal usage (e.g., pins, clips, clamps, pads, removable components, etc.). Seller must establish and maintain a process to minimize damage or loss, and take actions to maintain, repair, or replace ST damaged or lost features. Any discrepancies found during ST maintenance must be properly documented and addressed in accordance with Seller's documented maintenance and/or nonconformance processes.
  - E. Seller must immediately and formally submit request to Buyer's authorized procurement agent for resolution when normal wear or nonconformance conditions exceed Seller capability for correction.
  - F. Seller must, in a timely manner, formally submit request to Buyer's authorized procurement agent for resolution when ST approaches end of useful life cycle to ensure resolution is addressed before impact to the product quality or deliveries occur.

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## 15. ST Protection

### 15.1 Scope

This requirement is applicable to all Government- and Boeing-owned ST in Seller's and its subcontractors' possession. The requirement is effective for ST in use or not in use.

### 15.2 Requirements

All ST must be appropriately protected to prevent loss, theft, damage, and deterioration.

#### 15.2.1 ST in Use

- A. ST in Seller's possession must be protected from undue damage and deterioration including inappropriate exposure to the elements. When required, ST will have an appropriate preservative applied to prevent corrosion.
- B. Prior to each use, users must review the ST usage instructions for serviceability. Any conditions hindering fit, form, function, or tool performance must be addressed through Seller's ST maintenance process up to possible nonconformance documentation.

#### 15.2.2 ST not in Use

- A. As a result of procurement completion or contract termination involving ST such ST deemed out of production, stored or inactive must be properly documented within the supplier accountability process. Seller must formally notify Buyer's authorized procurement agent per contract closeout process and/or submit through online data system a request for ST disposition. (e.g. customer return, Buyer's request for seller storage, etc.)
- B. ST not in use or stored by Seller must be controlled in a fashion and in facilities to prevent loss, theft, damage, and deterioration. Measures must be taken to apply an appropriate preservative and to protect ST from the elements.
- C. Seller's storage requirements must include periodic preservation / condition checks for all ST in storage.



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## 16. ST Nonconformance

### 16.1 Scope

This section covers all categories of Government- or Boeing-owned ST involved with the manufacture of Government or Boeing products. It defines Seller requirements for Seller's ST nonconformance process.

### 16.2 Requirements

- A. Seller must ensure that ST is identified and controlled to prevent unintended use. The controls, related responsibilities, and authorities for dealing with nonconforming ST must be defined in a documented process. This process may be supported and documented as part of supplier approved Quality Management System.
- B. All nonconforming conditions of ST from the controlled ST definition must be documented in accordance with Seller's nonconformance process. Boeing does not delegate ST Material Review Authority .
- C. When nonconformance issues are found on Category I ST, Seller must immediately and formally report these to Buyer's authorized procurement agent. The discrepant Category I ST must not be used until a Boeing Category I ST disposition is contractually provided in writing.
- D. All nonconformance conditions of Category II and III ST must be addressed at the level of Seller capability. All Category II ST nonconformance dispositions must be retained by Seller and made available to Boeing upon request.
- E. Nonconforming ST must not be released for use by Seller's manufacturing organization until the tool is corrected per Boeing approved disposition, or an acceptable alternative method (e.g. work around plan, limited use process, etc.) has been documented and approved in accordance with Seller's capability and nonconformance process. All alternate method plans must be submitted to buyer's authorized procurement agent for approval prior to implementation and use.
- F. An acceptable alternate method plan must, at a minimum, contain the following:
  - 1. Specific and explicit workaround instructions that will ensure resulting production hardware will be in conformance with engineering requirements including master tooling, as applicable.
    - a). Any master tools (gages) determined to be deficient should be brought to the attention of Boeing immediately per section 16.2 C. Optical or hand layout methods may be utilized in lieu of ST where critical and/or close tolerance dimensional engineering requirements exist, such as Interchangeable & Replaceable (I&R) items.

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2. The workaround plan duration stated by one of the following:
    - a. Calendar Date, Manufacturing days, Unit numbers, Airplane line/variable number, Lot Number
    - b. The ST work authorization order and nonconformance report unique identifier that will correct the discrepant condition.
    - c. The dates of the ST rework window that will correct the discrepant condition.
  3. The applicable Suppliers Quality Management, Manufacturing Engineering Management, Tooling Management concurrence and approval of all the above elements is documented.
  4. Seller must coordinate with Buyer's authorized procurement agent to obtain contractual instruction for approval of any work around plan that is generated where ST rework may impact product or product delivery schedule.

### 16.3 Seller ST Nonconformance Reporting to Boeing

When ST nonconformance information is required to be forwarded to Boeing, it must be in the language and dimensions acceptable to Boeing. The following must be included in the Seller's notification to Boeing:

1. Complete Boeing identification as defined on ST.
2. Location of tool.
3. Clear and concise description of discrepancy.
4. Measurement results of discrepancy.
5. Is and Should Be conditions.
6. ST definition (i.e. category I, digital data, etc.) and revision.
7. Associated Purchase Order as applicable.
8. Photo or graphics of discrepancy as applicable.

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## 17. Potential Product Impact

### 17.1 Scope

This section includes all Government-, Boeing- owned ST used to produce Government- and Boeing-owned products.

### 17.2 Requirements

- A. ST discrepancies potentially impacting products must invoke a Potential Product Impact (PPI) investigation and Seller must support Boeing with ST event-based PPI investigations. Seller must document results of ST related PPI investigation per approved Quality Management System requirements for corrective and preventative action.
- B. Seller must document nonconforming ST within Seller's nonconformance process and identify, document, and segregate nonconforming ST from manufacturing use until ST is corrected or an alternative method is approved.
- C. ST nonconformance types requiring further investigation for PPI include but are not limited to the following:
  - 1. A dimension or feature that is out of ST tolerance and results in exceeding product engineering definition tolerances.
  - 2. Damage to the ST.
  - 3. Missing ST details.
  - 4. Missing ST Identification.
  - 5. No evidence of ST acceptance.
  - 6. Missing or altered ST tamper proof measures.

Note: Investigation may show that these conditions did not have an adverse effect on the product.
- D. Seller must notify buyer's authorized procurement agent upon initiation of PPI investigations and make investigation results available to Boeing upon request.
- E. Seller must identify the produced products potentially nonconforming as a result of the nonconforming ST (designated by serial number, lot number, date codes, any other available means) and identify (reconfirm) the acceptability of produced products outside the suspect range or, if appropriate, identify (reconfirm) the acceptability of all produced products.
- F. Seller must formally and immediately report all ST nonconformance issues potentially impacting product to buyer's authorized procurement agent including identification, documentation, and segregation of potentially nonconforming products as a result of nonconforming ST. This activity must include products at Seller's and its subcontractors' facilities, and products previously delivered to Boeing.

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## 18. Receiving and Shipping

### 18.1 Scope

This section applies to all receipts and shipments of ST by Seller and its subcontractors. Seller and its subcontractors must have the following responsibilities to avoid ST loss and damage during receipt and shipment. This applies to all Government- and Boeing-owned ST.

### 18.2 Requirements

- A. Seller and its subcontractors must comply with the following requirements.
- B. Upon acceptance of receiving verification, all ST and ST data elements will be incorporated into Seller's approved ST control processes for storage, protection, accountability, and use per the requirements of this document.
- C. All ST received must satisfy requirements of section 8 "ST Acceptance" prior to production usage.

#### 18.2.1 Receiving

- A. Upon receipt of ST, Seller must verify the following in accordance with contract requirements:
  - 1. There is no damage and there are no missing details/parts.
  - 2. Serviceable condition.
  - 3. Configuration.
  - 4. Data elements (i.e. ST identification, ST definition, ST usage/inspection instructions, etc.).
  - 5. Evidence of initial acceptance
  - 6. Periodic tool inspection release status (when applicable).
- B. Any discrepancies found during receiving must be properly documented and addressed in accordance with Seller's documented maintenance and/or nonconformance processes including coordination with buyer's authorized procurement agent.
- C. Upon ST acceptance, Seller must update property accountability database as required by contract and enter the Boeing accountable ST in the Sellers ST accountability process, including all data elements.
- D. ST definition not received or not available at Seller or their subcontractors the Seller must coordinate with Buyer's authorized procurement agent to obtain contractual instruction for resolution (ref: 18.2.1 A4).

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## 18.2.2 Shipping

- A. Seller must use the shipping method called out in the contract, the shipping method as defined in the ST engineering definition, or a method that will ensure ST protection.
- B. Seller must obtain appropriate authorization and specific instructions for shipping Category I ST.
- C. Prior to any subcontractor release of ST, Seller must update property accountability database as required by contract and update the Boeing accountable ST in the Sellers ST accountability process.
- D. Prior to shipping Seller must:
  - 1. Account for all ST details and parts
  - 2. Include all required ST data elements (i.e. ST definition, ST usage instructions, PTI results, etc.)
  - 3. Ensure ST is in serviceable condition
  - 4. Include evidence of acceptance
  - 5. Include last periodic tool inspection evidence (Category II ST)
- E. When ST is not in a serviceable condition or ST details and parts are missing, Seller must initiate and submit to Buyer's authorized procurement agent a nonconformance document per contract requirement or internal quality management system. Seller must, prior to shipping, obtain a disposition approved by Boeing or permission from the Government or Boeing, as defined by contract, to ship with an open (no disposition) nonconformance.
- F. Seller must preserve and protect ST before packaging for shipping.
- G. Seller must use shoring within or on shipping packaging to protect ST from damage during shipping, when applicable.
- H. Seller must contact Buyer's authorized procurement agent for assistance with any shipping questions including but not limited to:
  - 1. ST details or parts accountability.
  - 2. Serviceable condition / nonconformance issues.
  - 3. Corrosion prevention.
  - 4. Shoring and protection
  - 5. Incomplete or lack of ST engineering definition and appropriate ST records and data.
  - 6. Appropriate shipping authorization.

When ST definition is not available for shipping seller must formally obtain authorization to ship ST from Boeing's authorized procurement agent.

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## 19. ST Use for Post-production and Spares

### 19.1 Scope

This section addresses post-production and spares use of ST including all variations of the terms post-production and spares (e.g., fleet modification programs, upgrade programs, service bulletins, warranty programs, maintenance programs, etc.). The scope covers all categories of Government- and Boeing-owned ST used to produce Government or Boeing products under a Boeing post-production or spares contract.

### 19.2 Requirements

- A. Seller must ensure ST that is defined, fabricated, received, or otherwise provided for the purpose of implementing a post-production or spares program is in compliance with all requirements of this document.
- B. Seller must confirm the category of tool, including the MOI type, for the purpose of acceptance/inspection requirements and implement required inspections.
- C. For category II ST returning from “inactive to active” or “not in use to in use,” Seller must perform PTI per section 10 and notify Boeing’s authorized procurement agent of the change for purposes of periodic tool inspection status alignment between Boeing and Seller.
- D. Seller and their subcontractors must have a documented ST post-production process and must keep ST in a serviceable condition. Seller and their subcontractors must have the following but not limited to:
  - 1. The ST Definition for the current Boeing accountable ST configuration being used.
  - 2. The applicable latest revision of the Boeing-defined ST specifications and requirements for Boeing-defined ST.

If Boeing-defined ST definition is not available at Seller or their subcontractors the Seller must coordinate with Buyer’s authorized procurement agent to obtain contractual instruction for resolution.

## Appendix A

Supplier Tooling Requirements Document Map		
D950-11059-1	AS9100	AS9102
Introduction and General Requirements	7.4.1, 6.2.2 4.2.1	
Definitions of General Terms		
ST Categories, Media of Inspection Definitions, and Inspection Criteria	7.5.1.3, 7.6	
Supplier ST Capability	6.2.2 7.4.3	
Configuration Management	7.1.3 7.2.3 7.5.1.2	
ST Engineering Definition	7.3 7.2.3 7.3.7	
ST Fabrication, Rework, and Modification	7.1, 7.2.3, 7.5, 7.5.1, 7.5.1.2, 7.5.1.4	
ST Acceptance	7.5.1.3, 7.6	
Each Use Condition Check	7.5.1.3, 8.3	
Periodic tool Inspection	7.2.3 7.5.1.3, 7.6 8.3	
ST Data Elements	7.5.1 7.5.3 7.2.3	

Manufacturing Work Instructions	7.1 7.2.3 7.5.1 7.5.1.2	
First Article Inspection and ST Relationship	7.2.3 7.5.1.1 7.5.1.3 8.2.4	5.2 5.3 5.5.3
ST Maintenance	7.1 7.2.3 7.5.1.3 8.3	
ST Protection	7.5.1.3 7.5.5 8.3	
ST Nonconformance	7.2.3 8.3	
Potential Product Impact	7.2.3, 8.3, 8.5.2	
Receiving and Shipping	7.4.3 7.2.1 7.2.3 7.5.5 8.3	
ST Use for Post-production and Spares	Applies as above	



## Appendix B

### Document Revision Record

Rev	Section	Change	Rationale
A	Table of Contents	Added section 1.3 and appendix B.	Improvement. Standard technique for documenting revisions.
	Definitions	Deleted First Product Inspection, added Periodic tool Inspection and ST Validation.	Align with IDS common process.
	Section 1	Added new section 1.3, References.	Clarification.
	Section 3; Table 1	Added provision to contact Boeing for clarification; added “periodic” to inspection requirements.	Clarification.
	Section 4, 4.2	Added contract requirement language.	Improvement.
	Section 5, 5.2, 5.2.5	Revised title and paragraph to focus requirement at Seller level and remove from user level.	Align with generally accepted industry practices.
	Section 6, 6.2	Added requirement C.	Improvement.
	Section 7, 7.2	Added delegation requirements statement when using third party.	Clarify requirement specifically for acceptance delegation.
	Section 8, 8.2	Added computer measurement system requirements; added item 7, ST validation paragraphs; deleted FPI language.	Allow usage of advanced measurement equipment without DPD approval. Align with IDS common process.
	Section 9, 9.2	Deleted item 8.	Align with change in 5.2.5.
	Section 10, 10.2	Revised formatting; added change in MOI designation communication requirement; added delegation requirements when using third party.	Clarification.
	Section 11, 11.2.2	Added contract compliance requirement, change requirement; deleted item 8.	Clarification.
	Section 13, 13.2, 13.2.2	Revised wording.	Clarification.
	Section 18, 18.2	Added requirement to enter received ST into Seller’s approved control process.	Improvement.
Section 19, 19.2	Added not in use to in use communication requirement.	Process improvement.	
Requirements sections	Added alphabetical identification to each requirement within the section.	Eliminate confusion when referencing a specific requirement.	

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Revision Letter **A**  
Changes in This Revision See appendix B.  
Authorization for Release

AUTHOR:	<u>William J. Petry</u>	<u>3H1</u>	<u>Sept 17, 2009</u>
		Org. Number	Date
APPROVAL:	<u>Thomas J. Spiegel</u>	<u>D500</u>	<u>Sept 17, 2009</u>
		Org. Number	Date
DOCUMENT RELEASE:	<u>Ngoc H. Bui</u>	<u>G-823A</u>	<u>Sept. 23, 2009</u>
		Org. Number	Date

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## Revision Record

Rev	Section	Change	Rationale
B	Title	Changed IDS to BDS	Update of company business unit name
	Section 1.1	Added AS9100 revision level, Rev B	Clarification
	Section 1.2	Added “accountable to Boeing,” and business unit name update	Clarification of applicability to only those Government ST accountable to Boeing
	Section 3.2	Removed must and replaced with must	Clarification
	Section 4.2.A	Added seller subcontractor controls element	Clarification
	Section 5.2.1	Added instructions behind ST usage	Clarification
	Section 7.2.C.2	Added computer measurement system provision	Clarification
	Section 7.2.C.4	Added authorization requirement	Clarification
	Section 8.2.G	Added alternative method for evidence of acceptance	Alignment with AS9100 Rev B
	Section 11.2.2.B.5	Removed “coordination” and replaced with “notification”	Clarification
	Section 18.2.2.C	Restructured prior to shipping requirements from paragraph to listed requirements	Clarification
	Section 18.2.2.E	Reworded requirement to “adequately preserve and protect”	Clarification

Revision Letter

**B**

Changes in This Revision

See appendix B.

Authorization for Release

AUTHOR:	<u>William J. Petry</u>	<u>3H1</u>	<u>Oct 29, 2010</u>
		Org. Number	Date
APPROVAL:	<u>Thomas J. Spiegel</u>	<u>D500</u>	<u>Oct 29, 2010</u>
		Org. Number	Date
DOCUMENT RELEASE:	<u>Charlene J. Gerken</u>	<u>9M-ST-EUB0</u>	<u>Nov. 2, 2010</u>
		Org. Number	Date

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## Revision Record

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Revision Letter            **C**  
Changes in This            Revised verbiage in Section 10.2 item D. 7.  
Revision  
Authorization for  
Release

AUTHOR:	<u>Albert C Hodge-Jr</u>	<u>GT-01-3H2</u>	<u>Nov. 29, 2011</u>
		Org. Number	Date
APPROVAL:	<u>Joseph K. Lonigro-III</u>	<u>GT-01-3H1</u>	<u>Nov. 29, 2011</u>
		Org. Number	Date
DOCUMENT RELEASE:	<u>Rebecca Byers</u>	<u>9M-ST-EUB0</u>	<u>Nov. 29, 2011</u>
		Org. Number	Date

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## Revision Record

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Revision Letter            **D**  
Changes in This            Added word "technical" to content owner statement on page and also  
Revision                      added verbiage on page 1 stating Jeff Webb has RAA for ISE ownership  
Authorization for  
Release

AUTHOR:	<u>Albert C Hodge-Jr</u>	<u>GT-01-3H2</u>	<u>Feb, 23,2012</u>
		Org. Number	Date
APPROVAL:	<u>Jeff Webb</u>	<u>HM-01-D50A</u>	<u>Feb 23, 2012</u>
		Org. Number	Date
DOCUMENT RELEASE:	<u>Charlene J. Gerken</u>	<u>9M-ST-EUB0</u>	<u>Feb. 23, 2012</u>
		Org. Number	Date

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## Revision Record

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Revision Letter

**E**

Changes in This  
Revision

Added NEW content owner on page 1 and also  
added verbiage on page 1 stating Timothy R. Ditch has RAA for Quality  
Ownership

Authorization for  
Release

AUTHOR:	<u>Albert C Hodge-Jr</u>	<u>GT-01-3H2</u>	<u>Aug 24, 2015</u>
		Org. Number	Date
APPROVAL:	<u>James R. Peth</u>	<u>HM-01-D50A</u>	<u>Aug 24, 2015</u>
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DOCUMENT RELEASE:	<u>Alicia E. Otero</u>	<u>9M-ST-EUB0</u>	<u>October 6, 2015</u>
		Org. Number	Date

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## Revision Record

Rev	Section	Change	Rationale
F	Document Information	Added Non Proprietary statement; Add requirement to use most current document; Revised all instances of “shall” to “must”.	Clarification and missing requirement; document administration decision
	Table of Contents	Revised page numbers and added new section references.	Required to align with added requirement sections
	Section 1.1	Removed AS9100 revision references; Added AS9100 name; Added FAR references; Added Mylar reference; Added ST exclusion types. Revised All Special Tooling references to ST acronym throughout document.	Clarification of requirements applicability in introduction and to maintain term uniformity in document
	Section 1.2	Revised applicability statement; revised documentation requirements; revised internal audit requirements; revised surveillance and Boeing ST determination requirements; added Boeing provided ST definition requirement; added data system element; added ST usage and alternate method requirement.	Clarification of requirements
	Section 1.2.1	Added Seller subcontractor general requirements section; added definition to flow-down requirements to subcontractors; added Seller responsibility for subcontractor approvals.	Clarification and missing subcontractor control elements to align with AS9100
	Section 1.3	Added reference to Mylar controls; Add references to unique ST form documents.	Additional control elements identified to improve ST documentation
	Section 2	Added Boeing Defined Definitions; Revised Boeing-Defined ST to add ST elements; Added Capital Equipment definition; Revised Configuration Alignment definition; Revised Configuration Management definition to add ST life cycle and contract elements; Added General Purpose Tools definition; Revised Media of Inspection definition; Added Overhead Mechanical Handling Equipment definition; Added Post Production Spares definition; Added Seller-defined definition; Added Seller Owned ST definition; Added Shop Aid Tool definition; Revised ST Specification definition; Added CMS definition; revised Periodic Inspection to Periodic Tool Inspection throughout document; Added Special Test Equipment definition.	Required definitions to terms used throughout the document and clarification to existing definitions and to maintain term uniformity in document
	Section 3.1	Revised Category I description.	Clarification
	Section 3.2	Revised Category II description.	Clarification
	Section 3.3	Added Boeing right of ST category determination and buyer communication.	Clarification

Rev	Section	Change	Rationale
F	Table 1	Revised Category II description; Added evidence of ST acceptance requirement; added referred to terminology; added Cat II requirement; Added Cat II requirements per section 10.	Clarification
	Section 4.2	Revised B. Proficiency Statement; Revised C & D for Boeing communication requirements.	Clarification
	Section 5.2	Revised Boeing communication requirement.	Clarification
	Section 5.2.1	Added obtain ST definition instruction; Revised Boeing communication Requirement.	Clarification
	Section 5.2.3	Revised Configuration elements; Revised Boeing communication requirement.	Clarification
	Section 5.2.4	Revised Boeing communication statement.	Clarification
	Section 5.2.5	Revised B - for Boeing communication requirements; Added C - added conditions for configuration alignment, contract changes and coordination.	Clarification
	Section 6.2	Revised C – added CMS acronym; Revised D – ST definition approval and Boeing communication requirements; added a) & b) element to add seller owned ST responsibility; Added D – ST definition approval conditions; Revised E – Tolerance requirements and added ASME Y14.5 requirement; Revised G – changed ST history retention requirement.	Clarification and addition of missing control elements to align with AS9100 and industry recognized standards
	Section 7.2	Revised B – ST work authorization requirement examples; Added C – ST work authorization elements; Added E – Mylar control requirement and examples; Revised G.3 – for third party approval and control requirements.	Clarification and addition of missing control elements to align with AS9100 and industry recognized standards
	Section 8.1	Added requirements to ST Acceptance scope.	Clarification for intent of section
	Section 8.2	Removed B - CMS requirements; Added new B – including in-process and final ST acceptance parameters, use of build records and feature control elements. Revised C 3.- added End item MOI and reference to section 10; Revised D – added formal communication requirement; Revised F 1&2- defined permanent marking; clarified alternate marking method.	Clarification and addition of missing control elements to align with AS9100 and D6-51991
	Section 8.2.1	Added Section 8.2.1 A thru C detailed CMS control requirements and NADCAP recognition requirements.	Clarification and addition of missing control elements to align with AS9100 and D6-51991
Section 9.2	Added E – ST definition retention and communication requirements.	Clarification	



Rev	Section	Change	Rationale
F	Section 10.2	Revised and added A – Relocated and added condition requirement from section 3 (3.2.1 and 3.2.2) rev E; Add C – Seller determination of MOI status and conditions; Added C conditions 1&2. – retains ST definition; retains product definition; Added initial MOI determination meet section 8;PTI exclusion process and condition requirement; Added D - elements for out of production spares, PTI exceptions, and excess ST notification requirements; Revised E – submittal of seller created PTI plans to Procurement; Revised G & H – Mandatory requirement to send PTI results to procurement; Revised L – Seller changes and Boeing determination for PTI; Revised M 3 – For third party approval and flow-down; Added N – request for PTI extensions. Added O – PTI delinquency requirements / instructions and communication requirements.	Clarification of section scope and intent and addition of missing control elements to align with AS9100
	Section 10.3	Added section 10.3 – relocated requirement from section 11.2.4 rev E.	Clarification of section scope and intent
	Section 11.2.2	Revised B- as specified by contract; Revised B 1 – Added ST code examples; Revised B 2 – defined basic identification elements; Revised B 3 – Added contact and program elements; Revised B 5 – loose detail identification requirements; Revised C – for Boeing communication and identification change control.	Clarification
	Section 11.2.3	Revised A – Removed “intent” and added “developed and utilized”; Added 2. Boeing –defined a) – verify latest TUI usage revisions.	Clarification
	Section 12.2	Revised B – documenting tool use instruction on planning; Revised D – Boeing Communication requirements.	Clarification
	Section 14.2	Added – maintain documented process for ST maintenance; Revised A – clarified ST excessive ware instructions; Revised B – clarify formal request for ST definition; Added E & F –Boeing communication requirements.	Clarification and addition of missing control elements to align with AS9100
	Section 15.2.2	Added A – contract termination, accountability and ST excess notification requirements.	Clarification

Rev	Section	Change	Rationale
F	Section 16.2	Revised A – Added quality management system nonconformance elements; Revised C – Boeing communication requirements; Revised E – Added examples of alternate methods and approvals; Added F – defined alternate methods and conditions.	Clarification
	Section 16.3	Revised - Added nonconformance elements when reporting	Clarification
	Section 17.2	Revised A – added quality management system CA investigation documentation requirements; Added D – Boeing notification and results requirements; Revised F – Boeing communication requirements.	Clarification
	Section 18.2	Added C – ST must meet section 8 ST Acceptance requirements;	Clarification and addition of missing control elements to align with AS9100
	Section 18.2.1	Added C – ST receiving accountability and data system update requirements; Added D – Obtain ST definition when not received with ST as part of receiving insp.	Clarification and addition of missing control elements to align with AS9100
	Section 18.2.2	Added C – ST subcontractor shipping accountability and data system update requirement; Revised D.2 to add mandatory examples; Revised E – Submit nonconformance prior to shipping; Revised H 1 thru 6 – shipping question clarification; Added - Obtain Boeing authorization to ship ST without definition.	Clarification
	Section 19.2	Revised C – added PTI and contact requirement; Revised D – defined post production process requirements, obtain ST definition and Boeing communication.	Clarification
	Appendix A	Revised AS9100 and AS9102 to align with Rev F.	Clarification to AS9100 and AS9102

Revision Letter

**F**

Changes in This Revision

See appendix B.

Authorization for Release

AUTHOR:

Greg W. Schmid

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Date

APPROVAL:

Timothy R. Ditch

HM-01-D78A

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Org. Number

Date

REVIEWER:

Lucia Casillas

66-CJ-MP6Q

June 16, 2016

Org. Number

Date

DOCUMENT RELEASE:

Alicia E. Otero

9M-ST-EUA0

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