

NORTHROP GRUMMAN

Aerospace Systems

**SUB-TIER
SUPPLIER MANAGEMENT
GUIDE**

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**Joseph F. Jackson
Director, Supplier Quality
Northrop Grumman Aerospace Systems**

REVISION RECORD

The latest issue to this guide may be confirmed by viewing the OASIS web site at
<https://oasis.northgrum.com>

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1.0 Overview

Scope

This document provides guidance to suppliers of Northrop Grumman Aerospace Systems Sector (hereafter referred to as Northrop Grumman) for the management of sub-tier suppliers within their supply chain to ensure purchase order and technical requirements are maintained. The guide provides an overview of sub-tier management activities for a variety of commodities and processes. Each supplier should determine the level of implementation that is appropriate for the various suppliers in their supply chain.

Use of additional procedures and/or specifications may also be required to assure complete task compliance. Throughout this guide, the term “First -tier Supplier” is used to refer to the Company contracted by Northrop Grumman for parts or services. The term, “Sub-tier Supplier”, refers to any supplier in the First-tier Supplier’s supply chain.

Areas covered in this guide include but are not limited to Contract Flow-down by First-tiers, approval of sub-tier Suppliers, accessing OASIS, Manufacturing Planning, First Article Inspection, Product Audit, Product Acceptance, and Root Cause Analysis and Corrective/ Preventative Action.

General

It is the responsibility of a first-tier supplier to ensure that all requirements and technical documentation imposed via the Northrop Grumman purchase order are contractually flowed down to each sub-tier supplier and are adhered to. Responsibility for the acceptance of the final deliverable product to Northrop Grumman cannot be delegated to any sub-tier supplier unless supplier establishes delegation requirements and maintains the delegation list. Additional acceptance inspection may be required by Northrop Grumman source inspection and/ or government source inspection as directed by the purchase order.

2.0 Contract Flow down by First-tier Suppliers

Both ISO 9001 and AS9100 require suppliers to have purchasing information that describes the product to be purchased. In addition, Northrop Grumman Supplier Quality Assurance Requirements (SQAR) mandates that the applicable quality elements be contractually imposed throughout the supply chain. As such, the first-tier supplier shall review SQAR for all requirements that shall be incorporated in their purchasing information. Below is a list of items to be incorporated in the sub-tier’s purchase order.

- Quality Management System, such as ISO 9001, AS9100
- Special process approval requirements
- Customer Approved Special Processor List (ASPL)

- Customer approval for use and control of digital data (ref: SQAR Supplement)
- First Article Inspection requirements (ref: AS9102)
- Variation Management of Key Characteristics (AS9103)
- Statistically valid sampling plan
- Source inspection vs. receiving inspection
- Engineering drawing for dimensions, finish, materials & process requirement
- Process specification revision and associated EO's per OASIS
- Drawing revision, as required by customer purchase order
- Right of access by the direct customer, their customer, and authorities to all facilities involved in the purchase order and to all applicable records

3.0 Approval of Sub-tier Suppliers

Suppliers to Northrop Grumman are encouraged to utilize sub-tiers that are certified to ISO 9001:2000 or AS9100 by a recognized 3rd party Certification Body (CBs) agency as recognized by ANAB or RABSQA. As a minimum, sub-tiers throughout the supply chain shall be compliant to the above quality management systems.

As a minimum, suppliers should perform

- Onsite evaluation in lieu of "mail-in" survey.
- Periodic on-site surveillance to ensure continued compliance to industry standards, engineering specifications, special process requirements, and appropriate record keeping.

Suppliers may utilize quality system evaluation checklists that are available on OASIS web site (ref: <https://oasis.northgrum.com>) as an aid in conducting on-site verification reviews.

If a sub-tier has been delegated for product inspection on behalf of the supplier, additional oversight should be incorporated into the process.

In addition to initial and periodic process verification reviews, first-tier suppliers shall have a sub-tier performance reporting process that includes, at a minimum:

- Quality and delivery with defined thresholds
- The ability to monitor customer satisfaction as a performance metric
- Heightened inspections with poor performing sub-tiers
- Recovery or "Exit" plans from poor performing sub-tiers where applicable.

An Approved Supplier List (ASL) should be maintained. The first-tier supplier should have a formal process to restrict future procurement with disapproved sub-tier suppliers to ensure only approved sub-tier suppliers receive purchase orders. .

Sole or directed sourcing does not relieve the first-tier supplier from ensuring that sub-tier suppliers shall meet quality management system expectations and product/ processes requirements.

4.0 Special Process Approvals

Special processes for production and service provision, where the resulting output can not be verified by subsequent monitoring or measurement, must be evaluated and qualified prior to manufacturing.

Northrop Grumman and its customers have identified processes that require increased focus through validation and control. The list of NGAS/ customer controlled processes and approved Special Processors (ASPL) are located on OASIS (ref: <https://oasis.northgrum.com>). First-tier suppliers and their sub-tiers are responsible to ensure that only approved process sources are used.

Customer approval does not assure nor imply that work performed by a processor listed on the ASPL is acceptable. First-tier suppliers and their sub-tier suppliers are responsible to assure that a processor meets all process specification requirements. As such, it is important that the first-tier supplier confirm compliance through periodic process validation audits. Process checklists are available from Northrop Grumman. For additional information on process checklists, you may consult with Northrop Grumman SQ Field personnel or Process managers.

Although special provisions are granted to first-tier suppliers with design authority to approve their own internal processes or their sub-tier suppliers, they are strongly encouraged to attain Nadcap certification.

5.0 Accessing OASIS

Northrop Grumman provides a supplier website (OASIS) as a ready reference for technical, quality, and contractual information. This website can be accessed through the following web address: <https://oasis.northgrum.com>

Information available on the system includes the following:

- Approved Special Processors (Northrop Grumman ASPL)
- Links to the Boeing D1-4426
- Links to LMA QCS001
- Platinum Source Program information
- Supplier Scorecards
- SQAR – Supplier Quality Assurance Requirements
- The table of contents for materials & process specifications
- The text of process specifications (requires a password for each program)
- Purchase Order terms and conditions

- Purchase Order Standard notes
- Access to Oasis EDI

6.0 Review of Manufacturing Plan

Northrop Grumman recommends that suppliers periodically validate the following at their sub-tiers:

6.1 Drawing Requirements

- Material requirements
 - Size, alloy & temper
 - Mill certification for raw metallic materials
 - Non-destructive Testing (NDT)/ Ultrasonic Testing of raw stock
 - Grain direction
 - Qualification of forging / castings
 - Optional material or substitution
- Flag notes/ general note
- Dimensions / key characteristics
- Fracture Critical Traceability, Fracture Critical, Maintenance Critical & Fatigue Critical

6.2 Special Processor Requirements

Ensure that the latest process specifications including the referenced sub-tier specifications, as posted on OASIS, are called out on the Manufacturing Plan. In addition, validate the following as a minimum:

- When permitted by the specification, do the sub-tier suppliers select appropriate process options?
- When applicable, did Northrop Grumman approve their NDT technique?
- Ensure the processing sequence is correct from starting material to finish
- Heat treatment is performed either after forming or machining

6.3 Inspection

- Is either receiving or source inspection required for raw material or sub-tier processes?
- Is in-process inspection called out?
- Are all final inspections specified for?
 - Dimensions/ Key Characteristics
 - Non-destructive Testing
 - Tensile testing, when required
 - Hardness
 - Conductivity

7.0 First Article Inspection (FAI)

Northrop Grumman requires the use of the Society of Automotive Engineers (SAE) Aerospace Standard AS9102 (Aerospace First Article Inspection Requirement) throughout the supplier chain. Therefore, the first-tiers shall validate the use of AS9102 at their sub-tiers.

8.0 Periodic Product/ Process Audit

In order to ensure that sub-tier suppliers continue to produce acceptable product, periodic Product/Process Audits should be performed at each sub-tier supplier. The audits should be performed at the sub-tier supplier's facility to allow access to in-process hardware, work instructions, shop travelers and procedures governing the processes used by the supplier. The frequency of audits should be determined and documented in the first-tier supplier's procedures.

Northrop Grumman recommends the following quality elements be reviewed during the Process/Product Audit:

- Conformance of product to purchase order requirements.
- Conformance of product to drawing and process specification requirements (dimensions, hardness, conductivity, wet tape test, etc.).
- Conformance of product to acceptance test procedures (ATP) requirements.
- Witness and verify critical process steps against the specification requirements to ensure compliance for heat treat, NDT, cleaning, plating, priming, etc.
- Verify that an adequate first article inspection was completed for the hardware.
- Verify that the sub-tier supplier is using approved sources for parts/ processes they contract out (where required).
- Verify raw materials used are acceptable, properly documented and are traceable.
- Verify the adequacy of the production planning used to manufacture hardware.
- Verify the adequacy of tooling used in the fabrication and testing of hardware.
- Verify that packaging is appropriate and adheres to all applicable specifications.
- Verify the appropriate use of the suppliers MRB process as applicable.

Suppliers may utilize Process/ Product Audit checklists that are available on the OASIS web site (ref: <https://oasis.northgrum.com>) as an aid in conducting on-site audits.

9.0 Product Acceptance

All suppliers to Northrop Grumman are responsible for ensuring the acceptance of their products delivered directly to Northrop Grumman or drop shipped to a separate location. Do not rely solely on the integrity of a sub-tier supplier's "certificate of compliance". The first-tiers shall validate that the sub-tiers perform all final inspection and testing as required by engineering drawing and specification referenced in the applicable purchase order. In addition, the sub-tiers shall maintain the quality record for inspection and testing along with acceptance criteria.

Northrop Grumman has developed the "Supplier Product Acceptance Guide" to assist suppliers in determining if purchase order and technical requirements have been satisfied. This guide can be found on the Oasis web site (ref: <https://oasis.northgrum.com>).

9.1 Sampling Plan

When sub-tiers use sampling plans for product acceptance, the plan shall be statistically valid and appropriate for use. All suppliers are encouraged to use ANSI Z1.4 or Mil-Std-1916 when a sampling plan is used in their inspection process.

9.2 Operator Self-verification Process

One element of product acceptance is the Operator Self Verification process, which is commonly referred to as Self Inspection System (SIS). The AAQG has developed standard elements in an Aerospace Recommended Practice (ARP) document for Operator Self-Verification (ARP 9162) processes within the aerospace industry. All suppliers are strongly encouraged to use this standard as a guide when implementing such processes.

9.3 Delegated Acceptance Program

If a delegated acceptance program is administered to accept hardware from a sub-tier supplier, it is the responsibility of the first-tier supplier to ensure the product delivered conforms to specified requirements. This may be accomplished through periodic on-site system evaluations, product conformity audits and independent (3rd party) inspections/ testing. Prior to granting delegation, the first-tier supplier shall have a process for removing the suppliers from the delegation process when degradation is evident. Northrop Grumman's Platinum Source Certification Program can be viewed on OASIS as a process benchmark.

10.0 Root Cause Analyses and Corrective/Preventive Action

Root Cause Analysis and corrective/ preventive action is a process of finding the cause for non-conformance and facilitating corrective actions to prevent the potential of recurrence of an event(s). If left unchecked, it will ultimately lead to unrealized costs associated with rework, repair, and replacement at all levels of manufacturing.

Suppliers may utilize the Northrop Grumman “Corrective and Preventive Action Guidelines” that is available on OASIS (ref: <https://oasis.northgrum.com>). This guide is developed to document Northrop Grumman’s expectations on Root Cause /Corrective Action Analysis and Preventive Action Development.