


CURRENT REVISION				
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K	C26796	03/24/2017	Scott Peterson	
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<p><b>DOCUMENT APPROVALS ARE ELECTRONIC AND ARE MAINTAINED IN THE CONFIGURATION MANAGEMENT DATABASE SYSTEM (AGILE)</b></p>		<h2>Supplier Quality Requirements</h2>		
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Number: D14521

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## Revision History


Revision	Date	ECO Number	Change Description
G	10/14/2014	C12761	Reformatted entire document to the latest template. Updated Table of Contents, minor changes to sections 10.1, 11, 16, 21, 24, 27 and 32 (newly renumbered sections). Added Packaging requirement to section 17, updated requirements for Change Notifications to section 20, and added section 31, Calibration Provider Requirements.
H	11/20/2015	C17729	Updated document template to D13480 Rev F. Section 6: Added IAQG OASIS statement. Section 10, 11, 29.1, and 31: New Sections Section 19: Added Supplier Deviation Request and Supplier Disclosure forms. Section 27: Added last sentence. Section 29: Added SCAR response requirement. Section 31: Added AS9102 compliance requirement. Additional general and administrative changes.
J	08/31/2016	C21236	Complete document re-write to include the following: <ul style="list-style-type: none"> <li>Document title changed to "Supplier Quality Requirements"</li> <li>Requirements Compliance Matrix added</li> <li>Several new clauses added (B005, B006, B007, B008, B009, B010, B011, B012, B013, B022, B023, B025, B029)</li> <li>Clause language revised.</li> </ul>
K	03/24/2017	C26796	<ul style="list-style-type: none"> <li>Updated document template to D13480 REV H</li> <li>Removed "Confidential and Proprietary" disclaimer and added copyright at the direction of legal</li> <li>Made minor clarifications throughout the document</li> <li>Table 1 – Renamed Production Article Active &amp; Passive</li> <li>Table 1 – Added "X" to B009 (FMEA) for Passive components</li> <li>Table 1 – B027 deleted</li> <li>A004 – revised Performance Measurement criteria</li> <li>A009 – added sentence for temporary/permanent transfer of work</li> <li>B008 – Table 2: Added "-xxx" to ModMan, KANDU, Rx &amp; Tx. Added KRFU (ARINC 791). Removed 28Vdc acWAP.</li> <li>B008 – removed the FRACAS section within B008</li> <li>B009 – clarified DFMEA is for Active components &amp; PFMEA is for both Active &amp; Passive components</li> <li>B012 – clarified ALT vs. HALT</li> <li>B014 – clarified deviation vs. waiver</li> <li>B016 – revised shelf life to 75%</li> <li>B021 – added clarification &amp; examples of supplier deliverables</li> <li>B027 – deleted without replacement</li> <li>B030 – New clause for Special Processes</li> <li>B031 – New clause for Prohibited Materials/Substances</li> </ul>

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## 1 Purpose

This document defines quality assurance requirements for suppliers providing airborne articles and services to Gogo.

## 2 Scope

This document applies to Gogo approved suppliers of airborne articles; hardware, material, Line Replaceable Units (LRUs), Shop Replaceable Units (SRUs), electrical and mechanical assemblies and sub-assemblies, software, and services. This document is subject to incorporation into contractual documents.

## 3 Responsibilities

Gogo Aviation Quality is responsible for updating, maintaining, and ensuring compliance to this document.


Gogo Supply Chain and/or Gogo Aviation Quality is responsible for providing this document to potential and current suppliers.

Gogo Suppliers are responsible for implementing requirements defined within this document (as applicable). Any exceptions or waivers to these requirements will be documented and approved by Gogo Aviation Quality on the Supplier Quality System Survey.

## 4 Acronyms and Definitions

These acronyms and definitions apply to this document.


Term	Meaning
<b>Aircraft Installation Service</b>	Suppliers that provide aircraft installation services for Gogo systems. These suppliers install or upgrade/modify existing Gogo system installations.
<b>Aircraft Maintenance Service</b>	Suppliers that provide aircraft maintenance services for Gogo systems. These suppliers troubleshoot, remove and replace Gogo LRUs, and provide general maintenance and repair services for Gogo systems.
<b>ALT</b>	Accelerated Life Testing
<b>ASL</b>	Approved Supplier List
<b>ATA</b>	Air Transport Association of America
<b>C of C</b>	Certificate of Conformity
<b>CAA</b>	Civil Aviation Authority
<b>Calibration Service</b>	Suppliers that provide calibration services for Gogo's calibrated equipment.
<b>CCA</b>	Circuit Card Assembly
<b>COTS</b>	Commercial-Off-The-Shelf. These articles include standard parts and components that are commercially available (i.e. screws, nuts, bolts, rivets, etc.)
<b>DFMEA</b>	Design Failure Modes & Effects Analysis
<b>DSA</b>	Direct Ship Authorization

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<b>Engineering/STC Services</b>	Suppliers that provide engineering design and development services for new or modified aircraft installations, and/or STC services. These suppliers may also be contracted to provide prototype and/or production aircraft installation kits.
<b>ERAI</b>	Electronics Resellers Association International
<b>ESD</b>	Electrostatic Discharge
<b>ESS</b>	Environmental Stress Screening
<b>FAA</b>	Federal Aviation Administration
<b>FAI</b>	First Article Inspection
<b>FAIR</b>	First Article Inspection Report
<b>FMEA</b>	Failure Modes and Effects Analysis
<b>FOD</b>	Foreign Object Debris/Detection/Damage
<b>FRACAS</b>	Failure Reporting Analysis and Corrective Action System
<b>GIDEP</b>	Government-Industry Data Exchange Program
<b>ICOP</b>	Independent Industry Controlled Other Party
<b>LRU</b>	Line Replaceable Unit
<b>MRB</b>	Material Review Board
<b>MSA</b>	Measurement System Analysis
<b>MSD</b>	Moisture Sensitive Device
<b>MTBF</b>	Mean Time Between Failure
<b>NAS</b>	National Aerospace Standard
<b>NCR</b>	Nonconformance Report
<b>NFF</b>	No Fault Found
<b>OCM</b>	Original Component Manufacturer
<b>OEM</b>	Original Equipment Manufacturer
<b>OOT</b>	Out of Tolerance
<b>PFMEA</b>	Process Failure Modes & Effects Analysis
<b>PMA</b>	Parts Manufacturer Approval
<b>Production Article (Active)</b>	Suppliers that provide electronic assemblies and/or sub-assemblies (i.e. LRUs, SRUs, end item deliverables, electrical or electro-mechanical assemblies, etc.)
<b>Production Article (Passive)</b>	Suppliers that provide other (non-active) assemblies or parts (i.e. Kits, radomes, passive antennas, racks, sheet metal parts, machined parts, wire/cable harnesses, etc.)
<b>QMS</b>	Quality Management System
<b>RCA</b>	Root Cause Analysis
<b>RPN</b>	Risk Priority Number
<b>SCAR</b>	Supplier Corrective Action Request
<b>SDL</b>	Supplier Disclosure Letter
<b>SDS</b>	Safety Data Sheet
<b>SRU</b>	Shop Replaceable Unit
<b>STC</b>	Supplemental Type Certificate

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## 5 Supplier Quality Requirements

5.1 Supplier Quality Requirements are comprised of two parts:

- [Part A](#) – General Requirements (Applicable to all airborne suppliers)
- [Part B](#) – Product/Service Specific Requirements (Applicability defined in Table 1 – Requirements Compliance Matrix)

Requirements Compliance Matrix	Supplier Type (See Section 4 for definitions)						
	COTS	Production Article (Active)	Production Article (Passive)	Aircraft Maintenance Service	Aircraft Installation Service	Engineering/STC Service	Calibration Service
Part A – All Clauses	X	X	X	X	X	X	X
Part B – B001 QMS Certification		X	X				
Part B – B002 Counterfeit Parts Prevention Program		X					
Part B – B003 First Article Inspection		X	X				
Part B – B004 Certificate of Conformity	X	X	X				
Part B – B005 TSO/PMA Certificate and Airworthiness Approval Tag		X	X				
Part B – B006 Foreign Object Debris/Damage Prevention Program		X	X				
Part B – B007 Electrostatic Discharge Protection Program		X					
Part B – B008 Environmental Stress Screening		X					
Part B – B009 Failure Modes & Effects Analysis		X	X				


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Requirements Compliance Matrix	Supplier Type (See Section 4 for definitions)						
	COTS	Production Article (Active)	Production Article (Passive)	Aircraft Maintenance Service	Aircraft Installation Service	Engineering/STC Service	Calibration Service
Part B – B010 Key Characteristics		X	X				
Part B – B011 Measurement System Analysis		X	X				
Part B – B012 Accelerated Testing		X					
Part B – B013 Mean Time Between Failure		X					
Part B – B014 Supplier Request for Deviation/Waiver	X	X	X				
Part B – B015 Sampling Plan		X	X				
Part B – B016 Sensitive Items	X	X	X				
Part B – B017 Hazardous Material	X	X	X				
Part B – B018 Delivery	X	X	X				
Part B – B019 Packing Slip	X	X	X				
Part B – B020 Packaging, Pallets, Crates, and Shipping	X	X	X				
Part B – B021 Configuration Change Notification		X	X				
Part B – B022 Direct Ship Authorization		X	X				


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Requirements Compliance Matrix	Supplier Type (See Section 4 for definitions)						
	COTS	Production Article (Active)	Production Article (Passive)	Aircraft Maintenance Service	Aircraft Installation Service	Engineering/STC Service	Calibration Service
Part B – B023 Source Inspection		X	X				
Part B – B024 Control of Nonconforming Material	X	X	X	X	X		
Part B – B025 Failure Reporting Analysis & Corrective Action System		X	X	X	X		
Part B – B026 Gogo Owned Tooling & Gauges		X	X	X	X		
Part B – B028 Calibration Service							X
Part B – B029 Solder/Solderability of Parts		X	X	X	X		
Part B – B030 Special Processes		X	X				
Part B – B031 Prohibited Materials/ Substances	X	X	X				

Table 1 – Requirements Compliance Matrix

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## Part A – General Requirements

### A001 – Quality Management System

The Supplier shall have a Quality Management System (QMS) that complies with the International Organization for Standardization ISO 9001 – Quality Management System Requirements (equivalent or better – i.e. AS9000 series). Independent Industry Controlled Other Party (ICOP) certification/registration is not required.

### A002 – Evaluation & Approval

The Supplier shall undergo an initial evaluation before inclusion to the Gogo Approved Supplier List (ASL).

The Supplier shall undergo recurring (surveillance) evaluation to maintain an Approved status on the Gogo ASL.

These evaluations may include, but are not limited to, a Quality System Survey review and/or Supplier Evaluation audit, and may be completed by either a desktop or on-site assessment. Failure to meet the acceptance criteria of these evaluations may result in probationary approval status, or possible removal/exclusion from the Gogo ASL.

### A003 – Right of Facility Access

The Supplier shall allow right of facility access to Gogo, Gogo's customers, and regulatory authorities, at any level of the supply chain involved in the order and to all applicable records. The aforementioned parties may conduct on-site process or product audits of the Supplier to ensure the requirements of this document, as well as the requirements of the Gogo purchase order, Contract, Statement of Work, drawings, and specifications are being met. Refusal to allow on-site access may jeopardize the Supplier's approval status.


### A004 – Performance Measurement

Supplier Performance Measurement criteria for ongoing supplier evaluation and selection may include the following, depending upon the product/service provided:

- Inspection Performance (i.e. receiving inspection, ATP, and/or source inspection yield)
- Field Failures/Performance
- Supplier Corrective Action Requests (SCARs) Performance (i.e. quantity and responsiveness)
- On-Time Delivery Performance

#### Scoring Legend

- **Green** (Score 95 – 100):  
Exceptional to Satisfactory supplier performance. Meeting Gogo expectations.

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- **Yellow** (Score 90 - <95):  
Substandard supplier performance, requiring attention and improvement to meet Gogo expectations.
- **Red** (Score <90):  
Unsatisfactory supplier performance, requiring immediate attention and improvement to meet Gogo expectations.

### **A005 – Purchase Order**

The Supplier shall enter into a contractual relationship and have an approved Purchase Order from Gogo prior to delivery of any articles or services to Gogo. The Supplier may jeopardize their ability to be considered for future opportunities if they proceed without these arrangements. Verbal authorizations are not considered formal agreements. The Purchase Order may include: part numbers, revisions, prices, quantities, and other requirements that govern the purchase and supply of the parts or services. Quotations the Supplier provides must include additional costs; such as delivery, packaging, etc. required to supply the item or service. With regard to price, Gogo requires the Supplier invoice prices match negotiated Gogo prices to ensure timely processing. Changes may be handled on a case by case basis. Invoices which do not match the purchase order or the agreement may be returned to the Supplier.

### **A006 – Record Retention**

The Supplier shall maintain accurate quality records documenting conformance to requirements. Documented procedures shall be in place defining responsibilities for record retention and control. Records pertaining to Gogo projects shall be retained for a minimum of 10 years unless otherwise specified in the Purchase Order or contract.


*Note: Aircraft Maintenance Service suppliers are excluded from the 10-year record retention requirement. In accordance with CFR 145.219, Aircraft Maintenance Service suppliers must retain records for at least 2 years from the date the article was approved for return to service.*

### **A007 – Sub-Tier Supplier Management**

The Supplier shall manage all second and third party suppliers or subcontractors in accordance with their agreements. The Supplier must flow down all applicable requirements, including customer requirements, statutory requirements, and regulatory requirements as applicable, to second and third party suppliers.

### **A008 – Corrective & Preventive Action**

Supplier Corrective Action Request (SCAR) and Nonconformance Report (NCR): The Supplier shall provide a SCAR/NCR response within 10 business days of SCAR/NCR issuance. (Exception: If the SCAR/NCR was written for product failure(s), then the Supplier shall provide a SCAR/NCR response within 10 business days after receipt of the failed product for evaluation.) It is essential that corrective action be immediately taken by the supplier when any nonconformance is identified at

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Gogo or any of its customers. When this occurs, Gogo Aviation Quality will inform the supplier of the nonconformance. A SCAR/NCR may be issued for purchased components found to be nonconforming through line rejections, testing failures, failed inspection results, Gogo customer concerns or returns, or obsolete material. Suppliers may jeopardize their ability to be considered for future opportunities if they fail to respond to the SCAR/NCR in a timely manner.

### **A009 – Control of Work Transfers**


The Supplier shall make Commercially Reasonable Efforts to notify Gogo in writing of any merger/acquisition, relocation, or closure of the Supplier's facility, including manufacturing facilities.

The Supplier shall also make Commercially Reasonable Efforts to notify Gogo in writing as soon as the information is known, of any temporary or permanent transfer of work (e.g. location of manufacture, from the Supplier to an external provider, or from one external provider to another external provider).

Upon receipt of written notification from Supplier, Gogo may request at its option, and Supplier shall provide, adequate assurances, including a comprehensive plan, detailing how Supplier intends to meet its performance obligations and delivery of conforming Product as required under this Agreement.

This notification shall be provided to: [AviationQuality@gogoair.com](mailto:AviationQuality@gogoair.com), and must include the following:

- Purpose of relocation or work transfer
- Address of new location
- Risk identification and mitigation plan specific to Gogo's contracted products
- Schedule of move, minimizing impact to Gogo
- Coordinator / Point of Contact for the relocation or work transfer

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## Part B – Product/Service Specific Requirements

### **B001 – QMS Certification**

The Supplier shall have an ICOP QMS certification by an accredited registrar, either ISO 9001 and/or AS9100 series. The scope of the Supplier's certificate of registration shall adequately cover the product(s) or service(s) being provided by the Supplier.

All suppliers to Gogo who hold third-party certification under the AS9100 series of aerospace quality management system standards (AS9100, AS9110, AS9115, and/or AS9120) must maintain an active profile within the International Aerospace Quality Group – Online Aerospace Suppliers Information System (IAQG-OASIS). These suppliers must grant Assessment Detail access to Gogo within their respective OASIS profile upon request.

Additionally, Supplier shall promptly notify Gogo Aviation Quality ([AviationQuality@gogoair.com](mailto:AviationQuality@gogoair.com)) of any changes in its quality leadership or senior management, any adverse changes to product accreditations/approvals (e.g., expired, withdrawn, suspended, downgraded), any certification body or regulatory agency findings/nonconformances classified as "Major".

### **B002 – Counterfeit Parts Prevention Program**


The Supplier shall establish and maintain a counterfeit part prevention plan. AS5553 may be used as a guide to develop the plan. This plan shall focus on detection, prevention, mitigation, disposition, and reporting of suspected or confirmed counterfeit parts or assemblies. This Counterfeit Part Prevention Plan should adhere to the following:

Counterfeit parts are defined as any parts containing unlawful or unauthorized reproductions, substitutions, or alterations that have been knowingly mismarked, misidentified, or otherwise misrepresented to be an authentic, unmodified part from the original manufacturer, or a source with the express written authority of the original manufacturer, such as an approved aftermarket distributor.

Upon discovery of counterfeit or suspect counterfeit parts the Supplier shall notify Gogo Aviation Quality ([AviationQuality@gogoair.com](mailto:AviationQuality@gogoair.com)) and Gogo Supply Chain within one (1) business day. The Supplier must be able to provide the supply chain traceability showing how the counterfeit parts were obtained (this includes the supply chain path from the original manufacturing of the parts through any intermediaries and ultimately to delivery to Gogo).

If Counterfeit Parts/Items are furnished under this PO and are found in any of the delivered goods, the Supplier shall promptly replace such with items acceptable to Gogo, and the Supplier shall be liable for all direct costs relating to the removal and replacement of said items. Gogo reserves all rights to report such to third-party monitoring or reporting entities (e.g. Electronics Resellers Association International (ERAI) at [www.eraf.com](http://www.eraf.com) and the Government-Industry Data Exchange Program (GIDEP) at [www.gidep.org](http://www.gidep.org)).

Documentation shall be made available by Supplier that authenticates unbroken traceability to the applicable Original Component Manufacturer/Original Equipment Manufacturer (OCM/OEM) upon request. The Supplier shall flow down requirements for a counterfeit parts prevention program to their suppliers, as applicable.

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**B003 – First Article Inspection (FAI)**

The Supplier shall complete a First Article Inspection (FAI) for all items except those that are (a) standard catalog/COTS items (ref. AS9102 Standard Catalog Hardware), (b) raw material, or (c) covered by a military/industry standard/specification. FAI shall be performed on an item from the initial production lot provided by the Supplier. The FAI and First Article Inspection Report (FAIR) shall be completed in accordance with AS9102 requirements.

The Supplier shall not perform FAI using prototype items or items manufactured using methods different from those intended for the normal production process. The Supplier shall record, whenever possible the variable measurements, of all characteristics including applicable drawing notes on the FAIR, validation data for any applicable specifications and tests, and reference and attach FAIRs for major lower level subassemblies. A representative of the Supplier's Quality Assurance Department shall sign and date the report. The Supplier shall forward the FAIR along with applicable material or test data/certifications (e.g., painting, plating, composition, x-ray, functional testing, etc.) with the lot and to [AviationQuality@gogoair.com](mailto:AviationQuality@gogoair.com) for review and approval.


A partial (a.k.a. delta) or re-accomplishment FAI shall be performed when any of the following events occur:

1. A change in the design characteristics affecting fit, form, or function of the part.
2. A change in manufacturing source(s), process(es), inspection method(s), location of manufacture, tooling, or materials that can potentially affect fit, form, or function.
3. A change in numerical control program or translation to another media that can potentially affect fit, form, or function.
4. A natural or man-made event, which may adversely affect the manufacturing process.
5. An implementation of corrective action required to complete a previous FAI.
6. A lapse in production for two years shall require an update for any characteristics that may be impacted by the inactivity. This lapse is from the completion of last production operation to the actual restart of production.

The Supplier shall forward the partial (delta) FAIR along with applicable material or test data/certifications (e.g., painting, plating, composition, x-ray, functional testing, etc.) with the lot and to [AviationQuality@gogoair.com](mailto:AviationQuality@gogoair.com) for review and approval.

**B004 – Certificate of Conformity (C of C)**

The Supplier shall provide a Certificate of Conformity (C of C) for material delivered against a Gogo PO that states conformance to all applicable documentation, engineering drawings, process specifications, and PO requirements. The C of C must include, at a minimum, the name of the supplier, the address of the supplier, the part number, the part revision, the Gogo PO number, shipment quantity, all applicable specifications, and the signature and printed name and title of the supplier's authorized quality representative.

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**B005 – TSO/PMA Certificate and Airworthiness Approval Tag**

If the Supplier holds National or Civil Aviation Authority (CAA) certification/approval/authorization (e.g., Federal Aviation Administration (FAA) Technical Standard Order Authorization/Parts Manufacturer Approval (PMA)/Type Certification)), and if required by the Purchase Order, the Supplier shall provide the original Authorized Release Certificate, FAA Form 8130–3 (Airworthiness Approval Tag) or other CAA equivalent Airworthiness Approval Tag with delivery of each product.

**B006 – Foreign Object Debris/Damage (FOD) Prevention Program**


The Supplier shall establish and maintain a FOD prevention program. NAS-412 (National Aerospace Standard, Foreign Object Damage/Foreign Object Debris (FOD) Prevention) may be used as a guide to develop the program. The program shall focus on FOD awareness, prevention, detection, housekeeping, and material handling.

Whenever and/or wherever FOD entrapment or foreign objects can migrate, the Supplier shall ensure applicable FOD requirements are flowed down to sub-tier suppliers. Prior to closing inaccessible or obscured areas and compartments during assembly, the Supplier shall inspect for foreign objects/materials and ensure no FOD barriers remain embedded or attached (e.g. protective plugs). The Supplier shall ensure tooling, jigs, fixtures, and test or handling equipment are maintained in a state of cleanliness and repair sufficient to prevent FOD.

By delivering items to Gogo, the Supplier shall be deemed to have certified to Gogo that such items are free from any foreign materials that could result in FOD.

**B007 – Electrostatic Discharge (ESD) and Moisture Sensitive Device (MSD) Protection Program**

If the Supplier provides electric/electronic parts or assemblies, they shall document and implement an ESD and Moisture Sensitive Device (MSD) Control Program in accordance with ANSI/ESD S20.20, ESD Association Standard for the Development of an Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices) and IPC/JEDEC J-STD-033, Standard for Handling, Packing, Shipping and Use of Moisture/Reflow Sensitive Surface Mount Devices.

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## **B008 – Environmental Stress Screening (ESS)**

*Note: Articles in production (as of the date on the revision history of this document for Rev J) shall be subjected to ESS testing if listed in Table 2 (a “-xxx” signifies that all dash numbers on the drawing shall be subjected to ESS testing). Otherwise, this clause is applicable to new development of items classified as Production Article (Active), unless otherwise agreed to in writing with Gogo.*

LRU Name	Gogo P/N	Supplier P/N
ACPU-2	P19667	E71-100-01
ModMan	P23740-xxx	1004980-xxx
KANDU	P23741-xxx	1004990-xxx
Rx Antenna	P23742-xxx	1005000-xxx
Tx Antenna	P23746-xxx	1005300-xxx
KRFU	P23747-001	305-0560-001
KRFU (ARINC 791)	P34632	8950LWEWFEX
SACL-PF	P31672-001	73000005-001
acWAP (115 Vac)	P33206	E71-301-01

*Table 2 – LRUs requiring ESS (see note above)*


Gogo suppliers who manufacture items classified as Production Article (Active), shall implement ESS procedures as defined within this clause, unless otherwise agreed to in writing with Gogo.

### **General ESS Process**

The first step in implementing an ESS is the planning, which includes selecting the level of assembly at which to screen. The Supplier may perform screening at levels of assembly lower than the LRU level. The screening methods shall be random vibration and thermal cycling. These two methods are the most effective screens for precipitating latent defects. The Supplier shall conduct the screening, record, and report the results.

### **ESS Program Planning**

Planning a stress screening program for production should begin early in the development phase. It is imperative that ESS resources, training requirements, and detailed plans (including all levels of assembly tested and associated environmental profiles) are in place by the supplier when production begins. The supplier shall develop appropriate ESS testing to remove early-life failures. The cost of rework in manufacturing escalates by orders of magnitude as the assembly process proceeds from component level to the LRU level. Finding defects at the lowest possible level of assembly will tend to minimize rework costs by reducing corrective action time. However, some defects manifest

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themselves only at higher levels of assembly. The success of a stress screening program is strongly dependent on knowledge of the product and the processes to be used in manufacture of the product. The defects that can potentially reside within the product, and the effectiveness of stress screens in precipitating the defects are not necessarily known. Information derived from the following sources should be used in planning an ESS program.

- Identification of similar hardware items that have exhibited a high incidence of latent defects on other programs.
- Identification of suppliers or sub-suppliers whose products have exhibited a high incidence of latent defects on other programs.
- Qualification test results for items subject to ESS testing.
- Receiving inspection results of similar hardware items.
- Screening and test records from previous programs.
- Reliability growth test results.

### ESS Levels and Application

All suppliers shall perform ESS at the LRU level. The supplier may, and is encouraged to perform ESS at lower level(s).


Per this document, the lowest level of assembly is a component (integrated circuit, resistor, switch, etc.). The next-higher level of assembly is a multi-part assembly that has a defined identity such as a printed wiring assembly, or a shop replaceable unit (SRU). The top level of assembly is a line replaceable unit (LRU). The choices of how many levels and which levels will involve an engineering evaluation by each LRU supplier.

### ESS Thermal Cycling Profile

The thermal cycling profile shall incorporate the high operating temperature and low operating temperature from the associated LRU qualification testing (DO-160 or equivalent). Thermal ramp rate and thermal dwell time shall be left to the discretion of the supplier. A minimum of 3 thermal cycles shall be performed.

### ESS Random Vibration Profile

The random vibration profile shall incorporate the operating curve from the associated LRU qualification testing (DO-160 or equivalent). A minimum exposure of 15 minutes shall be performed in the axis most susceptible to mechanical damage.

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## Sampling Plan

The supplier shall utilize Table 3 to determine the appropriate ESS sampling rate.

Consecutive ESS Tests w/o Failure (Same LRU Type)	ESS Sampling Rate (Minimum)
0 – 5	100%
6 – 10	50%
11 – 15	25%
> 15	10%

Table 3 – ESS Sampling Rate

A failure of an LRU during either the thermal cycling or random vibration portion of ESS shall reset the sampling rate to 100% for both the thermal cycling and random vibration portions.

## Performance Monitoring

The supplier shall monitor the performance of the LRU by performing functional testing during ESS. Power cycling of the LRU shall be performed during thermal cycling at the hot and cold temperature extremes. Continuous functional testing shall be performed during random vibration and during the powered portions of thermal cycling.


## ESS Retest

All LRUs that have been returned to the supplier from the field (excluding LRUs returned for cosmetic or minor mechanical issues not affecting functionality; for example, replacing a housing screw, replacing a label, paint touch-up, etc.) shall undergo an abbreviated ESS prior to returning to service. Abbreviated ESS shall consist of the following minimum requirements:

- Three (3) thermal cycles, with functional testing per the *Performance Monitoring* section of this clause.
- Random vibration of 7.5 minutes in the axis most susceptible to mechanical damage, with functional testing per the *Performance Monitoring* section of this clause.

## ESS Procedure

The supplier shall prepare an ESS procedure that documents the processes for accomplishing the requirements of this ESS plan. The ESS procedure shall document all required processes, or refer to those processes documented elsewhere in the supplier's controlled documentation system. The ESS procedure shall be submitted to [GogoReliability@gogoair.com](mailto:GogoReliability@gogoair.com) for approval.

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The supplier's ESS procedure shall contain the following:

- Test item functional description
- Environmental test profiles for thermal cycling and random vibration
- Special test equipment description
- Functional tests description
- Pass/fail criteria
- Test data elements (to be recorded, analyzed, and used for ESS reporting)
- Schedule

### ESS Report

The supplier shall provide quarterly ESS reports to Gogo via e-mail to [GogoReliability@gogoair.com](mailto:GogoReliability@gogoair.com). The ESS report shall contain the following:

- ESS test data
- ESS test results summary
- ESS fallout rate
- Pareto of ESS failures, root causes, and corrective actions

Reporting shall verify that ESS adequately performs the function of eliminating infant mortality failures and improving reliability in manufacturing.

### **B009 – Failure Modes & Effects Analysis (FMEA)**


*Note: This clause is applicable to new development only. Articles in production (as of the date on the revision history of this document for Rev J) are excluded from this requirement, unless otherwise agreed to in writing with Gogo.*

When supplying items classified as Production Article (Active), the Supplier shall perform Design Failure Modes & Effects Analysis (DFMEA) on the top level LRU and subsequently on the subsystem level if high risk areas are identified. The DFMEA report shall be submitted to Gogo with identified Risk Priority Number (RPN) values and action plans to address risk items. This shall be completed prior to Critical Design Review (CDR). All submissions shall be sent to [GogoReliability@gogoair.com](mailto:GogoReliability@gogoair.com) for approval.

Refer to MIL-STD-1629A and/or SAE J1739\_200901 for additional DFMEA guidance.

When supplying items classified as Production Article (Active) or Production Article (Passive), the Supplier shall perform Process Failure Modes & Effects Analysis (PFMEA) on the assembly processes. The PFMEA report shall be submitted to Gogo with identified RPN values and action plans to address risk items. This shall be completed prior to delivery of the first production article/First Article Inspection (FAI). All submissions shall be sent to [GogoReliability@gogoair.com](mailto:GogoReliability@gogoair.com) for approval.

Refer to SAE J1739\_200901 for additional PFMEA guidance.

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**B010 – Key Characteristics**

The Supplier shall identify key attributes or features whose variation have significant influence on product reproducibility, life or performance that would require specific actions to control the variation. The Key Characteristic could be for the product or process that makes the product. A report (e.g. Control Plan, reference AS9103) shall be supplied to Gogo specifying the Key Characteristics and how they will be controlled along with current process capability measures (Cp, Cpk) for those characteristics. This shall be completed prior to production with process capability measurements provided during product ramp and quarterly thereafter. All submissions shall be sent to [GogoReliability@gogoair.com](mailto:GogoReliability@gogoair.com) for approval.

**B011 – Measurement System Analysis (MSA)**

The Supplier shall perform Measurement System Analysis (MSA) on all Key Characteristics to determine if the measurement systems can adequately discriminate between good and bad parts, as well as identify trends in the product or process performance. An MSA study shall be supplied to Gogo on all measurement systems for Key Characteristics. Measurement systems that are not capable shall have action plans to address measurement error or variation prior to delivery of the first production article/First Article Inspection (FAI). All submissions shall be sent to [GogoReliability@gogoair.com](mailto:GogoReliability@gogoair.com) for approval.

**B012 – Accelerated Testing**

*Note: This clause is applicable to new development only, unless otherwise agreed to in writing with Gogo. Articles in production (as of the date on the revision history of this document for Rev J) are excluded from this requirement, unless otherwise agreed to in writing with Gogo.*

Supplier shall perform a Highly Accelerated Life Test (HALT) on their product to determine design margin and potential design weakness(es). The HALT procedure shall be submitted to Gogo prior to Preliminary Design Review (PDR). The HALT report shall be submitted to Gogo prior to the start of Qualification testing. HALT results shall be mutually reviewed by Gogo and the supplier to determine any subsequent need for redesign.


Supplier shall perform an Accelerated Life Test (ALT) on their product to determine potential end-use failure modes, and predict the useful life of the product. The ALT procedure shall be submitted to Gogo prior to Critical Design Review (CDR). The ALT report shall be submitted to Gogo prior to the Production Readiness Review (PRR).

All document submissions shall be sent to [GogoReliability@gogoair.com](mailto:GogoReliability@gogoair.com) for approval.

For additional guidance, refer to:

*Accelerated Reliability Engineering HALT and HASS, Gregg K. Hobbs, Hobbs Engineering Corporation.*

*HALT, HASS & HASA Explained: Accelerated Reliability Techniques, Harry W. McLean, ASQ Quality Press.*

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### **B013 – Mean Time Between Failure (MTBF)**

All Gogo Suppliers shall comply with the MTBF requirements listed herein and to the requirement in the statement of work or product specification within the contract.

MTBF Analysis & Reporting – The Parties agree as follows: (i) Gogo may, at its discretion, provide periodic reports of Supplier’s MTBF performance with respect to the Products; and (ii) Suppliers shall provide Gogo with access and available data required to analyze MTBF of Products for the returned/repared Products including but not limited to:

Analysis of MTBF; and

Analysis reports including but not limited to summary of warranty returns, confirmation of fault or No Fault Found, root cause analysis and corrective actions.

Supplier shall provide quarterly electronic reports to Gogo detailing the required information as specified above, throughout the applicable warranty period.

MTBF Remedies - In the event the Products (hardware and software) do not meet the MTBF Guarantee as specified under the terms of this Agreement, Supplier shall provide: (i) within thirty (30) days following Gogo notice, mutually agreed to quantity spares to meet the availability criteria to Gogo on a loan basis until the MTBF Guarantee Values are met; (ii) Immediate technical support for investigation via telephone and e-mail; (iii) Supplier will work with Gogo to achieve a recovery plan.

Measured MTBF = Total Flight Hours x Component Quantity / Number of Verified Failures. A “Verified Failure” means a failure corrected by (i) pulling and replacing an LRU which has been verified as a failure or (ii) download of a critical software patch or release to restore functionality. For avoidance of doubt, no fault found Products and Product upgrades are not considered a “Verified Failure”.


### **B014 – Supplier Request for Deviation/Waiver**

The Supplier’s adherence to approved design data is essential to continued, repeatable quality & reliability. Accordingly, once a product is qualified for production, and its configuration is released, the supplier shall not change the product, process, and/or location of manufacture without written communication and approval from Gogo, including components used on printed wiring board designs. Requests for Deviation/Waiver shall be communicated in writing via Form D20157, Supplier Request for Deviation/Waiver.

A Deviation request is used to obtain temporary authorization, prior to manufacture, to depart from a particular requirement of an item’s current approved configuration. The deviation shall be for a specific number of units or time period.

A Waiver request is used to obtain authorization to ship an item which is known to depart from a particular requirement, but is considered suitable after repair by an approved method or after a “Use-As-Is” disposition.

*Note: In accordance with Clause B024, the Supplier is not granted MRB authority to issue “Repair” or “Use-As-Is” dispositions without Gogo approval.*

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**B015 – Sampling Plan**

In the event a sampling plan is applicable, the sampling process shall be based on Military Standard 105D/E (ANSI/ASQC Z1.4, ISO 2859), Table 1- General Inspection Level II where C=0 and AQL = 1 and/or a Gogo approved methodology at the minimum.

**B016 – Packaging and Shipping of Sensitive Items**

**Age (Shelf Life):** Upon shipment, shelf life remaining shall meet the minimum shelf life specified on the purchase order. If no shelf life is specified, 75% of the shelf life shall be remaining on products upon shipment.

Note: Expiration dates must be clearly noted on the material, as well as on the packing slip, and the most restrictive item within the kit shall have its expiration date marked on the outside of the kit box.

**Light or temperature sensitive:** Items which require special storage, such as light or temperature sensitive materials, must be shipped with consideration of this sensitivity and must be clearly identified on the outside of the packaging material, as well as on the packing slip.

**Electro-Static Discharge (ESD):** Items that are ESD sensitive shall be handled and packaged to prevent ESD damage utilizing MIL-STD-1686, ANSI/ESD S20.20, or EIA/JEDEC JESD625 as a guideline. ESD sensitive items must be shipped in ESD protective packaging, and be clearly marked, as well as noted on the packing slip.


**Moisture Sensitive Device (MSD):** Items that are moisture sensitive shall be handled and packaged to prevent damage utilizing IPC/JEDEC J-STD-033 as a guideline. MSD items must be shipped in MSD protective packaging, and be clearly marked, as well as noted on the packing slip.

**B017 – Hazardous Material**

The Supplier must comply with all local, State, and Federal Health, Safety and Environmental regulations.

Shipping of all hazardous materials must be prepared in accordance with the appropriate Federal Hazardous Materials Regulations. These regulations can be found in Title 49 of the Code of Federal Regulations (49 CFR). 49 CFR changes periodically, and it is the Supplier's responsibility to comply with the most current standard.

The supplier must ensure that the proper Dangerous Goods-Hazardous Materials/Safety Data Sheet (SDS) markings are placed on the shipping or storage containers, and proper documentation is supplied. SDS sheets should be included in initial shipments, and upon request.

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**B018 – Delivery**

Gogo expects suppliers to maintain on time delivery performance approaching 100%. Just-In-Time delivery demands consistent and timely response from the entire supply base.

**Short Shipments**

Short shipment requests shall be communicated to the appropriate Supply Chain Buyer as soon as the issue is known. Short shipments may require a supplier action plan, and may result in poor delivery performance ratings.


**Delivery Schedules**

It is the supplier's responsibility to ensure goods are received at the required location on the date specified on the agreed documents. The acceptable time frame for shipments will be addressed specifically in these documents. Suppliers may be required to provide corrective action plans whenever this requirement is not being met. It is the supplier's responsibility to inform Gogo Supply Chain personnel immediately of any potential difficulties in meeting shipping requirements. Alternative plans may be available which avoid downtime. Gogo expectation is that all shipping requirements will be adhered to (including during holiday or other supplier shutdown periods), unless prior written arrangements are made.

**B019 – Packing Slip**

Material shipped shall be identified on a Packing Slip or Bill of Lading. The following information must be noted on these documents:

- Shipment Method and Date
- Ship to Address
- Single Line Item for Each Part Number Shipped
- Part Number, Serial Number, and Revision, as applicable
- Description of the Product
- Purchase Order Number(s)
- Order Release Number (if applicable)
- Quantity Ordered / Quantity Shipped
- Number of containers of each part number shipped with the extended quantity noted. (ex. 10 containers @ 100 pieces total 1000)
- Total number of cartons/skids and weight

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## **B020 – Packaging, Pallets, Crates, and Shipping**

Articles supplied to Gogo shall be packaged to provide physical, chemical, and cleanliness protection to prevent damage to or deterioration of the parts.

Packaging shall meet or exceed the guidelines established per the current revision of Air Transport Association of America (ATA) Specification 300 (Category III), Specification for Packaging of Airline Supplies.

Sensitive items (age, light, temperature, ESD, and MSD) shall be packaged in accordance with the Sensitive Items clause B016 of this document.

Suppliers are responsible to ensure pallet loads meet the following criteria:

- Even, level pallet loads (not pyramided)
- Proper securing shall be used, e.g. straps, stretch wrapped, boxed, etc.
- Height of pallet shall not exceed 50 inches
- Wood pallets and crates shall be 'heat-treated' to protect against wood infesting insects. International pallets require a conformance ID stamp to pass Customs

For questions, please contact your Gogo Supply Chain representative for clarification.

## **B021 – Configuration Change Notification**

The Supplier shall notify Gogo of any design change (major or minor) and receive approval from Gogo prior to incorporation of the change.

The Supplier will notify Gogo that they would like to make a change to any LRU or installation design data. This request shall be made in an e-mail sent to [GogoChangeRequests@gogoair.com](mailto:GogoChangeRequests@gogoair.com). The Supplier shall complete the D22499 Change Request Form and attach it to the e-mail submittal along with substantiating evidence (e.g. drawing redlines, BOMs, test reports, similarity assessments, etc.). If the Change Request is deemed acceptable (note that acceptance of the change request is not authorization to incorporate the change), a Gogo Engineering Change Order shall be issued by Gogo and implemented prior to the Supplier incorporating the change.


*Note: Due to contractual and regulatory requirements, Gogo is required to review and approve all changes for components that are used in Gogo owned Supplemental Type Certificates (STC)s.*

## **B022 – Direct Ship Authorization (DSA)**

The Supplier shall receive formal approval from Gogo Aviation Quality, in accordance with D20035, Procedure, Direct Ship Authorization, prior to shipment of any article(s) shipping to locations other than Gogo's Bensenville, IL facility. The Gogo PO will identify the required *Ship To* address.

A DSA letter (D19399) from Gogo Aviation Quality will be granted for every approved DSA shipment.

The Supplier shall notify [AviationQuality@gogoair.com](mailto:AviationQuality@gogoair.com) 5 business days in advance of any expected direct shipment.

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**B023 – Source Inspection**

The Supplier shall be subject to Source Inspection for all direct shipments where delegated inspection has not been authorized by Gogo Aviation Quality. Delegated or Source Inspection will be identified on the DSA letter (D19399) issued by Gogo Aviation Quality.

The Supplier shall notify [AviationQuality@gogoair.com](mailto:AviationQuality@gogoair.com) 5 business days in advance of any inspection readiness.

**B024 – Control of Nonconforming Material**

The Supplier shall have a Control of Nonconforming Material procedure in place, which includes industry best practice Root Cause Analysis (RCA) problem solving tools (i.e. 8D, DMAIC, 5 Why, Fishbone, etc.).

All materials furnished to Gogo shall conform to contractual requirements, approved type design and specifications. All materials are subject to inspection and acceptance upon receipt.

To obtain Gogo approval to ship unit(s) with known non-conformance(s), utilize the Supplier Request for Deviation/Waiver form D20157 (refer to clause B014 of this document). If a non-conformance has been identified on parts already shipped to Gogo, supplier is required to notify Gogo Aviation Quality ([AviationQuality@gogoair.com](mailto:AviationQuality@gogoair.com)) immediately via the Supplier Disclosure Letter (SDL) form D20158. Please utilize these forms and follow the instructions found therein for further details and requirements.


The Supplier is not granted Material Review Board (MRB) authority unless authorized in writing from Gogo, and the Supplier's MRB shall not issue "Repair" or "Use-As-Is" dispositions for products without Gogo approval.

**B025 – Failure Reporting Analysis & Corrective Action System (FRACAS)**

The Supplier shall provide inputs to the Gogo FRACAS system upon request. This includes but is not limited to responding to failures and/or noncompliances for which the supplier is responsible; identifying the failure mode, containment action(s), RCA, corrective action(s), and preventive action(s). The Supplier shall provide all required objective evidence needed to validate the effectiveness of the corrective action(s) taken.

**B026 – Gogo Owned Tooling & Gauges**

Unless otherwise agreed upon in writing, all supplies, materials, facilities, tools, jigs, dies, fixtures, patterns and equipment furnished to the supplier by Gogo for the performance to a purchase order, or for which the supplier has been reimbursed by Gogo, shall remain the property of Gogo. The supplier shall bear the risk of loss and damage to such property, normal wear excepted. Such property shall at all times be properly stored and maintained by the supplier, shall be identified as Gogo property, shall not be commingled with the property of the supplier or with that of a third party, shall not be moved from supplier's premises without Gogo prior written approval, and shall, upon request of Gogo to Supplier, be properly packed and marked in accordance with the requirements of

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the carrier selected by Gogo to transport such property. In general, the requirements for supplier's use of Gogo property include:

- Inspection & measuring equipment must be specified in the control plan, and be traceable to the inspections performed
- All inspection & test equipment must be included in a comprehensive calibration program, conducted prior to initial use, and at prescribed intervals. Reaction plans must be in place and followed when a piece of inspection/test equipment is deemed out of calibration
- Supplier is responsible for the proper use, maintenance and calibration of all tooling, testing and inspection equipment
- All equipment must be clearly identified, including part number, revision level, calibration date and have a Gogo identification number
- Records of maintenance shall be kept by the supplier until such time that the part is no longer considered 'active' (part remains "active" until tooling scrap authorization is given by Gogo)

Gogo reserves the right to inspect any tooling, testing and/or inspection measuring equipment at the supplier's location.


### **B027 – Contract Maintenance Providers**

Deleted without replacement at Revision K.

### **B028 – Calibration Service**

Calibration service suppliers shall:

- Have a quality management system that conforms to ISO/IEC 17025:2005, General Requirements for the Competence of Testing and Calibration Laboratories and/or ANSI/NCSL Z540.
- Perform calibration against measurement standards traceable to internationally recognized standards; where no such standards exist, the basis used for calibration or verification shall be recorded.
- Achieve traceability through calibrations by the National Institute of Standards and Technology or other National Measurement Institutes.
- Calibrations shall be per the OEM's specification or of greater accuracy.
- Identify measuring equipment in order to determine its calibration status.
- Protect equipment from damage and deterioration during handling, maintenance and storage.
- Safeguard equipment from adjustments that would invalidate the measurements result.
- Provide to Gogo a Certificate of Calibration for each piece of measurement equipment, which includes details of equipment type, unique identification, frequency of checks, check method/acceptance criteria, environmental conditions under which the calibration was performed, specifications to which the item was calibrated, the calibration standards used (which are traceable to NIST), date calibrated, due date and any out-of-tolerance (OOT) conditions, including "before" and "after" calibration data for those devices found OOT.

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**B029 – Solder/Solderability of Parts**

As applicable, drawing and specification requirements supersede these requirements:


- **Electronic and Circuit Card Assemblies** - Electronic and electronic Circuit Card Assemblies (CCA) shall be soldered to the requirements of IPC J-STD-001, Class 3. The Supplier shall implement and maintain a system that includes adequate process controls to assure conformance to the soldering, cleanliness, acceptance, material handling, storage, and shipping requirements. The item shall meet the cleanliness requirements of IPC J-STD-001, cleanliness designator C-22. Rework, if required, shall be in accordance with IPC 7711/7721.
- **Component & PCB Solderability** - The Supplier (manufacturer or distributor) shall ensure that all parts: leads, lugs, terminal, wires and terminations cited on this PO shall meet the component solder requirements of IPC J-STD-001 and the solderability requirements of IPC J-STD-002, and Printed Circuit Boards shall meet the solderability requirements of IPC J-STD-003.
- **Pre-Tinning** - Component leads or the like shall be tinned per IPC J-STD-006 and properly cleaned to remove flux residue. Leads shall meet the solderability requirements of IPC J-STD-002, Category 3.
- **Fluxes, Solder and Solder Paste** - Fluxes, solder alloys, and solder pastes shall meet the IPC J-STD requirements: J-STD-004 for Fluxes, J-STD-005 for Solder Pastes, and J-STD-006 for Solder Alloys.
- **Conformal Coating** - To mitigate the risk of tin whisker growth, conformal coating should be applied to CCA's.

**B030 – Special Processes**

*Note: This clause is applicable to new development only. Articles in production (as of the date on the revision history of this document for Rev K) are excluded from this requirement, unless otherwise agreed to in writing with Gogo.*

A special process is an operation performed on an item where the operation is not readily inspectable subsequent to its conclusion. Special processes have verifiable controls inherent to the process (i.e. plating, composites, nondestructive testing, etc.). Special processes shall be performed in accordance with specification(s) stated on the drawing and procurement documents.

Special processes should be performed by a Nadcap approved contractor (formerly NADCAP, National Aerospace and Defense Contractors Accreditation Program). The special processor should be approved by Nadcap for the special process on the date of which the special process is actually performed. If a Supplier's sub-tier supplier performs the special process, the Supplier is responsible to flow down the requirements on sub-tier POs. Supplier's utilization of Nadcap approved sources does not relieve the Supplier from the obligations to ensure subcontracted sources are in full compliance with applicable specifications. Certificates of Compliance for special processes which state the purchase order number, part number, specification number, specification revision, and the date the special process was performed shall be maintained on file and made available upon Gogo's request.

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**B031 – Prohibited Materials/Substances**

*Note: This clause is applicable to new development only. Articles in production (as of the date on the revision history of this document for Rev K) are excluded from this requirement, unless otherwise agreed to in writing with Gogo.*

Unless otherwise authorized in writing, Gogo prohibits certain materials/substances being contained in or on the product being supplied by the Supplier. Gogo further prohibits these materials/substances from being used during the following type of activities/processes, including, but not limited to: manufacture, processing (inclusive of Special Processing), assembly, integration, test, inspection, rework/repair, servicing, maintenance, handling, packaging. This requirement extends throughout Supplier's entire sub-tier supply chain for all items and processes comprising the product being supplied by the Supplier to Gogo, and shall be flowed down by Supplier and Supplier's sub-tiers as necessary. In the event of conflict between Gogo's engineering drawing, specification, or this clause, this clause shall take precedence.

**Registration, Evaluation, Authorization and Restriction of Chemicals (REACH)**

Supplier shall comply with the European Community (EC) Regulation No. 1907/2006 concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) for the product being provided by the Supplier to Gogo. Upon Gogo's request, the Supplier must provide to Gogo satisfactory supporting evidence demonstrating Supplier's compliance with their obligations with regards to REACH.

**Restriction of Hazardous Substances Directive (RoHS)**


Supplier shall comply with the European Directive 2002/95/EC on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (commonly referred to as the Restriction of Hazardous Substances Directive or RoHS) for the product/service being provided by the Supplier to Gogo. Upon Gogo's request, the Supplier must provide to Gogo satisfactory supporting evidence demonstrating Supplier's compliance with their obligations with regards to RoHS.

**6 Related Documents**

Document Title	Number
Procedure, Direct Ship Authorization	D20035

**7 Forms and Records**

Form/Record Title	Number
Form, Supplier Request for Deviation/Waiver	D20157
Form, Change Request	D22499
Form, Direct Ship Authorization Letter	D19399
Form, Supplier Disclosure Letter (SDL)	D20158

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