

AEROSPACE & DEFENSE SHEET METAL FABRICATION GUIDE

A practical reference guide for aerospace and defense engineers, procurement professionals, and program managers sourcing precision sheet metal fabrication for mission-critical applications.

AS9100 Certified

ISO 9001 Certified

ITAR Registered

DBE Certified

CAGE: 0YLX1

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Founded 1979 | 47+ Years of Precision Fabrication

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1. Introduction: Why Aerospace Fabrication Is Different

Precision sheet metal fabrication for aerospace and defense programs is fundamentally different from commercial or industrial fabrication. The differences are not subtle — they affect every stage of the manufacturing process, from material procurement and process control to inspection, documentation, and shipping.

In commercial fabrication, a part either fits or it doesn't. In aerospace fabrication, a part must conform to drawing dimensions within a defined tolerance, be produced from a documented material with a traceable material test report, be inspected with calibrated equipment, and be accompanied by paperwork that follows it through the supply chain. These requirements exist because aerospace and defense components often end up on aircraft, missiles, spacecraft, or ground defense systems where failure has catastrophic consequences.

This guide explains the key requirements, certifications, standards, and process controls that engineers and procurement professionals should understand when sourcing precision sheet metal fabrication for aerospace and defense programs.

What Makes Aerospace Fabrication Different:

Tighter tolerances: Aerospace programs commonly specify tolerances of $\pm 0.005''$ on laser cut features and $\pm 0.5^\circ$ on formed bends — tighter than commercial fabrication standards.

Material traceability: Every piece of material used on an aerospace program must be traceable to a certified material test report (MTR) documenting the heat, lot, chemical composition, and mechanical properties.

Documented quality systems: Aerospace programs require fabricators to operate under AS9100 certified quality management systems with documented procedures, calibrated inspection equipment, and formal nonconformance processes.

ITAR compliance: Most aerospace and defense programs involve controlled technology under the International Traffic in Arms Regulations (ITAR), requiring fabricators to be registered with the U.S. State Department.

First article inspection: Before a production run begins, aerospace programs typically require a First Article Inspection (FAI) — a comprehensive dimensional and material verification of the first production part.

Weld certifications: Aerospace welding is governed by AWS D17.1, a significantly more stringent standard than commercial welding codes, requiring certified welders with documented qualifications.

2. Key Certifications and What They Mean

Certifications are the primary screening tool aerospace and defense procurement teams use to qualify fabrication suppliers. Understanding what each certification requires — and what it means in practice — helps engineers and buyers make more informed sourcing decisions.

Certification	What It Requires	Why It Matters
AS9100	Aerospace quality management system standard. Covers the process aerospace quality management.	Core process aerospace quality management. Mandatory for aerospace procurement.
ISO 9001	International quality management standard. Covers the basic principles of quality management.	The basic principles of quality management. Required by many OEMs and suppliers.
ITAR Registered	Registration with the U.S. State Department Directorate of Defense Trade Controls (DDTC).	Required for companies manufacturing or exporting defense-related technology.
MIL-I-45208A	Military inspection system standard. Covers documentation, inspection, and process controls.	At a glance, inspection and process controls. Required for military procurement.
DBE Certified	Disadvantaged Business Enterprise certification from the U.S. Department of Transportation.	Required for state transportation agencies. Recognizes minority-owned businesses.

3. ITAR: What It Is and Why It Matters

The International Traffic in Arms Regulations (ITAR) is a set of United States government regulations administered by the U.S. State Department's Directorate of Defense Trade Controls (DDTC). ITAR controls the manufacture, export, import, and transfer of defense articles, defense services, and related technical data listed on the United States Munitions List (USML).

For precision sheet metal fabricators, ITAR registration is a legal requirement — not a quality certification — that allows the company to legally manufacture, handle, and ship hardware and technical data covered under ITAR. A fabricator without ITAR registration cannot legally participate in most defense and government programs.

Key ITAR Concepts for Procurement Teams:

ITAR Registered vs ITAR Certified: There is no such thing as "ITAR Certified." The correct terminology is ITAR Registered (with the DDTC) and ITAR Compliant (operating in accordance with ITAR requirements). Beware of suppliers who claim "ITAR Certified" — this is an error in terminology.

ITAR and Foreign Nationals: ITAR restricts the disclosure of controlled technical data to foreign nationals — even on U.S. soil. ITAR-compliant fabricators must control access to controlled drawings and technical data and screen their employees accordingly.

ITAR and Technical Data: Controlled drawings, specifications, process documents, and design data are all subject to ITAR if they relate to items on the USML. Sending controlled drawings to a non-ITAR-registered fabricator is a potential ITAR violation.

ITAR and Supply Chain: If your program is ITAR-controlled, every supplier in your supply chain that receives controlled technical data must also be ITAR registered. This is frequently overlooked in supply chain management.

Verification: ITAR registration can be verified through the DDTC's public registration lookup. You can also request a copy of a supplier's ITAR registration letter directly from the supplier.

MJM Manufacturing ITAR Status

MJM Manufacturing is ITAR Registered with the U.S. State Department Directorate of Defense Trade Controls (DDTC). Our registration covers the manufacture and handling of precision sheet metal components and assemblies for defense and government programs. We maintain controlled access to ITAR-protected technical data and screen personnel with access to controlled information. CAGE Code: 0YLX1 | SAM.gov Registered.

4. Precision Tolerances for Aerospace Sheet Metal

Tolerances define the acceptable variation from nominal dimensions on a fabricated part. Aerospace programs routinely specify tighter tolerances than commercial fabrication standards because components must mate precisely with other assemblies, fit within tight structural envelopes, and maintain alignment under load and temperature variation.

The following table summarizes standard achievable tolerances for each major sheet metal fabrication process at MJM Manufacturing, operated under our AS9100 certified quality management system with Amada Fabri-Vision automated optical inspection and Keyence CMM dimensional verification.

Process	Tolerance	Notes
Laser Cutting — Linear	±0.005"	5 Amada fiber laser systems. Verified by Fabri-Vision optical inspection.
Laser Cutting — Hole Diameter	±0.005"	Consistent across production run.
CNC Turret Punching — Location	±0.005"	Amada AE 2610NT. Center-to-center on punched features.
Press Brake — Bend Angle	±0.5°	9 Amada forming machines. Tighter achievable with bottoming/coining.
Press Brake — Flange Length	±0.010"	Measured from bend centerline to edge.
TIG Welding — Positional	±0.030"	AWS D1.1, D1.2, D9.1M, D17.1 certified welders.
IPG Fiber Laser Welding	±0.010"	9x IPG 2kW systems. Tightest positional accuracy of all weld processes.
CNC Machining — Linear	±0.005"	Mazak BCN 530 C. Tighter on specific features by request.
Hardware Insertion — Location	±0.010"	Haeger presses and Auto-Sert automated insertion.

Note: Tighter tolerances may be achievable depending on material, gauge, geometry, and process. Contact MJM Engineering at sales@mjmimg.com with specific requirements for evaluation.

5. Materials for Aerospace & Defense Applications

Material selection for aerospace and defense sheet metal components is driven by strength-to-weight requirements, corrosion resistance, thermal performance, and compliance with program material specifications. The following materials are most commonly specified in aerospace and defense fabrication programs.

Material	Common Alloys	Properties	Typical Aerospace Use
Aluminum	5052-H32 6061-T6 2024-T3	Lightweight, excellent strength-to-weight, good corrosion resistance, weldable	Structural components, fuselage, skin, brackets
Stainless Steel	304 316 17-4 PH	High strength, corrosion resistant, weldable, good elevated temperature performance	Hardware, brackets, high-temp applications
Titanium	Grade 2 Grade 5 (Ti-6Al-4V)	Exceptional strength-to-weight, excellent corrosion resistance, high temperature capability	Structural components, brackets, high-strength parts
Beryllium Copper	C17200	High strength, excellent electrical conductivity, non-magnetic	Spring components, RF connectors
Cold Rolled Steel	ASTM A1008	Good formability, weldable, cost-effective, readily available	Support equipment, internal structural components

Material Traceability Requirements

All materials used in aerospace and defense fabrication programs must be fully traceable. This means the raw material must be accompanied by a certified material test report (MTR) — also called a mill certificate — that documents the material heat or lot number, chemical composition analysis, and mechanical properties test results.

When requesting aerospace fabrication, specify your material traceability requirements explicitly in your drawing notes or purchase order. Common specifications include:

- Certified Material Test Reports (MTRs) to be provided with each shipment
- Material to be certified to specific ASTM, AMS, or military material specifications
- Material heat/lot numbers to be recorded on part travelers and shipping documentation
- No substitute materials without prior written approval from the customer

6. Welding Standards and Certifications

Welding in aerospace and defense fabrication is governed by specific AWS (American Welding Society) standards that are significantly more stringent than commercial welding codes. Understanding which standards apply to your program — and verifying that your fabricator's welders are qualified to those standards — is critical for program compliance.

Standard	Application	Key Requirements
AWS D17.1	Aerospace fusion welding — the primary aerospace welding standard	Qualified WPS and PQR. Required for structural and non-structural welds.
AWS D1.1	Structural welding — steel. Applies to structural steel welding and supports.	Certified welder qualifications based on aerospace equivalent.
AWS D1.2	Structural welding — aluminum. Applies to structural aluminum welding.	Separate qualification required for aerospace applications. Most challenging standard due to
AWS D9.1M	Sheet metal welding. The primary standard for covering of gage materials.	WPS and PQR directly applicable to sheet metal fabrication.

Key Welding Documentation Terms

WPS — Weld Procedure Specification: A documented welding procedure that defines the parameters for a specific weld joint: base metal, filler metal, preheat, interpass temperature, welding position, and other variables. Required before any certified weld can be performed.

PQR — Procedure Qualification Record: The test record that proves a WPS produces welds meeting the mechanical and quality requirements of the applicable code. The PQR supports and qualifies the WPS.

WPQR — Welder Performance Qualification Record: Documentation that an individual welder has demonstrated the ability to produce welds meeting code requirements using a qualified WPS. Welders must be re-qualified if they have not welded under a process for 6 months or more.

MJM Manufacturing Welding Certifications

AWS D17.1 (Aerospace Fusion Welding) with Lockheed Martin program approval | AWS D1.1 (Structural — Steel) | AWS D1.2 (Structural — Aluminum) | AWS D9.1M (Sheet Metal Welding) | Lloyd's Register LR 33932 | Qualified WPS and PQR documentation available | 9x IPG 2kW fiber laser welders | 3x Sciaky spot welders (75/100/200 KVA)

7. Quality Documentation Requirements

Aerospace and defense programs generate significantly more quality documentation than commercial manufacturing. Understanding what documentation to require — and when — is essential for program compliance and audit readiness.

Document	When Required	What It Contains
First Article Inspection (FAI) Report	Before the first production shipment of a new part or after significant process changes	Full dimensional verification process features on the drawing. Material certifications. Process control plan.
Material Test Report (MTR)	Every shipment of material used on critical programs	Material type, chemical composition analysis, mechanical properties test results.
Certificate of Conformance (C of C)	With every shipment.	Signed statement from the manufacturer certifying that the parts conform to applicable specifications.
Inspection Records	As required by program quality plan.	In-process and final inspection results, dimensional data, inspector identification, and dates.
Nonconformance Reports (NCR)	When a part does not conform to requirements	Description of nonconformance, disposition (use as-is, rework, scrap), root cause, and corrective action.
Weld Records	For all certified aerospace welding.	WPS reference, welder identification, WPQR reference, and inspection results for each weld.

8. Selecting an Aerospace Sheet Metal Fabricator

Selecting the right fabrication partner for an aerospace or defense program is one of the most consequential decisions a procurement team makes. The wrong choice results in quality problems, schedule delays, documentation gaps, and compliance risk. This checklist covers the key qualification criteria.

Supplier Qualification Checklist

- **AS9100 Certification:** Verify current AS9100 certification with valid scope. Request a copy of the certificate and confirm it is not expired. Scope should cover sheet metal fabrication.
- **ITAR Registration:** Verify ITAR registration through DDTC or request registration letter. Confirm registration covers the manufacturing activities required for your program.
- **CAGE Code and SAM.gov:** Verify CAGE Code registration and active SAM.gov status for government programs. Required for DoD and federal contracting.
- **Welding Certifications:** Request WPS, PQR, and welder WPQR documentation for the applicable welding standard (D17.1 for aerospace, D1.1 for steel, D1.2 for aluminum, D9.1M for sheet metal).
- **Inspection Capability:** Confirm dimensional inspection capability including calibrated CMM or optical inspection equipment capable of verifying your part tolerances.
- **Material Traceability:** Confirm the supplier can provide certified MTRs for all materials and maintain material traceability through their production process.
- **First Article Capability:** Confirm the supplier can perform and document a First Article Inspection (FAI) to your program requirements.
- **Quality History:** Request references from current aerospace or defense customers. Long-standing relationships with prime contractors like Boeing, Lockheed Martin, or Northrop Grumman are the strongest indicator of consistent quality.
- **Financial Stability:** For long-term programs, verify the supplier is financially stable and has the capacity to support your program through its lifecycle.
- **Domestic Manufacturing:** For ITAR-controlled programs, confirm all fabrication is performed domestically by U.S. persons. Offshore or foreign-national involvement in ITAR-controlled work is a compliance risk.

9. About MJM Manufacturing

MJM Manufacturing is a precision sheet metal fabrication and OEM manufacturing company located in Miami, Florida. Founded in 1979 by Mike Mijares in a two-car garage, MJM has grown into a 44,000 sq ft manufacturing facility with 80+ employees serving aerospace, defense, robotics, medical device, transportation, marine, lighting, kiosk, telecommunications, and energy industries across the United States.

Certifications & Registrations	Equipment Highlights	Aerospace Clients
AS9100 Certified ISO 9001 Certified ITAR Registered DBE Certified MIL-I-45208A CAGE Code: 0YLX1 SAM.gov Registered SFMA Member Lloyd's Register LR 33932 AWS D17.1 (Lockheed Approved) Minority-Owned Small Business 17 Total Certifications	5 Amada Laser Systems 9x IPG 2kW Fiber Laser Welders 3x Sciaky Spot Welders 9 Amada Forming Machines 14-Foot, 240-Ton Press Brake Mazak BCN 530 C CNC Amada Fabri-Vision Inspection Keyence LM-X Optical Measurement Keyence XM-5000 Handheld CMM 4 Haeger Insertion Presses 3 Flash Forge 3D Printers	Boeing Lockheed Martin Northrop Grumman BAE Systems L3 Harris Bell Textron Goodrich Honeywell and more...

Ready to discuss your aerospace or defense program?

Contact MJM Manufacturing's engineering team to discuss your program requirements, request a quote, or verify our certifications and documentation capabilities. Email: sales@mjmmfg.com | Phone: (305) 620-2020 | www.mjmmfg.com 5205 NW 161 Street, Miami, FL 33014