This manual defines the policy for the development, implementation and continual improvement of the M.S. Aerospace, Inc. quality management system (QMS).

The QMS manual is endorsed and evidenced by a signature record maintained in hard copy that is available at M.S. Aerospace for review. A signature and approval record shall be maintained that supports current Top Management awareness, support and approval of policies defined in this manual.

Original QMS Release Date: April 30, 2003
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M.S. Aerospace, Inc. was established as a start-up company on June 1st, 1992. The original facility was located on Foothill Boulevard in Sylmar, California.

The Company’s long term strategy was to position itself as a niche player in high temperature, high strength aerospace bolts, studs, pins, and screws, serving the jet engine and rocket engine industry, as well as customers demanding superior quality high strength fasteners.

In the short term, the depressed aerospace market in 1992 and 1993 forced the company to distinguish itself by concentrating on these core strengths: unrivaled quality, significantly shorter lead times and superior service. This dedication and integrity allowed the company to grow even in an industry recession.

M.S. Aerospace, Inc. soon gained a formidable reputation as a manufacturer capable of producing consistent world-class fasteners offering impressive lead times, with the integrity and documentation required by an increasingly demanding marketplace.

By the end of 1993, M.S. Aerospace, Inc. had grown to 48 employees and was doing significant business with jet engine manufacturers through distribution.

In January of 1994, the Northridge Earthquake destroyed the company’s building on Foothill Boulevard. Although a profound blow to the fledging company, M.S. Aerospace, Inc. secured a building in Burbank and was back in full production by the beginning of February 1994, just two weeks after the earthquake, and just four days after moving into the new building.

The process of rebuilding the company began immediately and was successful beyond expectations, so that by the end of 1994, M.S. Aerospace, Inc. had 73 employees and had a secured General Electric Aircraft Engines approval with a 100% zero defect rating.

This impressive growth continued through 1995 and 1996, and the most significant factor in this development was attributable to the company providing Pratt and Whitney and General Electric Aircraft Engines with impeccable quality fasteners in very short lead times.

In a genuine commitment to continuous improvement, M.S. Aerospace, Inc. has implemented full SPC Controls, has automated much of the machinery and equipment, has added significant CNC capability, and has achieved ISO9001/AS9100 and Nadcap Accreditation.

In 1998, M.S. Aerospace, Inc. moved to a brand new, purpose-built facility in a new business park in Sylmar, which, at 46,000 square feet, tripled the manufacturing floor space and provided significantly greater capability.

By 2004, M.S. Aerospace had once again outgrown floor space and, looking to increase capacity, moved into our current location – a 100,000 square foot, purpose-built facility. The new building is only 1000 feet from our previous building, and we are again in the wonderful setting of the Cascade Business Park. In addition to adding manufacturing capability, the move also allowed the addition of a full heat-treatment operation, increased testing and NDT capacity, as well as cleaning, Chemical Processing and Lube.

We are more prepared than ever to meet the demands of an ever-increasing compliance, and a challenging marketplace.

We look forward to serving our customers with consistent reliability, quality, integrity, and service, building on our knowledge and experience in the high strength, close tolerance and high temperature fastener market.
Unless otherwise indicated on the front cover page, this document is a controlled copy of M.S. Aerospace, Inc.'s (MSA's) Quality Management System (QMS) Manual. The manual number identified is registered with and controlled by MSA's Quality Assurance.

For controlled copies, changes and additions to this manual will be forwarded to the recipient as they are incorporated. Recipients of uncontrolled copies will not receive any updates.

This manual and individual procedures or documents referenced throughout are considered company proprietary and confidential and are not to be loaned, duplicated or distributed externally except when duly authorized by MSA management.

The recipient’s acceptance of a controlled copy of the QMS Manual indicates that you will read and acknowledge all requirements set forth therein. Further, you will make every effort to ensure your personal compliance with the stated requirements and their references.

In addition, it is the recipient's personal responsibility to continually promote and work to improve the QMS defined by this document.

If the controlled manual is recalled or otherwise becomes obsolete it is the responsibility of the manual holder to make the necessary substitution of revised pages as instructed, return the copy to MSA or destroy the copy & notify MSA of its destruction.
# QUALITY MANAGEMENT SYSTEM MANUAL

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1.0 Scope

This manual applies to the following site:

M.S. Aerospace, Inc.
13928 Balboa Blvd.
Sylmar, CA 91342

Phone (818) 833-9095
Fax (818) 833-9525

CAGE Code: 0UCY9

www.msaerospace.com

This manual serves as the policy for the development, implementation and continual improvement of the M.S. Aerospace, Inc. (MSA) quality management system. This manual establishes MSA Management policy concerning quality and refers to Quality Management Procedures and Work Instructions. These procedures and instructions have been developed to ensure the quality of deliverables in strict accordance with contractual, jurisdictional, and regulatory requirements. The policies contained herein, and the methodologies defined by each referenced procedure and instruction are applicable to all contracts performed by MSA. MSA procedures and instructions shall act as supplements to all industry specifications, drawings, standards, contractual requirements, and statutory or regulatory requirements, and shall not supersede the aforementioned documents.

Nothing in this manual relieves MSA of the responsibility for the conformity of all products to all customer, statutory and regulatory requirements, including work performed by customer-designated and MSA suppliers.

QMS Exclusions

Based on the justifications provided below, two Quality Management System requirements which are defined within the ISO 9000 / AS9100 Standard do not apply to our type of operation and have been excluded from our Quality Management System and this manual:

Section 7.3: Design and Development: No design or development is performed at or by M.S. Aerospace, Inc. at this time.

Section 7.5.1.4: Post-Delivery Support: No post-delivery support operations are performed at or by M.S. Aerospace, Inc. at this time.
2.0 Normative References

The quality management system defined herein is derived from the requirements of the following documents, either in whole or in part.

Appendix QX     Supplier Quality Requirements (Lockheed)
AS9100         Quality Management Systems – Requirements for Aviation, Space and Defense Organizations
ASQR-01        Supplier Quality System Requirements (UTC)
ISO 9000       Quality management Systems – Fundamentals and Vocabulary
ISO 9001       Quality management Systems – Requirements
ISO 9004       Managing for the Sustained Success of an Organization – A Quality Management Approach
ISO/IEC 17025   General Requirements for the Competence of Testing and Calibration Laboratories
QSLM           Class 3 Threaded Fasteners – Qualified Supplier List for Manufacturers (DoD)
S-1000         Quality System Requirements for Suppliers (GE Aviation)
3.0 Terms and Definitions

Unless otherwise specified, all terms and definitions used herein are as defined by ISO9001 and AS9100.

**critical items:** those items (e.g., functions, parts, software, characteristics, processes) having significant effect on the product realization and use of the product; including safety, performance, form, fit, function, producibility, service life, etc.; that require specific actions to ensure they are adequately managed. Examples of critical items include safety critical items, fracture critical items, mission critical items, key characteristics, etc.

**customer:** organization or person that receives a product.

  Note 1: A customer can be internal or external to the organization.

  Note 2: The term customer also relates to applicable legal and regulatory agencies (e.g., FAA).

**key characteristic:** an attribute or feature whose variation has a significant effect on product form, fit, performance, service life, or producibility, that requires specific actions for the purpose of controlling variation.

**process:** set of interrelated or interacting activities which transforms inputs into outputs.

  Note 1: Inputs to a process are generally outputs of other processes.

  Note 2: processes in an organization are generally planned and carried out under controlled conditions to add value.

  Note 3: a process where the conformity of the resulting product cannot be readily or economically verified is frequently referred to as a “special process”.

**product:** result of a process.

**risk:** an undesirable situation or circumstance that has both a likelihood of occurring and a potentially negative consequence.

**special requirements:** those requirements identified by the customer, or determined by the organization, which have high risks to being achieved, thus requiring their inclusion in the risk management process. Factors used in the determination of special requirements include performance requirements imposed by the customer that are at the limit of its technical or process capabilities.
4.0 Quality Management System

4.1 General Requirements

This manual establishes, documents, implements, and maintains a quality management system and continually improves its effectiveness in accordance with the requirements of AS9100 and ISO 9001.

The QMS documentation shall include:

a) the processes required for the QMS and their application throughout MSA are identified in Table I,

b) the sequence and interaction of the QMS processes are defined in Figure I,

c) criteria and methods needed to insure both the operation and control of processes are effective and defined by Section 7 of this manual,

d) availability of resources and information necessary to support the operation and monitoring of processes in ensured through Section 6 of this manual,

e) monitoring, measurement and analysis of processes is defined by Section 8 of this manual, and

f) Implement actions necessary to achieve planned results and promote continuous improvement of processes are defined by Section 8 of this manual.

4.2 Documentation Requirements

4.2.1 General

The Quality Management System documentation shall be in English and shall include:

a) documented statements of a quality policy and quality objectives,

b) a quality manual,

c) documented procedures and records required by AS9100, and

d) documents, including records, needed by MSA to ensure the effective planning, operation and control of processes.

MSA shall ensure that personnel have access to quality management system documentation and are aware of relevant procedures and changes.
4.2.2 Quality Manual

MSA shall maintain a quality assurance manual such that:

a) **Section 1.0** of this manual defines the scope of the quality management system and any element exclusion(s),

b) documented procedures authorized by this manual are incorporated into the QMS as referenced herein, and

c) the interaction between the processes of the QMS is reflected in Figure I.

4.2.3 Control of Documents

Documents required by the MSA QMS shall be controlled. Records are a special type of document and shall be controlled in accordance with the requirements of Paragraph 4.2.4.

MSA shall develop a documented procedure that defines the controls needed:

a) to approve documents for adequacy prior to use,

b) to review and update as necessary and reapprove documents,

c) to ensure that changes and the current revision status of documents are identified,

d) to ensure the relevant versions of applicable documents are available at points of use,

e) to ensure that documents remain legible and readily identifiable,

f) to ensure that documents of external origin or determined by MSA to be necessary for the planning and operation of the QMS are identified and their distribution controlled, and

g) to prevent the unintended use of obsolete documents, and to apply suitable identification to them if they are retained for any purpose.

4.2.4 Control of Records

Records established to provide evidence of conformity to requirements and to the effective operation of the QMS shall be controlled.

MSA shall develop a documented procedure to define the controls needed for identification, storage, protection, retrieval, retention, and disposition of records.

The documented procedure shall define the method for controlling records that are created by and/or retained by suppliers.

**QMS Authorized Procedures**

- MSAP 4.1 Document Development
- MSAP 4.2 Control of Documents
- MSAP 4.3 Control of Quality Records
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Refer to MSA QMS Process Code (Table I)
5.0 Management Responsibility

5.1 Management Commitment

MSA top management shall provide evidence of its commitment to the development and implementation of the QMS and continually improving its effectiveness by:

a) communicating to the employees of MSA the importance of meeting customer as well as statutory and regulatory requirements,

b) establishing the quality policy

c) ensuring that quality objectives are established,

d) conducting management reviews, and

e) ensuring the availability of resources.

5.2 Customer Focus

Top management shall ensure that customer requirements are determined and are met with the aim of enhancing customer satisfaction (see Paragraphs 7.2.1 and 8.2.1).

Top management shall ensure that product conformity and on-time delivery performance are measured and that appropriate action is taken if planned results are not, or will not be, achieved.

5.3 Quality Policy

Top management shall ensure that the quality policy:

a) is appropriate to the purpose of MSA,

b) includes a commitment to comply with requirements and continually improve the effectiveness of the QMS,

c) provides a framework for establishing and reviewing quality objectives,

d) is communicated and understood within MSA, and

e) is reviewed for continuing suitability.

5.4 Planning

5.4.1 Quality Objectives

Top management shall ensure that quality objectives, including those needed to meet requirements for product [(see Paragraph 7.1a)], are established at relevant functions and levels within MSA. The quality objectives shall be measurable and consistent with the quality policy.

5.4.2 Quality Management System Planning

Top management shall ensure that:
a) the planning of the QMS is carried out in order to meet the requirements given in Paragraph 4.1, as well as the quality objectives, and

b) the integrity of the QMS is maintained when changes to QMS are planned and implemented.

5.5 Responsibility, Authority, and Communication

5.5.1 Responsibility and Authority

MSA top management shall ensure that the responsibilities and authorities are defined and communicated within MSA. Responsibility and authority shall be as listed below.

President: The President has overall responsibility for the operation of MSA. The President has the responsibility and authority to develop and implement long-term strategic planning and budgeting and to ensure an experienced staff is assigned to adequately manage daily operations and contractual commitments, including the policies and procedures referenced within this Quality Manual. The President has authority over all departments and personnel.

Vice President (VP): The VP reports directly to the President and is responsible to aid the President in developing and implementing medium to long-term strategic planning, including sales & marketing, capital investment, quality objectives, production targets, and shipping goals. The VP shall help the president ensure an experienced staff is assigned to adequately manage daily operations and contractual commitments, including the policies and procedures referenced within this Quality Manual.

General Manager (GM): The GM reports directly to the Vice President and is responsible to aid the President and Vice President in short and medium term strategic planning including financial targets and budgeting. The GM shall be responsible for the day-to-day and month-to-month sales, shipping, quality, and production objectives and shall help ensure that an experienced and capable staff is in place to adequately manage these objectives as well as contractual commitments, including the policies and objectives embodied in or referenced to in this Quality Manual.

Director of Quality Assurance: The Director of Quality Assurance reports directly to the VP/GM and shall be responsible for the implementation and compliance of the company quality policy, quality objectives and procedures defined or referenced herein. Additional responsibilities include, but are not limited to:

a) planning, implementing and maintaining the MSA QMS in accordance with the requirements defined herein,

b) controlling, reviewing and revising the QMS and all internal procedures, instructions and related documentation,

c) representing MSA in resolving matters pertaining to quality with MSA suppliers, customers and representatives from external regulatory and jurisdictional bodies,

d) ensuring that quality related deficiencies are thoroughly documented, investigated and corrected,
e) ensuring that all manufactured items are completely documented and traceable, and
f) ensuring that only acceptable material is presented or delivered to the customer.

Director of Engineering & Manufacturing Support: The Director of Eng. & Mfg. reports to the General Manager and shall be responsible for developing Mfg & Process methods, systems, controls and improvement. In addition this individual is required to provide oversight and direction of Lean and Continuous Improvement programs and provide support and development of training programs.

Engineering & Development Manager (Engineering): The Manufacturing and Development Manager reports to Director of Eng. & Mfg. and has the responsibility and authority to engineer standard and custom product orders, design required tooling and test equipment. The Manufacturing & Development Manager has the responsibility and authority to evaluate, recommend and develop process improvements in the field of production and associated activities for the purpose of continual improvement. Additional responsibilities include, but are not limited to:

a) developing and implementing practices for process consistency,
b) establish the best planning sequence possible to manufacture quality parts efficiently, while meeting all requirements,
c) ensure that tooling and dies adapted to the part are available to support efficient manufacturing,
d) participating in MRB activities, and
e) developing plans/programs for product and process improvement.

Director of Manufacturing: The Director of Manufacturing reports to the General Manager and has the responsibility and authority to research and develop new and efficient ways of manufacturing, continually improve the existing methods/equipment for manufacturing. Additional responsibilities include, but are not limited to:

a) researching, developing, and implementing new and more efficient methods of manufacturing product,
b) improving, automating, and enhancing speed and safety for all machinery and equipment used to manufacture product, and
c) controlling processes to ensure continued compliance to planned requirements.

Human Resources Manager: The Human Resources Manager reports to the General Manager and has the responsibility and authority to coordinate and effectively manage all aspects of human resources including, employee relations, health and safety, skills development and training, compensation, benefits and recruitment.

5.5.2 Management Representative

The Director of Quality Assurance shall act as the management representative and, irrespective
MANAGEMENT RESPONSIBILITY

of other responsibilities, shall have the responsibility and authority that includes:

a) ensuring that processes needed for the QMS are established, implemented and maintained,

b) reporting to top management on the performance of the QMS and any need for improvement,

c) ensuring the promotion of awareness of customer requirements throughout MSA, and

d) the organizational freedom and unrestricted access to top management to resolve quality management issues.

5.5.3 Internal Communication

To ensure that the MSA quality policy, quality objectives, and QMS requirements are adequately understood, implemented and maintained at all levels in the organization:

a) a copy of the quality manual shall be issued to all MSA Managers,

b) the quality policy, quality objectives, and requirements of the QMS shall be reviewed with each employee during quality indoctrination training,

c) management review meetings,

d) supervisor and departmental meetings,

e) postings on bulletin boards, company newsletters, and communications, and

f) quality training sessions and presentations.

5.6 Management Review

5.6.1 General

Top management shall review MSA’s QMS at planned intervals, to ensure its continuing suitability, adequacy, and effectiveness. This review shall include assessing opportunities for improvement and the need for changes to the QMS, including the quality policy and objectives.

Records from management reviews shall be maintained in accordance with Paragraph 4.2.4.

5.6.2 Review Input

The input to management review shall include information on:

a) results of audits,

b) customer feedback,

c) process performance and product conformity,

d) status of preventive and corrective actions,
e) follow-up actions from previous management reviews,
f) changes that could affect the QMS, and
g) recommendations for improvement.

5.6.3 Review Output

The output from the management review shall include any decisions and actions related to:

a) improvement of the effectiveness of the QMS and its processes,
b) improvement of the product related to customer requirements, and
c) resource needs.

QMS Authorized Procedures

   MSAP 5.1 Management Review
6.0 Resource Management

6.1 Provision of Resources

MSA shall determine and provide the resources needed:

a) to implement and maintain the QMS and continually improve its effectiveness, and
b) to enhance customer satisfaction by meeting customer requirements.

6.2 Human Resources

6.2.1 General

Personnel performing work affecting conformity to product requirements shall be competent on the basis of appropriate education, training, skills, and experience.

Note: Conformity to product requirements can be affected directly or indirectly by personnel performing any task within the QMS.

6.2.2 Competence, Training, and Awareness

MSA shall:

a) determine the necessary competence for personnel performing work affecting conformity to product requirements,
b) where, applicable, provide training or take other actions to achieve the necessary competence,
c) evaluate the effectiveness of the actions taken,
d) ensure that its personnel are aware of the relevance and importance of their activities and how they contribute to the achievement of quality objectives, and
e) maintain appropriate records, in accordance with Paragraph 4.2.4, of education, training, skills, and experience.

6.3 Infrastructure

MSA shall determine, provide, and maintain the infrastructure needed to achieve conformity to product requirements. Infrastructure includes, as applicable:

a) buildings, workspace, and associated utilities,
b) process equipment (both hardware and software), and
c) supporting services (such as transport, communication, or information systems.)
6.4 Work Environment

MSA shall determine and manage the work environment needed to achieve conformity to product requirements.

Note: The term “work environment” relates to those conditions under which work is performed including physical, environmental, and other factors such as noise, temperature, humidity, lighting, or weather.

QMS Authorized Procedures

MSAP 6.1 Competence, Awareness, and Training
7.0 Product Realization

7.1 Planning of Product Realization

MSA shall plan and develop the processes needed for product realization. Planning of product realization shall be consistent with the requirements of other processes of the QMS (see Paragraph 4.1).

In planning product realization, MSA shall determine the following, as appropriate:

a) quality objectives and requirements for the product,

Note: Quality objectives and requirements for the product include consideration of aspects such as
- product and personal safety,
- reliability, availability and maintainability,
- producibility and inspectability,
- suitability of parts and materials used in the product,
- selection and development of embedded software, and
- recycling or final disposal of the product at the end of its life.

b) the need to establish processes and documents, and to provide resources specific to the product.

c) required verification, validation, monitoring, measurement, inspection, and test activities specific to the product and the criteria for product acceptance,

d) records needed to provide evidence that the realization processes and resulting product meet requirements;

e) configuration management appropriate to the product, and

f) resources to support the use and maintenance of the product.

The output of this planning shall be in a form suitable for MSA’s method of operations.

7.1.1 Project Management

As appropriate to MSA and the product, MSA shall plan and manage product realization in a structured controlled manner to meet requirements at acceptable risk, within resource and schedule constraints.

7.1.2 Risk Management

MSA shall establish, implement, and maintain a process for managing risk to the achievement of applicable requirements, that includes as appropriate to MSA and the product:

a) assignment of responsibilities for risk management,
b) definition of risk criteria (e.g., likelihood, consequences, risk acceptance),

c) identification, assessment and communication of risks throughout product realization,

d) identification, implementation and management of actions to mitigate risks that exceed the defined risk acceptance criteria, and

e) acceptance of risks remaining after implementation of mitigating actions.

7.1.3 Configuration Management

MSA shall establish, implement, and maintain a configuration management process that includes, as appropriate to the product:

a) configuration management planning,

b) configuration identification,

c) change control,

d) configuration status accounting, and

e) configuration audit.

7.1.4 Control of Work Transfers

MSA shall establish, implement, and maintain a process to plan and control the temporary or permanent transfer of work (e.g., from one MSA facility to another, from MSA to a supplier, from one supplier to another supplier) and to verify the conformity of the work to requirements.

7.2 Customer-Related Processes

7.2.1 Determination of Requirements Related to the Product

MSA shall determine:

a) requirements specified by the customer, including the requirements for delivery and post-delivery activities,

b) requirements not stated by the customer but necessary for specified or intended use, where known,

c) statutory and regulatory requirements applicable to the product, and

d) any additional requirements considered necessary by MSA.

7.2.2 Review of Requirements Related to the Product

MSA shall review the requirements related to the product. This review shall be conducted prior to MSA’s commitment to supply a product to the customer (e.g., submission of tenders, acceptance of contracts or orders, acceptance of changes to contracts or orders) and shall ensure that:
a) product requirements are defined,
b) contract or order requirements differing from those previously expressed are resolved,
c) MSA has the ability to meet the requirements,
d) special requirements of the product are determined, and
e) risks (e.g., new technology, short delivery time frame) have been identified (see Paragraph 7.1.2).

7.2.3 Customer Communication

MSA shall determine and implement effective arrangements for communicating with customers in relation to:

a) product information,
b) enquiries, contracts or order handling, including arrangements, and
c) customer feedback, including customer complaints.

7.3 Design and Development

MSA does not perform any design or development at this time. The 7.3 series sections are included in this manual to preserve the numbering scheme established by AS9100.

7.4 Purchasing

MSA shall ensure that purchased product conforms to specified purchase requirements. The type and extent of control applied to the supplier and the purchased product shall be dependent upon the effect of the purchased product on subsequent product realization or the final product.

MSA shall be responsible for the conformity of all products purchased from suppliers, including product from sources defined by the customer.

MSA shall evaluate and select suppliers based on their ability to supply product in accordance with MSA’s requirements. Criteria for selection, evaluation, and re-evaluation shall be established. Records of the results of evaluations and any necessary actions arising from the evaluation shall be maintained (see Paragraph 4.2.4).

Note: One factor that can be used during supplier selection and evaluation is supplier quality data from objective and reliable sources, as evaluated by MSA (e.g., information from accredited quality management system or process certification bodies, organization approvals from government authorities). Use of such data would be only one component of MSA’s supplier control process and MSA remains responsible for verifying that purchased product meets specified purchase requirements.

7.4.1 Purchasing Process

MSA shall:
a) maintain a register of its suppliers that includes approval status (e.g., approved, conditional, disapproved) and the scope of the approval (e.g., product type, process family),

b) periodically review supplier performance; the results of these reviews shall be used as a basis for establishing the level of controls to be implemented,

c) define the necessary actions to take when dealing with suppliers that do not meet requirements,

d) ensure where required that both MSA and all suppliers use customer-approved special process sources,

e) define the process, responsibilities, and authority for the approval status decision, changes of the approval status and conditions for a controlled use of suppliers depending on the supplier’s approval status, and

f) determine and manage the risk when selecting and using suppliers (see Paragraph 7.1.2).

7.4.2 Purchasing Information

Purchasing information shall describe the product to be purchased, including, where appropriate:

a) requirements for approval of product, procedures, processes, and equipment,

b) requirements for qualification of personnel,

c) quality management system requirements,

d) the identification and revision status of specifications, drawings, process requirements, inspection/verification instructions and other relevant technical data,

e) requirements for design, test, inspection, verification (including production process verification), use of statistical techniques for product acceptance, and related instructions for acceptance by MSA, and as applicable critical items including key characteristics,

f) requirements for test specimens (e.g., production method, number, storage conditions) for design approval, inspection/verification, investigation, or auditing,

g) requirements regarding the need for the supplier to:

- notify MSA of nonconforming product,
- obtaining MSA’s approval for nonconforming product disposition,
- notify MSA of changes in product and/or process, changes of suppliers, changes of manufacturing facility location and, where required, obtain MSA approval, and
- flow down to the supply chain the applicable requirements including customer requirements
h) records retention requirements, and

i) right of access by MSA, our customer and regulatory authorities to the applicable areas of all facilities, at any level of the supply chain, involved in the order, and to all applicable records.

MSA shall ensure the adequacy of the specified purchase requirements prior to their communication to the supplier.

7.4.3 Verification of Purchased Product

MSA shall establish and implement the inspection or other activities necessary for ensuring that purchased product meets specified purchase requirements.

Note 1: Customer verification activities performed at any level of the supply chain should not be used by MSA or the supplier as effective control of quality and does not absolve MSA of its responsibility to provide acceptable product and comply with all requirements.

Note 2: Verification activities can include

- obtaining objective evidence of the conformity of the product from the supplier (e.g., accompanying documentation, certificate of conformity, test records, statistical records, process control records),
- inspection and audit at the supplier’s premises,
- review of the required documentation,
- inspection of products upon receipt, and
- delegation of verification to the supplier or supplier certification.

Where purchased product is released for production use pending completion of all required verification activities, it shall be identified and recorded to allow recall and replacement if it is subsequently found that the product does not meet requirements.

Where MSA delegates verification activities to the supplier, the requirements for delegation shall be defined and a register of delegations maintained.

Where MSA or its customer intends to perform verification at the supplier’s premises, MSA shall state the intended verification arrangements and method of product release in the purchasing information.

7.5 Production and Service Provision

7.5.1 Control of Production and Service Provision

MSA shall plan and carry out production and service provision under controlled conditions. Controlled conditions shall include, as applicable:

a) the availability of information that describes the characteristics of the product,
Note: This information can include drawings, parts lists, materials and process specifications.

b) the availability of work instructions, as necessary,

Note: Work instructions can include process flow charts, production documents (e.g., manufacturing plans, travelers, routers, work orders, process cards) and inspection documents.

c) the use of suitable equipment,

Note: Suitable equipment can include product specific tools (e.g., jigs, fixtures, molds) and software programs.

d) the availability and use of monitoring and measuring equipment,

e) the implementation of monitoring and measurement,

f) the implementation of product release, delivery, and post-delivery activities,

g) accountability for all product during production (e.g., part quantities, split orders, nonconforming product),

h) evidence that all production and inspection/verification operations have been completed as planned, or as otherwise documented and authorized,

i) provision for the prevention, detection, and removal of foreign objects,

j) monitoring and control of utilities and supplies (e.g., water, compressed air, electricity, chemical products) to the extent they affect conformity to product requirements, and

k) criteria for workmanship, specified in the clearest practical way (e.g., written standards, representative samples, illustrations).

Planning shall consider, as appropriate:

- establishing, implementing, and maintaining appropriate processes to manage critical items, including process controls where key characteristics have been identified,

- designing, manufacturing, and using tooling to measure variable data,

- identifying in-process inspection/verification points when adequate verification of conformance cannot be performed at later stages of realization, and

- special processes (see Paragraph 7.5.2).

7.5.1.1 Production Process Verification

MSA shall use a representative item from the first production run of a new part or assembly to verify that production processes, production documentation, and tooling are capable of producing parts and assemblies that meet requirements. This process shall be repeated when changes occur that invalidate the original results (e.g., engineering changes, manufacturing process changes, tooling changes).
Note: This activity is often referred to as first article inspection.

7.5.1.2 Control of Production Process Changes

Personnel authorized to approve changes to production processes shall be identified.

MSA shall control and document changes affecting processes, production equipment, tools or software programs.

The results of changes to production processes shall be assessed to confirm that the desired effect has been achieved without adverse effects to product conformity.

7.5.1.3 Control of Production Equipment, Tooling, and Software Programs

Production equipment, tools and software programs used to automate and control/monitor product realization processes, shall be validated prior to release for production and shall be maintained.

Storage requirements, including periodic preservation/condition checks, shall be defined for production equipment or tooling in storage.

7.5.1.4 Post-delivery Support

MSA does not perform any post-delivery support at this time. Paragraph 7.5.1.4 is included in this manual to preserve the numbering scheme established by AS9100.

7.5.2 Validation of Processes for Production and Service Provision

MSA shall validate any processes for production and service provision where the resulting output cannot be verified by subsequent monitoring or measurement and, as a consequence, deficiencies become apparent only after the product is in use or the service has been delivered.

Note: These processes are often referred to as special processes.

Validation shall demonstrate the ability of these processes to achieve planned results.

MSA shall establish arrangements for these processes including, as applicable:

a) defined criteria for review and approval of processes,

b) approval of equipment and qualification of personnel,

c) use of specific methods and procedures,

d) requirements for records (see Paragraph 4.2.4), and

e) revalidation.

7.5.3 Identification and Traceability

Where appropriate, MSA shall identify the product by suitable means throughout product realization.
MSA shall maintain the identification of the configuration of the product in order to identify any differences between the actual configuration and the agreed configuration.

MSA shall identify product status with respect to monitoring and measurement requirements throughout product realization.

When acceptance authority media are used (e.g., stamps, electronic signatures, passwords), MSA shall establish appropriate controls for the media.

Where traceability is a requirement, MSA shall control the unique identification of the product and maintain records (see Paragraph 4.2.4).

Note: Traceability requirements can include:
- identification to be maintained throughout the product life,
- the ability to trace all products manufactured from the same batch of raw material, or from the same manufacturing batch, to the destination (e.g., delivery, scrap),
- for an assembly, the ability to trace its components to the assembly and then to the next higher assembly, and
- for a product, a sequential record of its production (manufacture, assembly, inspection/verification) to be retrievable.

7.5.4 Customer Property

MSA shall exercise care with customer property while it is under MSA’s control or being used by MSA. MSA shall identify, verify, protect, and safeguard customer property provided for use or incorporation into the product. If any customer property is lost damaged, or otherwise found to be unsuitable for use, MSA shall report this to the customer and maintain records (see Paragraph 4.2.4).

Note: Customer property can include intellectual property and personal data.

7.5.5 Preservation of Product

MSA shall preserve the product during internal processing and delivery to the intended destination in order to maintain conformity to requirements. As applicable, preservation shall include identification, handling, packaging, storage, and protection. Preservation shall also apply to the constituent parts of a product.

Preservation of product shall also include, where applicable in accordance with product specifications and applicable statutory and regulatory requirements, provisions for:

a) cleaning,
b) prevention, detection, and removal of foreign objects,
c) special handling for sensitive products,
d) marking and labeling including safety warnings,
e) shelf life control and stock rotation, and
f) special handling for hazardous materials.
g) Environmental controls (e.g., temperature, humidity)

7.6 Control of Monitoring and Measuring Equipment

MSA shall determine the monitoring and measurement to be undertaken and the monitoring and measuring equipment needed to provide evidence of conformity of product to determined requirements.

MSA shall maintain a register of the monitoring and measuring equipment and define the process employed for their calibration/verification including details of equipment type, unique identification, location, frequency of checks, check method, and acceptance criteria.

Note: Monitoring and measuring equipment includes, but is not limited to: test hardware, test software, automated test equipment (ATE) and plotters used to produce inspection data. It also includes personally owned and customer supplied equipment used to provide evidence of product conformity.

MSA shall establish processes to ensure that monitoring and measurement can be carried out and are carried out in a manner that is consistent with the monitoring and measurement requirements.

MSA shall ensure that environmental conditions are suitable for the calibration, inspection, measurement, and testing being carried out.

Where necessary to ensure valid results, measuring equipment shall:

a) be calibrated or verified, or both, at specified intervals, or prior to use, against measurement standards traceable to international or national measurement standards; where no such standards exist, the basis for calibration or verification shall be recorded (see Paragraph 4.2.4);

b) be adjusted or re-adjusted as necessary;

c) have identification in order to determine its calibration status;

d) be safeguarded from adjustments that would invalidate the measurement result;

e) be protected from damage and deterioration during handling, maintenance, and storage.

MSA shall establish, implement, and maintain a process for the recall of monitoring and measuring equipment requiring calibration or verification.

In addition, MSA shall assess and record the validity of the previous measuring results when the equipment is found to not conform to requirements. MSA shall take appropriate action on the equipment and any product affected.

Records of the results of calibration and verification shall be maintained (see Paragraph 4.2.4).
When used in the monitoring and measurement of specified requirements, the ability of computer software to satisfy the intended application shall be confirmed. This shall be undertaken prior to initial use and reconfirmed as necessary.

Note: Confirmation of the ability of computer software to satisfy the intended application would typically include verification and configuration management to maintain its suitability for use.

QMS Authorized Procedures

MSAP 7.1 Customer Requirements and Communications
MSAP 7.2 Planning of Product Realization
MSAP 7.4 Purchasing
MSAP 7.5 Validation and Control of Processes
MSAP 7.6 Identification and Traceability
MSAP 7.7 Customer Property
MSAP 7.8 Handling, Storage, Packaging, Preservation, and Delivery of Product
MSAP 7.9 Control of Monitoring and Measuring Devices
MSAP 7.10 Thermal Treatment
MSAP 8.12 Foreign Object Debris
MSAP 8.13 Counterfeit Parts Prevention
8.0 Measurement, Analysis, and Improvement

8.1 General

MSA shall plan and implement the monitoring, measurement, analysis, and improvement processes needed:

a) to demonstrate conformity to product requirements,

b) to ensure conformity of the QMS, and

c) to continually improve the effectiveness of the QMS.

This shall include determination of applicable methods, including statistical techniques, and the extent of their use.

Note: According to the nature of the product and depending on the specified requirements, statistical techniques can be used to support:

- design verification (e.g., reliability, maintainability, safety),

- process control,
  
  ➢ selection and inspection of key characteristics,
  
  ➢ process capability measurements,
  
  ➢ statistical process control,
  
  ➢ design of experiment,

- inspection, and

- failure mode, effect, and criticality analysis.

8.2 Monitoring and Measurement

8.2.1 Customer Satisfaction

As one of the measurements of the performance of the QMS, MSA shall monitor information relating to customer perception as to whether MSA has met customer requirements. The methods for obtaining and using this information shall be determined.

Information to be monitored and used for the evaluation of customer satisfaction shall include, but is not limited to, product conformity, on-time delivery performance, customer complaints, and corrective action requests. MSA shall develop and implement plans for customer satisfaction improvement that address deficiencies identified by these evaluations, and assess the effectiveness of the results.

Note: Monitoring customer perception can include obtaining input from sources such as customer satisfaction surveys, customer data on delivered product quality, user opinion surveys, lost business analysis, compliments, warranty claims, and dealer reports.
8.2.2 Internal Audit

MSA shall conduct internal audits at planned intervals to determine whether the QMS

a) conforms to the planned arrangements (see Paragraph 7.1), to the requirements of ISO 9001/AS9100 and to the QMS requirements set forth herein, and

Note: Planned arrangements include customer contractual requirements.

b) is effectively implemented and maintained.

An audit program shall be planned, taking into consideration the status and importance of the processes and areas to be audited, as well as the results of previous audits. The audit criteria, scope, frequency, and methods shall be defined. The selection of auditors and conduct of audits shall ensure objectivity and impartiality of the audit process. Auditors shall not audit their own work.

A documented procedure shall be established to define the responsibilities and requirements for planning and conducting audits, establishing records and reporting results.

Records of audits and their results shall be maintained (see Paragraph 4.2.4).

The management responsible for the area being audited shall ensure that any necessary corrections and corrective actions are taken without undue delay to eliminate detected nonconformities and their causes. Follow-up activities shall include verification of the actions taken and the reporting of verification results (see Paragraph 8.5.2).

8.2.3 Monitoring and Measurement of Processes

MSA shall apply suitable methods for monitoring and, where applicable, measurement of the QMS processes. These methods shall demonstrate the ability of the processes to achieve planned results. When planned results are not achieved, correction and corrective action shall be taken, as appropriate.

Note: When determining suitable methods, it is advisable that MSA consider the type and extent of monitoring or measurement appropriate to each of its processes in relation to their impact on the conformity to product requirements and on the effectiveness of the QMS.

In the event of process nonconformity, MSA shall:

a) take appropriate action to correct the nonconforming process,

b) evaluate whether the process nonconformity has resulted in product nonconformity,

c) determine if the process nonconformity is limited to a specific case or whether it could have affected other processes or products, and

8.2.4 Monitoring and Measurement of Product
MSA shall monitor and measure the characteristics of the product to verify that product requirements have been met. This shall be carried out at appropriate stages of the product realization process in accordance with the planned arrangements (see Paragraph 7.1). Evidence of conformity with the acceptance criteria shall be maintained.

Measurement requirements for product acceptance shall be documented and shall include:

a) criteria for acceptance and/or rejection,
b) where in the sequence measurement and testing operations are to be performed,
c) required records of the measurement results (at a minimum, indication of acceptance or rejection), and
d) any specific measurement instruments required and any specific instructions associated with their use.

When critical items, including key characteristics, have been identified MSA shall ensure they are controlled and monitored in accordance with the established processes.

When MSA uses sampling inspection as a means of product acceptance, the sampling plan shall be justified on the basis of recognized statistical principles and appropriate for use (i.e., matching the sampling plan to the criticality of the product and to the process capability).

Where product is released for production use pending completion of all required measurement and monitoring activities, it shall be identified and recorded to allow recall and replacement if it is subsequently found that the product does not meet requirements.

Records shall indicate the person(s) authorizing release of product for delivery to the customer (see Paragraph 4.2.4).

Where required to demonstrate product qualification, MSA shall ensure that records provide evidence that the product meets the defined requirements.

The release of product and delivery of service to the customer shall not proceed until the planned arrangements (see Paragraph 7.1) have been satisfactorily completed, unless otherwise approved by a relevant authority and, where applicable, by the customer.

MSA shall ensure that all documents required to accompany the product are present at delivery.

8.3 Control of Nonconforming Product

MSA shall ensure that product which does not conform to product requirements is identified and controlled to prevent its unintended use or delivery. A documented procedure shall be established to define the controls and related responsibilities and authorities for dealing with nonconforming product.

Note: The term “nonconforming product” includes product returned by a customer.

MSA’s documented procedure shall define the responsibility and authority for the review and disposition of nonconforming product, and the process for approving personnel making these decisions.

Where applicable, MSA shall deal with nonconforming product by one or more of the following ways:
a) by taking action to eliminate the detected nonconformity;
b) by authorizing its use, release or acceptance under concession by relevant authority and, where applicable, by the customer;
c) by taking action to preclude its original intended use or application;
d) by taking action appropriate to the effects, or potential effects, of the nonconformity when nonconforming product is detected after delivery or use has started;
   - MSA’s nonconforming product control process shall provide for timely reporting of delivered nonconforming product;

Note: Parties requiring notification of nonconforming product can include suppliers, internal organizations, customers, distributors, and regulatory authorities.
e) by taking actions necessary to contain the effect of the nonconformity on other processes or products.

Dispositions of use-as-is or repair shall only be used after approval by an authorized representative of the organization responsible for design.

Note: Authorized representative includes personnel having delegated authority from the design organization.

MSA shall not use dispositions of use-as-is or repair, unless specifically authorized by the customer, if the nonconformity results in a departure from the contract requirements.

Product dispositioned for scrap shall be conspicuously and permanently marked, or positively controlled, until physically rendered unusable.

When nonconforming product is corrected it shall be subject to re-verification to demonstrate conformity to the requirements.

Records of the nature of nonconformities and any subsequent actions taken, including concessions obtained, shall be maintained (see Paragraph 4.2.4).

8.4 Analysis of Data

MSA shall determine, collect, and analyze appropriate data to demonstrate the suitability and effectiveness of the QMS and to evaluate where continual improvement of the effectiveness of the QMS can be made. This shall include data generated as a result of monitoring and measurement and other relevant sources.

The analysis of data shall provide information relating to:

a) customer satisfaction (see Paragraph 8.2.1),
b) conformity to product requirements (see Paragraph 8.2.4)
c) characteristics and trends of processes and products, including opportunities for preventive action (see Paragraphs 8.2.3 and 8.2.4), and
8.5 Improvement

8.5.1 Continual Improvement

MSA shall continually improve the effectiveness of the QMS through the use of the quality policy, quality objectives, audit results, analysis of data, corrective and preventive actions, and management review.

MSA shall monitor the implementation of improvement activities and evaluate the effectiveness of the results.

Note: Continual improvement opportunities can result from lessons learned, problem resolutions, and the benchmarking of best practices.

8.5.2 Corrective Action

MSA shall take action to eliminate the causes of nonconformities in order to prevent recurrence. Corrective actions shall be appropriate to the effects of the nonconformities encountered.

A documented procedure shall be established to define the requirements for:

a) reviewing nonconformities (including customer complaints),
b) determining the causes of nonconformities,
c) evaluating the need for action to ensure that nonconformities do not recur,
d) determining and implementing the action needed,
e) records of the results of action taken (see Paragraph 4.2.4),
f) reviewing the effectiveness of the corrective action taken,
g) flowing down corrective action requirements to a supplier when it is determined that the supplier is responsible for the nonconformity,
h) specific actions where timely and/or effective corrective actions are not achieved, and
i) determining if additional nonconforming product exists based on the causes of the nonconformities and taking further action when required.

8.5.3 Preventive Action

MSA shall determine action to eliminate the causes of potential nonconformities in order to prevent their occurrence. Preventive actions shall be appropriate to the effects of the potential problems.

A documented procedure shall be established to define requirements for:

a) determining potential nonconformities and their causes,
b) evaluating the need for action to prevent occurrence of nonconformities, 
c) determining and implementing action needed, 
d) records of results of action taken (see Paragraph 4.2.4), and 
e) reviewing the effectiveness of the preventive action taken.

Note: Examples of preventive action opportunities include risk management, error proofing, failure mode and effect analysis (FMEA), and information on product problems reported by external sources.

QMS Authorized Procedures

- MSAP 8.1 Measuring Customer Satisfaction
- MSAP 8.2 Internal Quality Audits
- MSAP 8.3 Monitoring and Measurement of Processes
- MSAP 8.4 Monitoring and Measurement of Product - Inspection
- MSAP 8.5 Monitoring and Measurement of Product – Destructive Testing
- MSAP 8.6 Monitoring and Measurement of Product – Nondestructive Testing
- MSAP 8.7 Monitoring and Measurement of Product – Source Inspection
- MSAP 8.8 Monitoring and Measurement of Product – Statistical Sampling
- MSAP 8.9 Control of Nonconforming Product
- MSAP 8.10 Planning for Continual Improvement
- MSAP 8.11 Corrective and Preventive Action
- MSAP 8.14 MRB NCR and Disposition