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DEPARTMENT OF DEFENSE HANDBOOK

KEY SUPPLIER PROCESSES FOR AERONAUTICAL SECTOR ACQUISITION AND SUSTAINMENT PROGRAMS

This handbook is for guidance only. Do not cite this document as a requirement.

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FOREWORD

1. This handbook is approved for use by all Departments and Agencies of the Department of Defense. It was prepared for the aeronautical business sector of the Department of Defense and designed to be used by suppliers to support defense systems acquisitions. Some aspects of the management processes and performance attributes defined herein may be peculiar to this sector, as they represent implementation of a number of joint government-industry initiatives.

2. This handbook is for guidance only. This handbook cannot be cited as a requirement. If it is, the contractor does not have to comply. This document provides fundamental management processes and performance attributes for program execution. Additional guidance is provided in the Joint Aeronautical Commanders' Group (JACG) Engineering and Manufacturing Practices for Defect Prevention: A Guide for Aerospace Acquisition Management Teams.

3. This volume is a component of a multi-volume set developed to implement acquisition reform within the aviation business sector of the Department of Defense. Each volume may be viewed from the JACG World-Wide Web home page at:

http://www.wpafb.af.mil/az/jacg/index.htm

The complete set of JACG Performance Based Business Environment (PBBE) documents consists of the following:

Integrated Performance Based Business Environment Guide — A capstone document designed to integrate the following volumes within an acquisition strategy framework:

Risk Management Pamphlet — Establishes a risk management framework for acquisition programs and serves to change the cultural thought from "risk avoidance" to "risk management"

Performance-Based Product Definition Guide — Provides guidance for the use of performance-based specifications and supports flexible acquisition and sustainment strategies

Joint Service Guide Specifications (JSGS) — A preparation guide for JSGS with aviation-unique, sample performance-based specifications

Key Supplier Process Handbook — Describes top-level key management processes critical to the effective management of an aviation acquisition program

Contractor Performance Assessment Reports (CPARS) — Provides a generic framework to collect and use contractor performance data in the source selection process

Performance Risk Assessment Group (PRAG) Guide — Provides guidance on how to obtain and assess past performance data during the source selection process

Flexible Sustainment Guide — Provides guidance on how to maintain combat capability and reduce life cycle costs by introducing flexibility into integrated logistics support.

4. Beneficial comments (recommendations, additions, deletions) or any pertinent data which may be used to improve this document should be addressed to: ASC/ENSI, 2530 Loop Road West, Wright-Patterson AFB OH 45433-7101, through use of the Standardization Document Improvement Proposal (DD Form 1426) that appears at the end of this document, or by letter.

CONTENTS

1. SCOPE.

This handbook is for guidance only. This handbook cannot be cited as a requirement. If it is, the contractor does not have to comply.

1.1 Scope/objective. The objective of this handbook is to identify and describe key management processes for program execution. It is oriented to aeronautical business sector suppliers who support defense systems acquisitions and sustainment. The processes and their associated performance attributes are applicable to all program phases, though their relative importance to program objectives will change throughout the product life cycle. The content of this document may be used to:

a. Develop performance-based acquisition strategies through the identification of process performance attributes most critical to the successful execution of the program;

b. Construct solicitations which encourage supplier-defined processes in place of processes defined and controlled by military standards; and

c. Provide a common basis to communicate desired process characteristics and performance attributes. This will facilitate efficient communication between government and industry. It may be used by suppliers to define and improve common, facility-wide processes and develop a set of top-down process metrics to assess process effectiveness and monitor process improvements.

1.2 Discussion. The six processes described in this handbook were selected to represent top-level generic functional processes common in the aeronautical business sector. Suppliers may differ in their definitions of the boundaries and interfaces of these processes. There may be differences in the specific application of these generic processes from one program to the next within a given supplier's organization. These generic definitions have been developed to allow industry to tailor and partition their management processes in a manner which best fits individual functional organization and products. In addition to the top-level processes identified in this document, there may be lower-level supporting and enabling processes which are essential to program performance. The key to successful programs will be to demonstrate the ability to implement an integrated set of industry processes and lower-level supporting and enabling processes to meet the programmatic requirements of the government. The processes, and their characteristics and performance attributes, described in this handbook are:

a. Program/Data Management Process (see 4.1),
b. Engineering Process (see 4.2),
c. Quality Process (see 4.3),
d. Manufacturing Process (see 4.4),
e. Procurement/Subcontract Management Process (see 4.5), and
f. Logistics Process (see 4.6).

2. APPLICABLE DOCUMENTS

This section is not applicable to this handbook.

3. DEFINITIONS

3.1 Definitions used in this handbook. The following definitions apply to terms as used within this document.

3.1.1 Element. An element is a lower-level indenture of a process which has all the characteristics of a process as described below. Elements may function independently or in conjunction with other elements.

3.1.2 Integrated master plan (IMP). An IMP is a top-level plan to conduct a program. It integrates all lower-level plans and is an event-driven tool that can minimize the exposure to risk by ensuring all functional elements of the program are aligned before subsequent activities are initiated. The IMP identifies major contractual milestones and may include non-contractual key events which represent both the completion of incremental program objectives and the commitment of future program resources. For each of these milestones and key events, specific entrance and exit criteria are identified which define accomplishments that must be achieved in terms of: (1) achievement of a desired result that indicates design maturity of the products and processes; (2) completion of a discrete step of the planned development; and (3) completion of detailed planning for the next phase of activities.

3.1.3 Key product characteristics. Key characteristics are the features of a material, part, or process whose variation has significant influence on product cost, safety, fit, performance, service life, or manufacturability. This concept asserts that among all the characteristics that define a part, material, etc., only a small subset is so critical to functionality or manufacturability that they must be closely controlled during fabrication, assembly, and test.

3.1.4 Operational/user requirements. These are end-user-generated requirements, normally defined in terms of a system capability or characteristic, required to accomplish mission needs. User requirements are initially stated in a Mission Need Statement (MNS) and evolve to system-specific performance requirements in the Operational Requirements Document (ORD).

3.1.5 Performance attribute. A performance attribute is a critical characteristic associated with a process or element which describes the expectations for that process or element in terms of capabilities.

3.1.6 Process. A process is a set of procedures and methodologies which, when applied, provide a consistent set of outputs for a given set of inputs.

3.1.7 Process implementation. Process implementation is the application of supplier processes for a given program. The overall implementation and associated dependencies will be described in an Integrated Master Plan (IMP).

3.1.8 Technical performance measurement. Technical Performance Measurement (TPM) is the continuing verification of the degree of anticipated and actual achievement for technical parameters. Confirms progress and identifies deficiencies that might jeopardize fulfillment of a system requirement. Assessed values falling outside established tolerances indicate a need for evaluation and corrective action.

3.1.9 Verification requirements. Generated by the acquisition community to define the method(s) and criteria by which the achievement of technical requirements will be substantiated during incremental development. Verification requirements apply to both product and process capabilities.

3.2 Acronyms. The acronyms used in this handbook are defined as follow:

a.	COTS	Commercial Off-The-Shelf
b.	CPI	Continuous Process Improvement
c.	IMP	Integrated Master Plan
d.	IPT	Integrated Product Team
e.	MNS	Mission Need Statement
f.	NDI	Non-Developmental Item
g.	ORD	Operational Requirements Document
h.	PP/CSC	Program Planning/Cost and Schedule Control
i.	SPC	Statistical Process Control
j.	TPM	Technical Performance Measurement
k.	VR	Variability Reduction

4. KEY PROCESSES AND CHARACTERISTICS

4.1 Program/data management process

4.1.1 Discussion/rationale. The program management process is intended to represent the top-level supplier process for the overall conduct and control of the program. There are seven elements within the process. The three key elements of this process are: (1) Integration and coordination of all other processes applied to the program, (2) Allocation of resources and assignment of responsibilities within the program, and (3) Primary communications interface with all involved in the program. This interface includes the parent corporation and the responsibilities for implementing corporate processes for the program. The following elements also contribute to the program management process: (4) Risk Management, (5) Program Planning/Cost and Schedule Control, (6) Contract Compliance, and (7) Data Management.

4.1.1.1 Integration and coordination. This element provides for the orchestration of program activities into a unified whole which satisfies the program requirements.

4.1.1.2 Resources and responsibilities. This element deals with the staffing and resourcing of the teams to execute program activities. It also defines staff responsibilities.

4.1.1.3 Communications. This element addresses the flow of information within and among the teams or organizations which implement program activities. It also deals with information communicated to the customer to ensure customer satisfaction is the focus of program activities.

4.1.1.4 Risk management. Risk management is an element that puts in place a structured decision-making process specifically oriented to the identification, balance, and management of cost, schedule, and technical risks bounded by the technical considerations and external constraints. This element consists of five subelements: risk identification, risk analysis in terms of probability of occurrence and consequence of failure, risk handling in terms of identification and assessment of alternative risk management options, decision-making and implementation, and tracking or feedback to assess the effectiveness of the risk management effort implemented.

4.1.1.5 Program planning/cost and schedule control. The program planning/cost and schedule control (PP/CSC) element for program management interfaces directly with other key processes. It is the mechanism for planning, forecasting, tracking, assessing, and reporting activities, resource expenditures, and requirements. It establishes both a schedule and cost performance baseline for the program. The PP/CSC should also establish a “self governance” program to verify that internal reviews/audits of processes and performance measures are in place and being used. It provides a method to assess progress in terms of the technical performance, contract schedule, and budget. It interfaces with the engineering process to evaluate technical progress in terms of technical performance measures and their influence on overall program cost and schedule and collects actual expenditures against the program work breakdown structure. It interfaces with the program management process to provide information and data with respect to overall program performance. It is initially used for proposal preparation and is updated based on actual events. An integral part of this process is the cost and schedule estimating methodologies required to forecast remaining effort accurately.

4.1.1.6 Contract compliance. Contract compliance is the means to record, report, disseminate, and track all active contract requirements and contract changes. These include those for customers and suppliers as well as associates and partners.

4.1.1.7 Data management. Data management is an element of all six described processes. Data is a collection of recorded information (regardless of the form or method of recording) generated and used to manage the development, acquisition, sustainment, or operation of defense systems and equipment. It is necessary for program definition, control, monitoring, evaluation, and support. Data includes both administrative and technical information. Reports (financial, progress, logistics, test, etc.), analyses, studies, plans, schedules, records, and other information constitute administrative data. Technical data is required to define and document an engineering design or component configuration. Technical data includes, but is not limited to, specifications, technical data packages (product definition data, associated lists, process descriptions), and technical manuals (operation and maintenance instructions, parts breakdown, and other instructions for installation, operation, maintenance, training, and support). The data management element applies policies, systems, and procedures to identify and control data requirements; acquires data in a timely and economical manner; and ensures the adequacy and accuracy of the data relative to the data requirements.

4.1.2 Performance attributes

4.1.2.1 Integration and coordination. Integration and coordination exhibits these performance attributes:

a. The capability to supply the leadership and management required to meet program objectives through timely and effective decisions and direction based on a structured decision-making process which provides traceability of program decisions including the supporting data and rationale, and

b. The capability to provide timely cost and schedule status across the facility/program.

4.1.2.2 Resources and responsibilities. Resources and responsibilities exhibits the following performance attributes: the ability to staff, train, organize, and equip the teams necessary to implement the proposed effort and meet overall program objectives.

4.1.2.3 Communications. Communications exhibits these performance attributes: establishment and maintenance of efficient and effective internal and external communications with all customers and suppliers, with an emphasis on customer satisfaction.

4.1.2.4 Risk management. Risk management exhibits the following performance attributes:

a. The ability to identify program risks and define incremental accomplishment criteria to measure progress in the reduction of that risk,

b. The ability to define mitigating strategies and alternatives with defined decision points for implementation, and

c. The capability to develop cost and schedule estimates which recognize and include the uncertainty of each task due to technical, cost, and schedule risks.

4.1.2.5 Program planning/cost and schedule control. Program planning/cost and schedule control exhibits the performance attributes listed below:

a. The ability to accumulate all technical performance, cost, and schedule data relative to responsible and accountable Integrated Product Teams (IPTs) and assess earned value of work in progress;

b. The ability to predict accurately near-term schedules and resource requirements;

c. The ability to forecast time and cost to completion of program/project;

d. The capability to provide timely cost and schedule data relative to cost work breakdown and IPT structure; and

e. The ability to support audits of actual costs tied to the cost work breakdown structure.

4.1.2.6 Contract compliance. The performance attributes exhibited by contract compliance are :

a. The ability to maintain and disseminate contract documentation current for all active efforts, and

b. The capability to maintain and distribute schedules for all contract deliverables and events and to provide timely notice of near-term contract requirements to promote compliance.

4.1.2.7 Data management. Data management exhibits the following performance attributes:

a. The ability to provide management, technical, and customer personnel the quality information required to accomplish their tasks in an efficient and cost-effective manner; and

b. The ability to refine data requirements continually.

4.2 Engineering process

4.2.1 Discussion/rationale. The engineering process is the governing technical management process that manages and controls the product development. It addresses all aspects of total system performance and provides the primary technical interface with the other key processes. It defines the technical processes and interfaces and provides the technical baseline for the Integrated Master Plan for development and production. Its primary function is to ensure the product meets the customer's cost, schedule, and performance needs. The cost, schedule, and performance considerations include the total product life cycle.

This definition enables industry to tailor and partition the overall engineering process in the manner which best fits their individual organizational elements and products. The key to a successful engineering process is the integration of these disciplines into an efficient and effective process for the overall technical management of programs and development of systems and equipment which meet user requirements. When hardware and software design and test and evaluation are addressed as separate disciplines, it will be necessary to demonstrate the defined roles of these disciplines assume the functional aspects of the engineering process and become integrated over the entire development cycle. These individual disciplines are melded herein and will be discussed in terms of six elements: (1) Systems Integration, (2) Requirements Analysis, (3) Functional Analysis/Allocation, (4) Design Synthesis (i.e., preliminary design and detail design), (5) Systems Verification, and (6) Systems Analysis and Technical Control.

4.2.1.1 Systems integration. Systems integration provides the overall leadership and management of the engineering process. It is the coordination, communication, and integration of decisions across and among various teams. It includes managing the interfaces internal and external to the system, including hardware to hardware, hardware to software, and software to software. The integration task leverages the individual activities to facilitate and enhance the individual products of the system. This element also provides for the application and tracks the progress of the numerous specialty technical disciplines commonly identified as the "-ilities". It also provides the interface with the manufacturing and logistics support processes to integrate production and support requirements into the product definition.

4.2.1.2 Requirements analysis. Requirements analysis determines system technical requirements by studying and understanding the user requirements as stated in the Mission Needs Statement (MNS) and the Operational Requirements Document (ORD), which address the entire life-cycle of the system. The ORD describes the missions or tasks the system must accomplish, the environment(s) in which the system will be used, any constraints placed upon the system, measures of effectiveness for test and evaluation, system life-cycle factors, and interoperability with other systems and operational requirements. Requirements analysis provides verifiable, performance-based requirements in the system utilization environments and the top-level functional requirements the system must perform. This set of requirements is commonly referred to as "the functional baseline". Requirements analysis flows down to the lowest level of the system. As the system evolves in greater detail, the requirements analysis is iterated to address user needs.

4.2.1.3 Functional analysis and allocation. Functional analysis and allocation defines and integrates a functional architecture to support synthesis of solutions for people, products, and processes and management of risk. Functional analysis/allocation is conducted iteratively to define successively lower-level functions required to satisfy higher-level functional requirements and to define alternative sets of functional requirements. Functional analysis turns big functions into an architecture of smaller, simpler functions to which a solution can be designed. The lowest level of this architecture yields a well-defined set of actions which must be performed by the components of the system to meet the top-level requirements, with a set of verifiable component requirements usable as criteria for design. This set of requirements is commonly referred to as "the allocated baseline". This activity also includes initial or conceptual design of products to validate the ability of the selected technologies to achieve desired results.

4.2.1.4 Design synthesis, or preliminary and detail design. Synthesis, or preliminary and detail design, translates the functional and performance requirements, including interfaces, into a description of the complete system that satisfies the requirements. It defines this solution in terms of a physical architecture of people, products, and processes. For the system products, solutions are iteratively defined through the preliminary and detailed design of the products and selection of production processes. This activity develops the design in accordance with the architecture selected. Results are defined and documented in the form of product definition data that allow hardware and/or software fabrication (coding). This product definition data is part of the overall package commonly referred to as "the product baseline".

4.2.1.5 Systems verification. Systems verification is the incremental, iterative determination of progress in satisfaction of technical requirements and program objectives. It provides a rigorous, quantitative basis for validation and verification of specification requirements. The ultimate objective is to confirm the design solution meets requirements. System verification addresses all elements of the final solution, including interfaces, as well as the integrated system solution. It is a combination of inspections, analyses and assessments, demonstrations, and tests which authenticates the cost and performance of the system. It also includes the validation of analytical methodologies used as part of the verification processes.

Test management is an integral part of this element. It plans testing and defines, acquires, and manages required resources. These resources include facilities, equipment, test articles, and test personnel. Test management also includes the methodologies required to predict test requirements accurately in terms of schedule. Prediction is based on broad test objectives, maturity of test articles, normal availability of facilities and equipment, and reliability of test methods. It further includes managing the conduct of tests in accordance with the detailed test instructions generated by the engineering process, and recording, analyzing, and reporting test results.

4.2.1.6 Systems analysis and technical control. Systems analysis and technical control is used to balance the requirements and constraints in the program. It includes, but is not limited to, trade studies among requirements, design alternatives and related manufacturing, test and support processes, program schedule and life cycle cost, configuration management, interface management, deficiency reporting, risk management, and performance-based progress measurement—including the milestone exit criteria, technical performance measurement, and technical reviews/audits.

Configuration management has four key elements: (1) technical baseline definition and maintenance, (2) control, (3) status accounting, and (4) audits. Technical baseline definition and maintenance documents the requirements and functional/physical characteristics of a system and includes such baseline definitions as hierarchy, nomenclature, and numbering. Control ensures changes to these requirements, the product configuration and its characteristics, and related documentation are evaluated and authorized by the use of a systematic process. Status accounting records and reports critical elements of information required to manage the configuration of the system. The audit function confirms the end item meets verification requirements and the as-delivered product matches the technical documentation.

Interface management controls the design compatibility of internal and external engineering interfaces and consists of performance/physical requirements/design constraints. Deficiency reporting is the systematic means to record, track, control, and provide feedback on technical and administrative actions for reported deficiencies or proposed enhancements to the system.

Technical risk management is a structured process specifically oriented to the identification, balance, and management of technical risks and associated cost and schedule impacts. It is primarily intended to be a proactive process which understands the technical risks at the outset of the program and manages these risks to a predetermined plan, but also includes the early recognition and management of unexpected problems. It supports the overall program risk management process by identifying technical risks, providing analyses in terms of probability of occurrence and consequence of failure, and identifying and assessing alternative approaches. Then, based on the program decisions, implements and tracks the effectiveness of the alternative(s) selected.

Performance-based progress measurement is the identification of key technical performance parameters in a structured format where lower-level performance parameters support performance parameters at higher levels of integration, prediction of their time-phased level of performance based on design maturity, and the tracking and reporting of actual versus projected performance. It provides for early recognition of unexpected problems.

4.2.2 Performance attributes

4.2.2.1 Systems integration. Performance attributes of systems integration are:

a. The ability to provide the leadership necessary to integrate all technical disciplines and functional processes (e.g., manufacturing and logistics), and establish and maintain effective communications with and among participants throughout the development effort;

b. The ability to identify key product characteristics and control allowable design margins for the integrated/installed performance of system components;

c. The ability to establish and track internal and external software component margin allocation and budgeting;

d. The ability to identify and manage technical risks;

e. The ability to identify and manage critical interfaces and prevent sub-optimal solutions by continually looking across all product teams;

f. The capability to provide quality interface control documents on a timely basis;

g. The capability to determine the appropriate application of specialty functions (-ilities);

h. The ability to staff, train, organize, and equip the technical teams necessary to implement the proposed technical effort required to meet overall program objectives; and

i. The ability to provide tools, databases and development practices specific to end items.

4.2.2.2 Requirements analysis. The performance attributes of requirements analysis are:

a. The ability to define comprehensive and quantitative system performance requirements based on demonstrated/projected end item performance capabilities;

b. The ability to integrate subsystem performance estimates into overall system performance;

c. The capability to establish and maintain a decision database that provides a traceable record of the system performance and verification requirements to customer/user needs, requirements, and objectives;

d. The ability to define, manage, track, and verify hardware/software growth and spare requirements in the program specifications;

e. The ability to provide system-level cost/performance trade studies which assess the use of commercial off the shelf (COTS)/non-developmental items (NDIs) and provide the ability to adjust system-level performance requirements when large cost savings are possible; and

f. The ability to establish life-cycle requirements for the system (e.g., manufacturing, support, disposal, training, etc.).

4.2.2.3 Functional analysis and allocation. The performance attributes of functional analysis and allocation are:

a. The ability to define a complete set of verifiable performance requirements for the products necessary to achieve required system capabilities at a level that allows reasonable development activities relative to risks, resources, and constraints;

b. The ability to define comprehensive and quantitative installed and uninstalled performance requirements for how and where the end item products will be used;

c. The ability to include product life requirements in early design trade studies;

d. The ability to allocate performance requirements, including interface tolerances, to subsystems and components as the design progresses;

e. The capability to establish and maintain a decision database that provides a traceable record of performance and verification requirements from each end item to system-level requirements; and

f. The ability to identify potential COTS and NDIs, and establish alternate subsystems/component requirements matrices based on estimated product performance capabilities for the intended use.

4.2.2.4 Design synthesis, or preliminary and detail design. Design synthesis performance attributes are:

a. The ability to define a physical architecture that satisfies overall system-level requirements;

b. The capability to model adequately the performance of both end items and the integration of these end items;

c. The ability to identify key performance design and safety requirements and key design requirements at each level of system or product indenture and translate them into design solutions;

d. The ability to identify key product characteristics and associated key production processes, and define and control allowable design margins and capabilities for key production processes;

e. The ability to identify control requirements for product integrity during operation and support phases to maintain the system or product operation within the users' key performance capabilities;

f. The ability to perform sensitivity analyses to establish design margins and examine the effects of design requirement shortfalls as well as the tolerance to variations in use, producibility, supportability, and other determining factors;

g. The ability to perform appropriate trade studies, prototypes, simulations, analysis, and design methodologies compatible with the identified system incremental development phasing;

h. The capability to establish and maintain a decision database that provides a traceable record of the results of analyses, trade studies, etc., which support key technical decisions;

i. The ability to integrate the design requirements for manufacturing (e.g., tooling datum requirements) and support processes (e.g., diagnostics, maintenance requirements) with the product design, and to facilitate ease of assembly through the use of geometric dimensioning and tolerancing; and

j. The ability to provide quantitative performance assessments of potential COTS and NDIs for the intended use based on demonstrated capabilities, environments, and performance.

4.2.2.5 System verification. The performance attributes of system verification are:

a. The ability to conduct incremental developmental analyses, simulations, and/or tests to develop required design data and verify design requirements and producibility;

b. The ability to perform final qualification/performance verification that represents usage and environments expected over the life of the system or product;

c. The ability to identify test objectives and other critical information required to plan for and execute testing;

d. The ability to predict test requirements in terms of schedule and resources;

e. The ability to acquire and manage test resources, conduct the required testing in a timely and effective fashion, and interface with the manufacturing processes to provide for the timely availability of test articles;

f. The ability to report results accurately and establish and maintain a verification database that provides a traceable record of performance verification; and

g. The ability to assess adequacy of verification of COTS and NDIs, identify additional verification requirements if needed, and integrate existing verification data into the overall system verification database.

4.2.2.6 Systems analysis and technical control. Systems analysis and technical control performance attributes are:

a. The ability to verify changes and variances to the system are accurately evaluated, documented, and approved, and that changes are accomplished using a systematic, measurable change process;

b. The ability to provide definitive, accurate, and timely information on the current configuration of the system for use within management and technical processes;

c. The ability to confirm the end items meet verification requirements, and provide traceable results the as-delivered product matches its technical documentation;

d. The ability to control interfaces among systems, subsystems, and commodities to provide for design compatibility;

e. The capability to identify problems, conduct root cause analyses, and define and implement corrective actions for both the products and the production processes which generated the problem to preclude recurrence;

f. The capability for early identification of technical risks and advanced planning to manage these risks adequately as part of the initial program development;

g. The ability to identify and apply measures of effectiveness and technical performance measures which capture the maturity, performance, and risks in the program and establish associated incremental milestone criteria and accomplishments; and

h. The ability to conduct trade studies among requirements, design solutions, program schedule, life-cycle costs, and various program constraints, and to provide technical alternatives and options to technical and program management decision makers.

4.3 Quality process

4.3.1 Discussion/rationale. The quality process is the foundation for achieving quality. It should be based on the elements of ISO-9000/ANSI/ASQC-9000, or equivalent. The quality process performance can be satisfied by company, commercial, or international standards.

4.3.2 Performance attributes. Performance attributes are:

a. A supportive, quality system that conforms to generally-accepted commercial, international, or military standards;

b. The ability to identify and document the common, facility-wide processes used to create the products and services of the facility;

c. The ability to identify the products and services of the common, facility-wide processes, including intermediate products and services;

d. The ability to identify the customer(s) of the products and services (internal and external), and to provide a customer satisfaction orientation which considers what is necessary to fulfill customer needs;

e. The ability to identify suppliers required by the common, facility-wide processes and provide clear definitions of supplier requirements;

f. The ability to configure the common, facility-wide process to provide for clear interfaces with internal and external customers and suppliers to facilitate the communications required to satisfy requirements and to allow facility processes to be tailored to specific program requirements; and

g. The ability to provide continuous improvement through measurement and analysis of the performance of common, facility-wide processes as implemented on each program within the facility, and the ability to eliminate sources of errors/defects and non-value added activity.

4.4 Manufacturing process

4.4.1 Discussion/rationale. The manufacturing process includes the total set of activities and interfaces necessary to convert the product definition into an affordable end item product. The objective of the manufacturing process is to provide: (1) a complete definition of the factory environment in which the product is to be produced for consideration by the product/production process design activity; (2) a capable, efficient factory design as a product of the development program; (3) development and production/reproduction articles produced in support of delivery requirements; and (4) adequate insight into how factories are performing during contract execution. Reproduction includes the repair and overhaul of service units. The manufacturing process assesses the product and factory design, production processes, and tooling. It mitigates production transition risk through evaluation of design and manufacturing alternatives relative to program affordability, manufacturing efficiency, and quality objectives. It identifies and resolves production and quality-related problems experienced in the manufacturing facility.

a. The manufacturing process supports the program/data management process by providing the up-front planning for the factory management systems necessary to manage the factory. Within the factory there must be adequate control to verify a thorough understanding of how the product is being built and what actions may be taken to reduce risk. These factory control systems must consider the control of the material on the production floor, the planning and statusing of work in process, and a systematic approach to continuous improvement and waste elimination.

b. The manufacturing process also supports the engineering process by providing for the integration of the product and factory design. If production costs are to be controlled, there must be a continual interchange between the product and factory design activities. That is, the capabilities of the planned or existing factory must be a consideration in the product design and vice versa in terms of unit production cost, the projected delivery schedule, and product quality requirements. To determine the impact of the factory to production cost, consideration must be given items such as process capacity and capability, environmental concerns, standard work content, factory flow, and assembly methods. Factory modeling may be used to validate the compatibility of the product design and factory in terms of cost, schedule, and quality requirements.

c. The overall manufacturing process will be discussed in terms of five elements: 1) material control; 2) shop floor planning, tracking, and control; 3) factory flow optimization; 4) factory design; and 5) factory performance.

4.4.1.1 Material control. Material control is the identification, ordering, receipt, flow, and tracking of material for the system. This element should provide visibility and control of material as it is used within the factory.

4.4.1.2 Shop floor planning. The shop floor planning, tracking, and control element addresses the factory systems necessary to plan, status, and accomplish production risk management.

4.4.1.3 Factory flow optimization. The factory flow optimization element will seek to identify and eliminate continually waste or non-value added effort.

4.4.1.4 Factory design. The factory design element addresses the concurrent technical development of the product and factory to verify that these aspects of the product/production processes are considered and the factory infrastructure is in place to support manufacturing activities necessary to accomplish the program. This includes activities such as tool design/fabrication and consideration of facilities necessary to produce the end products. This element should provide for the integration of the product and production processes with the factory design activities.

4.4.1.5 Factory performance. The factory performance element identifies and seeks to reduce the direct labor content of the product, optimizes the man/machine interface, and establishes control and feedback mechanisms within the factory. This element should provide management visibility of efficiency and productivity. It should also provide data to determine factory problem areas, thus driving corrective action and continuous improvement. Subelements include:

a. Use of stable, capable manufacturing processes as the basis for product acceptance — Replacement of discrete inspection or test by stable, capable processes eliminates the cost associated with non-value added verification activities. Defective products must be repaired or reworked and re-inspected, or scrapped, all of which add cost to the final product without adding value. In most cases, a stable, capable process is the preferred condition since it generally leads to the lowest cost method of product acceptance.

b. Control of variation in the measurement system — Measurement processes exhibit variation just as do manufacturing processes. Consequently, it is important to conduct measurement equipment repeatability and reproducibility analyses when performing process capability studies to verify that measurement device variation is not consuming an excessive amount of design tolerance.

c. Root cause, closed-loop corrective action — Advanced manufacturing systems emphasize prevention of a defect's recurrence through the use of multi-functional teams and formal problemsolving techniques. This approach is combined with high-level management attention and tracking to evaluate and implement changes in designs, production processes, tooling, work instructions, training, etc., to ensure the problem does not recur.

d. Continuous process improvement (CPI) or variability reduction (VR) — The basic objective is to reduce the cost to deliver a quality product. This is achieved by assessing the root causes of variability and instituting cost-effective changes to reduce this variability by eliminating or reducing the impact of root causes. Another aspect of CPI is the evaluation of the design to identify cost-effective ways to make it more robust or more tolerant to variation. In the more general sense, CPI would address the processes associated with the product, including factory infrastructure processes such as inventory control, parts and material handling, and technical, business, and administrative support functions (as they affect production).

4.4.2 Performance attributes

4.4.2.1 Material control. A performance attribute of material control is the ability to store, move, and manage the material requirements to optimize on-schedule support to production requirements.

4.4.2.2 Shop floor planning and control. Shop floor planning and control performance attributes are:

a. The ability to determine product flow and span time within the factory;

b. The capability to provide product status information;

c. The ability to provide a production scheduling and control system utilized plant-wide; and

d. The ability to manage factory operations and resources to deliver required articles on schedule—including tooling, test, and support equipment.

4.4.2.3 Factory flow optimization. A performance attribute of factory flow optimization is the ability to identify and eliminate non-value added effort continuously within the product flow.

4.4.2.4 Factory design. Factory design performance attributes are:

a. The ability to define factory performance requirements;

b. The ability to provide manufacturing data, factory capabilities, special tooling/test equipment requirements, and unique production process characteristics which affect or influence the design of the products and factories;

c. The ability to optimize product requirements with factory capabilities; define factory cost, schedule, and quality requirements; and

d. The ability to develop the production planning necessary to build the product and provide the manufacturing support systems (tooling, test equipment, etc.) on schedule.

4.4.2.5 Factory performance. The performance attributes of factory performance are:

a. The ability to identify standard labor content;

b. The ability to optimize the use of resources;

c. The capability to measure first pass yields and implement continuous process improvement or variability reduction;

d. The ability to verify manufacturing processes and tooling which control key product characteristics and are stable and able to meet customer product requirements;

e. The ability to use stable, capable manufacturing processes as a basis for product acceptance in lieu of inspection and test;

f. The ability to assess the contribution of variation associated with measurement and test equipment and ensure it is accounted for when determining process capability;

g. The ability to facilitate process maturity through continuous variability reduction for key product characteristics;

h. The ability to provide continuous improvement by measuring and analyzing manufacturing process performance, and eliminating sources of errors/defects and non-value-added activity; and

i. The ability to facilitate the rapid disposition of defects, rapid and accurate identification of the root causes of defects, and the implementation of effective corrective action.

4.5 Procurement/subcontract management process

4.5.1 Discussion/rationale. The subcontract management process establishes the total set of business and technical relationships between the customer and supplier. The process begins with development of requirements and subcontract acquisition strategy, and involves all phases of the acquisition cycle. It involves all of the other key supplier processes and many of their elements and subelements. Emphasis is placed on close, interactive relationships between customer and supplier and longer-term business relationships, as opposed to arms-length, short-term relationships. Key to accomplishing these changing relationships is early and continuing involvement of suppliers with the customer in the entire acquisition life cycle and development of fully-integrated teamwork among the customer and his suppliers. This approach builds long-term, cooperative relationships with suppliers and stresses extensive information sharing and joint problem-solving that is based on mutual trust and commitment. In this respect, subcontract management must be expanded to enable key suppliers to participate in the integration process.

The subcontract management process interfaces with the program management process by providing the contractual linkages between the prime and suppliers. It also defines the technical relationships of the key suppliers in support of the prime's IPTs. It describes the roles and responsibilities of parties and establishes the formal and informal communications channels. The technical relationship will also include the integration of the configuration management process in terms of: configuration identification; control, status accounting, and audits; and interface management.

An integral part of the subcontract management process is an effective method to assess supplier performance which provides for efficient proposal evaluation and award of contracts to best value suppliers.

4.5.2 Performance attributes. Performance attributes are:

a. The ability to differentiate between suppliers based on past performance and other indicators of risk;

b. The ability to provide timely subcontract awards based on best value;

c. The ability to define mutually-acceptable contracts which completely define technical and business relationships relative to the contract effort;

d. The capability to synchronize production schedules;

e. The ability to assess make/buy alternatives based on core competencies;

f. The ability to provide information-sharing among stakeholders;

g. The ability to establish mutually beneficial relationships;

h. The ability to integrate supplier processes as an integral part of the overall program performance measures and metrics; and

i. The ability to provide for the selection of key suppliers based on their ability to implement appropriate aspects of quality systems.

4.6 Logistics process

4.6.1 Discussion/rationale. The overall Logistics Process will be discussed in terms of two elements: (1) Logistics Planning and (2) Product Support. Logistics Planning and development processes are multi-functional, technical and management planning disciplines associated with the design, development, test, production, fielding and sustainment of the infrastructure support elements necessary to sustain the system in the field. Product Support activities include maintenance or materiel management activities in support of fielded systems.

4.6.1.1 Logistics planning. Logistics planning involves the integration of the product support subelements during the upfront design. Development and integration of these subelements is essential to successful fielding, operation, and support of the system. Specifically included is the planning required to evolve and establish maintenance concepts and requirements for the lifetime of the system. Because of the impacts on systems design and the long-term operations and support cost implications, a cost-effective support concept needs to be established early in the program after careful consideration of all viable alternatives and refined concurrently with the design effort into detailed maintenance plans.

4.6.1.2 Product support. Product support includes all sustainment activities which support operational systems, including disposal. Subelements required for this support include the following:

a. Manpower and personnel — Manpower and personnel are the military and civilian personnel with the skills and grades required to operate and support the system over its lifetime at peacetime and wartime rates. Program managers should strive to minimize the quantity of personnel and the skill levels required to operate and maintain systems;

b. Supply support — Supply support is the secondary items necessary to field and support the system, including consumables, repair parts, and spares;

c. Support equipment — Support equipment is all equipment required to support the operation and maintenance of the system. This includes associated multi-use end items, ground handling and maintenance equipment, tools, metrology and calibration equipment, test equipment, and automatic test system. The automatic test system includes automatic test equipment hardware and operating system software, test program sets that include the interface test adapter hardware and software programs to test individual weapon electronic items, and the associated software development environments and interfaces;

d. Technical manuals and technical data — These are scientific or technical information recorded in any form or medium (such as manuals or drawings). Computer programs and related software are not technical data; whereas, the documentation of computer programs and related software are technical data. Also excluded are financial data or other information related to contract administration;

e. Training and training devices — These are processes, procedures, techniques, training devices, and equipment used to train civilian and active duty and reserve military personnel to operate and support the system. This includes individual and crew training (both initial and continuation) as well as new equipment training; and initial, formal, and on-the-job training;

f. Computer resources support (CRS) — The computer resources may be part of the system, a subsystem, support equipment (automatic test system), training equipment and training devices, or other applications. Computer Resources Support considers all support elements as they apply to the computer resources employed by the system. Generally, however, CRS focuses on facilities, hardware, system software, software development and support tools, related documentation and data, and identification and establishment of the knowledge and skills required to provide sustainment and future modification of the computer resources;

g. Facilities — Facilities are permanent, semi-permanent, or temporary real property assets required to support the system. This includes studies conducted to define facilities or facility improvements, locations, space allocation, utilities, environmental requirements, real estate requirements, and equipment; and

h. Packaging, handling, storage, and transportation — These are the resources, processes, procedures, design considerations, and methods which ensure all system, equipment, and support items are preserved, packaged, handled, and transported properly. This includes environmental considerations, equipment preservation requirements for short- and long-term storage, and transportability.

4.6.2 Performance attributes

4.6.2.1 Logistics planning.: Logistics planning performance attributes are:

a. The ability to conduct support trade-offs which consider the impacts on life-cycle support;

b. The ability to analyze and assess alternative support approaches;

c. The ability to identify, define and/or develop support resources related to one another and consistent with the system design configuration and the users' requirements;

d. The ability to plan for, track, and mitigate the support impact caused by engineering design changes; and

e. The ability to develop and provide engineering and support-related technical data which enables further support resource development or management.

4.6.2.2 Product support. Product support performance attributes are:

a. The ability to provide cost-effective maintenance and materiel management activities for in-service system support consistent with the users' readiness requirements;

b. The ability to track and assess materiel management and maintenance metrics and develop and implement effective courses of action to remediate identified deficiencies; and

c. The ability to apply defect prevention practices in the post-production support and sustainment phase of systems and products, including modifications, upgrades, and product improvements.

5. NOTES

5.1 Intended use. This handbook is intended to supplement departmental manuals, directives, and military standards, and provide fundamental information which describes the generic key processes for program execution used by suppliers to support defense acquisition for the aeronautical sector.

5.2 Subject term (key word) listing.

Configuration Management
Data Management
Engineering Process
Interface Management
Key Supplier Processes
Logistics Process
Manufacturing Process
Process Attributes
Procurement/Subcontract Management Process
Program/Data Management Process
Quality Process
Risk Management

Custodians:
Army - AV
Navy - AS
Air Force - 11

Preparing activity:
Air Force - 11
(Project 15GP-0028)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

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