1.4 Executive Summary

1.4.1 The Nature of the Challenge

Whereas the business model for aerospace supplier management and control is changing, the objective of 100% compliance remains paramount. Existing regulatory guidance and policy are based on the traditional "A-factory" model, wherein small suppliers at the base of the "A" feed their products "up" to other suppliers that make increasingly more complex products. Industry movement today is toward a global "web" or "chain" of suppliers where extensive and complex design work may be done at many suppliers. This complexity has "grayed" the roles and responsibilities of the participants and raised concern about the integrity of the system.

This industry movement has elicited responses:

- The FAA questions the effectiveness of industry supplier control and oversight system and is evaluating what actions may be necessary.
- Congress has also expressed concerns about trends in aircraft design and manufacturing such as outsourcing and globalization.
- The DOT Inspector General has conducted an audit of "FAA's Oversight of Aircraft Manufacturers' Quality Assurance Systems for Suppliers."
- The GAO has been asked to investigate FAA procedures and oversight of aircraft parts certification and manufacture.

Without proactive industry action, FAA and Congressional concerns could result in imposition of significant burdens on PAH in the form of new regulations or restrictions that may limit industry's ability to continue growing the use of domestic and foreign suppliers to design and manufacture parts, components, and systems.

Note: Throughout this document, the terms supplier and vendor have both been used. In some cases they appear to be interchangeable, but in others, there is a clear distinction (for example, in a discussion of the supplier source control drawing (SOCD) versus the vendor top drawing (VTD) or in the title of Team 5). Because of such distinctions, we have permitted the use of both terms.

1.4.2 Purpose and Scope of the Document

The intent of RAISC is to develop solutions that are part of the proactive industry response to challenges inherent in the changing business model. Six broad areas were investigated by industry and FAA representatives:

1. Type Design data elements.
2. Notification of design changes across the supply chain.
3. Vendor Top Drawings (VTD) and their data relationship to Original Equipment Manufacturer (OEM) supplier control drawings.
4. Risk management by oversight and handling tailored to part criticality.

5. Root cause analysis of industry data for resource targeting.
6. Supplier–OEM relationships in today's global market.

Recommendations were developed with emphasis on immediate action by the FAA, industry, and industry groups.

These recommendations are made to the sponsoring bodies. The RAISC is jointly sponsored by Aerospace Industries Association of America, Inc. (AIA), and General Aviation Manufacturers Association (GAMA) through the guidance of their representatives, Michael Romanowski and Walter Desrosier, respectively. It was launched in July 2004 in response to FAA concerns regarding supplier management with Messrs. Scott Peterson of Boeing and Dan Burns of Bombardier Aerospace serving as co-leaders throughout. Thirty aerospace companies have contributed personnel and other resources to this effort.

1.4.3 Recommendations

The intent of RAISC is to develop solutions that are part of the proactive industry response to the challenges identified (table 1-1, Summary Table of Recommendations).

RAISC's recommendations represent an intersection of FAA concerns and industry capability, and change readiness assessments by aerospace industry professionals. While leading roles for industry, industry groups and the FAA were identified, it is clear that cooperation and coordination across all three sets of stakeholders is a necessary condition to meet objectives.

Key to long-term improvement in the performance of the aerospace supply chain is the definition of what constitutes Type Design, the precise and consistent application of definitions, roles and responsibilities for controlling Type Design data, and the identification of root causes for failures of the system and well-considered allocation of resources towards their abatement.

The key issues being addressed through the RAISC Team recommendations can be grouped into the following three areas:

1. Managing the Type Design—Better defining what is considered to be type design and how to maintain/manage the Type Design. [Teams 3, 2, and 5]
2. Oversight of Suppliers—Resource targeting for supplier oversight and recognition of the various supplier/OEM relationships. [Teams 7 and 10]
3. Data Analysis of Escapes—Analyzing and categorizing industry data, using common cause codes, to validate ACSEP findings to answer the question, "Are we focusing on the right problem?" [Team 9]

Each team has provided one or more recommendations. Each of the recommendations is targeted at addressing the following objectives:

- Reduce field incidents due to inconsistent interpretation of what constitutes Type Design.
- Reduce number of escapes due to unapproved changes to Type Design.

- Improve clarity of the TCH–supplier design interface.
- Improve surveillance guidelines based on part criticality and supplier performance.
- Define an industrywide acceptable method to collect ACSEP and Code of Federal Regulations (CFR) 14 CFR 21.3 report data using standardized root cause codes.
- Define quality system and technical data flow requirements for the various relationships between OEMs/PCHs and their suppliers, recognizing global manufacturing and partnering trends.

1.4.3.1 Managing the Type Design [Teams 3, 2, and 5]

Team 3: Objective

Reduce field incidents due to inconsistent interpretation of what constitutes Type Design.

Team 3: Issue

Inconsistent interpretation and application of Type Design holder responsibilities related to Type Design complicates control of Type Design and renders the system more vulnerable to uncontrolled supplier changes that affect Type Design. Parts that are found not to conform to an approved Type Design/TSOA due to uncontrolled design changes would be considered unapproved parts.

Team 3: Recommendations

3.1 The FAA: Release policy letter based on the information detailed in Section 2.2.9 (Team 3) of this document to clarify "What is Type Design?" for all stakeholders in the supply chain.

3.2 AIA/GAMA: Reflect new understanding regarding Type Design in Certification Process Improvement (CPI) Guide.

Team 3: Discussion

Type Design consists of the data that defines the configuration and design characteristics that must be controlled to ensure compliance with all the applicable FAA requirements for the product. The TCH is responsible for having a system in place to ensure continued operational safety. To support the reliability of that system, the language that defines Type Design must be identical across the supply chain. As language drives both expectations and actions, each dissonance in the system language represents a vulnerability to the system. The intention of the set of recommendations associated with this area of concern is to establish clear definitions and common language that will guide the industry.

Team 2: Objective

Reduce number of escapes due to unapproved changes to Type Design.

Team 2: Issue

Various methods for communication and approval of Type Design changes across the supply chain complicate control of Type Design and render the system more vulnerable to uncontrolled supplier changes that affect Type Design.

Team 2: Recommendations

2.1 Industry: Sponsor activity to develop guidelines for (1) approving a supplier system for delegation of Type Design changes and (2) addressing requirements for instituting and delegating authority in the supply chain based on functional requirements, systemic requirements of the components, and the capabilities of the suppliers that design and/or produce them.

2.2 Industry: Sponsor activity to develop guidelines for processing Type Design changes involving suppliers, addressing the determination of categories of changes as it relates to communication between the OEM and supplier, taking into account the level of supplier capability and experience and part criticality.

2.3 Industry: Sponsor activity to develop guidelines for approving changes to the Type Design, addressing the roles and responsibilities for obtaining approval for a Type Design change.

2.4 AAQG: Recommend preparation of an Aerospace Standard entitled "Change Management Within the Supply Chain" to encompass the above industry recommendations.

Team 2: Discussion

Changes affecting Type Design must be reliably communicated across the supply chain. Suppliers are expected to continuously improve their processes and the quality of their products. Some of these well-intended changes are made with the belief they do not affect Type Design, so the TCH is not informed. If those changes do affect Type Design, they are hidden from the controls necessary for compliance and represent a vulnerability of the system. The intention of the set of recommendations associated with this area of concern is to establish clear definitions and common language in the primary documentation vehicles that guide the industry.

Team 5: Objective

Improve clarity of the TCH/supplier design interface.

Team 5: Issue

The SOCD and a supplier's "Top Drawing"—vehicles for such communication with respect to the component's requirements and design—have data elements sufficiently dissimilar as to cause confusion and, in some cases, inappropriate action.

Team 5: Recommendations

5.1 Industry: Utilize American Society of Mechanical Engineers (ASME) standard, ASME Y14.24 ("Types and Applications of Engineering Drawings"), to establish relationship between VTD and OEM's SOCD.

5.2 The FAA: Revise relevant Advisory Circulars (AC) to recognize industry standards (ASME Y14.24). Cascade amended material to the Aircraft Certification Offices (ACO) to ensure homogeneous interpretation and application.

5.3 Society of Automotive Engineers (SAE): Amend AS9100 ("Quality Systems—Aerospace - Model for Quality Assurance in Design, Development, Production, Installation and Servicing") to address the need for an agreed process to ensure identification and traceability of product definition can be maintained as parts are passed through the supplier chain.

5.4 American National Standards Institute/Government Electronics and Information Technology Association (ANSI/GEIA): Amend language in EIA-649 ("National Consensus Standard for Configuration Management") to emphasize importance of flowdown of configuration management (CM) requirement to suppliers.

5.5 ASME: Amend language in ASME Y14.24 to capture a "criticality code" and other key information set by the customer on the SOCD.

5.6 AAQG: Develop a letter to the industry acknowledging the importance of SOCD and VTD having all the information needed to control design configuration. Additionally, AAQG should champion an amendment to AS9100 as delineated within paragraph 5.3 above.

Team 5: Discussion

The SOCD and a supplier's VTD act as vehicles for communication required for the TCH to carry out their responsibility with respect to the component's requirements and design. The intention of the set of recommendations is to establish explicit relationships between the SOCD and VTD through most widely supported industry guidance and thereby increase both awareness of the issue and provide established mechanisms for constructively addressing it.

1.4.3.2 Oversight of Suppliers [Teams 7 and 10]

Team 7: Objective

Improve surveillance guidelines based on part criticality and supplier performance.

Team 7: Issue

Levels of oversight appropriate to part criticality—contribution of a part to overall airframe safety and performance—and historical supplier performance can be viewed as "resource targeting" where the available resources are judiciously applied for maximum effect. Current system operations use the same criteria to determine supplier oversight requirements for all aircraft parts.

Team 7: Recommendations

7.1 The FAA: Amend Order 8150.1B ("Technical Standard Order Program") to emphasize the need to inform TCHs of design changes, regardless of Technical Standard Order (TSO) change classification.

7.2 The FAA: Amend language in AC 21-36 ("Quality Assurance Controls for Product Acceptance Software") to recognize line-replaceable unit (LRU) software changes as Type Design changes and provide required change notification to TCHs in accordance with an approved process.

7.3 AIA/GAMA: Foster activity with the FAA to amend language in Order 8110.4C ("Type Certification") to reflect an agreed definition of part "criticality."

7.4 AIA/GAMA: Foster activitie with the FAA to amend language in AC 21-20B to further clarify and recognize the ability to tailor individual supplier oversight based on part criticality and supplier performance and provide recommended supplier evaluation timeframes based on this criteria.

Team 7: Discussion

Considering that each component on an aircraft has a different function, it's reasonable to assume that each component would contribute to overall airframe safety and performance in a different way, effectively making some components more "critical" than others. The intention of the set of recommendations is to establish across industry, explicit definitions and processes to determine part criticality that marshals the appropriate surveillance resources for each part so as to ensure an overall higher level of performance for the supply chain.

Team 10: Objective

Define quality system and technical data flow requirements for the various relationships between OEMs/PCHs and their suppliers, recognizing global manufacturing and partnering trends.

Team 10: Issue

Variation in the types of relationships between PAHs and suppliers represents complexity that can reduce the overall reliability of the system. This is especially complicated for the Type Design information of components for which the TCH does not have all the Type Design information. This information may reside at various levels in the supply chain and proper classification, communication, and approval of changes becomes very difficult.

Team 10: Recommendations

Incorporate the Supplier Type matrix documented in table 4-1, "Maximum Delegation Acceptable to the FAA for Various Types of Suppliers," of this RAISC Project Report into the appropriate guidance/directive materials as follows:

10.1 Develop and adopt a new FAA Order, "*Determining Supplier Control by a PAH or Associate Facility*" to capture the 10 types of suppliers identified within the RAISC Team 10 matrix, "*Maximum Delegation Acceptable to the FAA for Various Types of Suppliers,*" including the correlated approval responsibilities of the OEM and supplier in each of these 10 relationships.

10.2 After accomplishment of Recommendation 10.1, amend language in FAA Order 8120.2D, "*Production Approval and Certificate Management Procedures"* to add reference to the new FAA Order and the matrix, *"Maximum Delegation Acceptable to the FAA for Various Types of Suppliers."*

10.3 After accomplishment of Recommendation 10.1, amend language in AC 21-1B ("Production Certificates") to add a reference to the new FAA Order and the matrix, "*Maximum Delegation Acceptable to the FAA for Various Types of Suppliers."*

10.4 After accomplishment of Recommendation 10.1, amend language in AC 21-20B/C *("Supplier Surveillance Procedures"),* AC 21-24 *("Extending a Production Certificate to a Facility Located in a Bilateral Airworthiness Agreement Country"),* AC 21-27 *("Production Certification Multinational/Multicorporate Consortia")* to add references to the new FAA Order and the matrix *"Maximum Delegation Acceptable to the FAA for Various Types of Suppliers."*

10.5 After accomplishment of Recommendation 10.1, amend language in the Common Supplier Surveillance Standards (CSSS) to add a reference to the new FAA Order and the matrix, *"Maximum Delegation Acceptable to the FAA for Various Types of Suppliers."*

10.6 After accomplishment of Recommendation 10.1, amend language in Order 8130.2F to add a reference to the new FAA Order and the matrix, *"Maximum Delegation Acceptable to the FAA for Various Types of Suppliers."*

Team 10: Discussion

The intention of the set of recommendations is to define an approach for controlling—based on the relationship between the PAH and the supplier— the amount of surveillance and control a PAH may exercise over a supplier to satisfy the responsibility to ensure continued operational safety of the product.

1.4.3.3 Data Analysis of Escapes [Team 9]

Team 9: Objective

Define an industrywide acceptable method to collect ACSEP and 14 CFR 21.3 ("Aeronautics and Space—Certification Procedures for Products and Parts") report data.

Team 9: Issue

Root cause understanding of system failures is key to effective process improvement activities. Current system evaluation data may guide our industry process improvement efforts toward symptom suppression rather than genuine system performance and reliability improvement.

Team 9: Recommendations

9.1 Industry: Sponsor activities to examine the adequacy and effectiveness of engineering designs in the area of Design Control.

9.2 The FAA: Revise AC 21.9A ("Manufacturers Reporting Failures, Malfunctions, or Defects") to incorporate root cause analysis on 14 CFR 21.3 reporting.

9.3 The FAA: Base ACSEP findings on normalized data.

9.4 AAQG: Develop an Aerospace Standard for root cause analysis with common cause codes.

9.5 Industry: Sponsor activity for developing and deploying an anonymous industry wide database for collection of root cause data on industry escapes.

9.6 Industry: Sponsor activity to improve manufacturing and special processes with focus on adequacy of and compliance to procedures.

Team 9: Discussion

Improvement of the continued operational safety system requires identification of root cause. Accelerated learning and consequently improvement of the system can be accomplished with a more rapid accumulation of data. Common language (i.e., cause codes) across the industry enables this accelerated learning. The intention of the set of recommendations is to define and implement an industrywide process to conduct analysis using cause codes that will be used in the identification of systemic, product-related escapes as well as systemic, process-related deficiencies. Trending cause codes will enable industry to more effectively allocate its valuable corrective-action resources.

1.5 Summary of Recommendations

Table 1-1 provides a summary of the recommendations from the participating teams.