Appendix R

AIRWORTHINESS QUALIFICATION REQUIREMENTS

AQS and Component Verification Matrix
The Airworthiness Qualification Specification (AQS) and the Component Verification Matrix

R.1 Introduction

The airworthiness qualification specification (AQS) should be prepared by the aircraft contractor (AC) in response to the requirements established by the procuring activity (PA) in the airworthiness qualification plan (AQP) and the contracts data requirements list (CDRL). The PA should require that the AC prepare for its approval an airworthiness qualification specification (AQS) for each aircraft and system that requires qualification or requalification because of major modifications. The AQS should identify the means (similarity, analyses, tests, demonstrations, modeling and simulation, and inspection or by combinations of these methods), performance, and effectiveness criteria needed to validate compliance with the system specification and airworthiness qualification plan. This should include contractor conducted tests with Government surveillance, and also Government conducted tests with contractor support and surveillance. Facilities, targets, and simulators should be identified in the AQS. Pass-fail criteria should be identified by the AC and approved by the PA. A compliance matrix is typically required as part of the AQS. The minimum scope of the AQS should satisfy all requirements of the AQP but should not necessarily be limited to requirements in the AQP. ACs may propose additional tests, simulations, reviews, and demonstrations deemed necessary to ensure qualification of the modification or development program. For modifications involving few components or subsystems, the scope of the airworthiness qualification specification (AQS) should be limited to only those systems modified and those related components and subsystems that are affected by modifications and should be subjected to qualification. Modification programs that involve many components or development programs may require an AQS that essentially involves all areas covered by this AMACC.

R.2 Objectives

The Contractors technical management processes should be applied to reduce technical risk through early test and demonstration. The AQS serves to identify, control, and/or reduce the technical risk associated with modification and development programs.

Providing aviation systems which are safe for operators is also an objective of the AQS elements. Through the System Safety Program (SSP), establishment of operating limitations, restrictions, and advisory "Notes," "Cautions," and "Warnings" in technical publications, and determination of component fatigue lives, only acceptable risks to operators are present when the airworthiness qualification program is completed.
Various elements of the AQS also aid in conservation of both contractor and Government assets. As part of a coordinated test program, the AQS delineates facilities to be used, minimum testing requirements, test articles to be used, and responsibilities for conduct, reporting, and support. In this way, duplication of effort is eliminated.

Finally, knowledge of mission capability will be enhanced by use of an AQS. Verification of aircraft ranges, velocities, mission radii, target detection, acquisition, designation, and engagement capabilities, reliability, availability, and maintainability (RAM) characteristics, and other operational capabilities is necessary to verify specification compliance.

R.3 Paragraph Headings and Content for AQS Document

The paragraphs contained in the AQS shall be as a minimum be titled Scope, Applicable Documents, Definitions, and the section name of the paragraph that is listed in the AQP starting with Section 4.

1. Scope

The purpose of the AQS is to define the approach which will be used by the Contractor to satisfy the requirements of the AQP. The minimum scope of the AQS should satisfy all requirements of the AQP, but should not necessarily be limited to requirements of the AQP. Contractors may propose additional tests, surveys, reviews, and demonstrations deemed necessary to ensure qualification of the modification or developmental program.

The initial AQS should be prepared by the Contractor in response to requirements of the request for quotes/request for proposals (RFQ/RFP) developed by the procuring activity (PA). Revision during the development or modification program is often necessary, and the end result will be documentation of the complete qualification effort from RFP/RFQ through fielding of the system. While this effort may be limited for a modification of a previously qualified aircraft, aircrafts undergoing developmental testing may have more extensive qualification requirements.

The AQS should provide a brief summary of major subsystems undergoing modification, weapons systems which are being developed concurrently and will form a part of the end item (engine development programs, for example, and other information necessary) to convey the magnitude of the qualification effort. Responsibilities for accomplishment, surveillance or test witnessing, and support for each AQS element identified in the AQP should be reiterated in this paragraph, and may be identified down to the AQS subelement level, if necessary for clarity.

2. Applicable Documents
Applicable documents are documents included by reference in the AQS. All and only those documents referenced elsewhere in the AQS should be listed. If referenced documents are numerous, this listing may occur in an appendix to the AQS.

References should be listed by document numbers and titles, and may include specific issues or revision numbers where necessary to rigidly control configuration or implementation. Within the text of the AQS, tailoring or modification of requirements of the referenced documents should be identified. The entire referenced document should not be made applicable by reference unless all of its provisions are clearly required.

3. Definitions

If applicable, a definition of the system or functional areas, and functional and physical interfaces, include logic, block, and schematic diagrams, and contain pertinent configuration item undergoing airworthiness qualification should be included in this section of the AQS in the form of a brief description. This definition should identify major physical parts, organizational, operational, and logistics considerations and concepts.

4. System Level Requirements, Processes and Engineering Cognizance

5. Structures

6. Aeromechanics

7. Propulsion and Propulsion Installations

8. Subsystems

9. Human Systems Integration

10. Reserved

11. Avionics and Navigation

12. Electrical System

13. Electromagnetic Environmental Effects (E3)

14. System Safety

15. Software Safety

16. Sustainment of Airworthiness

17. Armament and Stores Integration
18. Passenger Safety

19. Materials and Processes

20. Other Military Criteria

21. Environmental Effects for Electrical/Electronic Equipment and other Installed Material

The component verification matrix should contain the columns as shown below:

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The expectation would be to expand columns MIL-STD-810, MIL-STD-461, DO-160, and MIL-STD-704 to contain all appropriate tests.

1st Column: Component for Verification is the Line Replaceable Unit (LRU) that is under test.

2nd Column: Part Number is part number of the LRU.

3rd Column: Government Furnished Equipment annotated with an “X” if the Government furnished the LRU.

4th Column: Component Verification Method is defined with the word/words similarity, analyses, tests, demonstrations, modeling and simulation, and inspection.
5th Column: MIL-STD-810 component tests include, high temperature, fluid contamination, rain, low pressure non-operational, low temperature non-operational, high temperature non-operational, temperature shock, humidity, fungus, salt fog, sand and dust, solar radiation, explosive atmosphere, acceleration, icing and freezing rain, vibration, functional shock, crash hazard shock, bench handling shock, transit drop shock, gunfire shock, combined tests of temperature/humidity/vibration/altitude.


7th Column: MIL-STD-704 tests are defined as LDC101, LDC102, LDC103, LDC104, LDC105, LDC201, LDC301, LDC302, LDC401, LDC501, LDC601, and LDC602.