

FAA National Software Conference, June 2001

USAF GATM Certification Process



GATO/MC2 SPO

USAF GATM Certification Process

Presented by:
Marilyn R. Oberhardt
ESC/GAT (Titan)
June 2001

1



USAF GATM Certification

GATO/MC2 SPO

Purpose

- Ensure USAF aircraft conform to appropriate civil requirements for communication navigation surveillance/air traffic management (CNS/ATM)
- Provide a defined path for upgrades to meet anticipated future CNS/ATM requirements
- Ensure commercial avionics retain full functionality after integration and that military-unique systems provide an equivalent level of safety

2

FAA National Software Conference, June 2001

USAF GATM Certification Process



USAF GATM Certification

GATO/MC2 SPO

Certification Basis

- **USAF Direction**
 - **AFPD 63-13, *Global Air Traffic Management And Navigation Safety Certification for USAF Aircraft***
 - **AFI 63-1301, *Assurance Of Global Air Traffic Management Certifications***

- **To obtain AFI & AFPD:**
 - **SAF AQ link:**
<http://www.safaq.hq.af.mil/policy.html>

3



USAF Certification Background

GATO/MC2 SPO

- **USAF self-certifies its aircraft - USAF aircraft are “State Aircraft”**
- **USAF mission requirements drive the need for access to airspace belonging to other nations**
- **State Aircraft require permission from the host nation to fly in their airspace**
 - **Coordinated with each host nation**
- **We use civil standards for GATM functions in order to facilitate acceptance of our self-certification for flight in civilian airspace**
 - **Remove technical basis for denying access to our aircraft.**
 - **Don't compromise the safety of other aircraft in civilian airspace**

4

FAA National Software Conference, June 2001

USAF GATM Certification Process



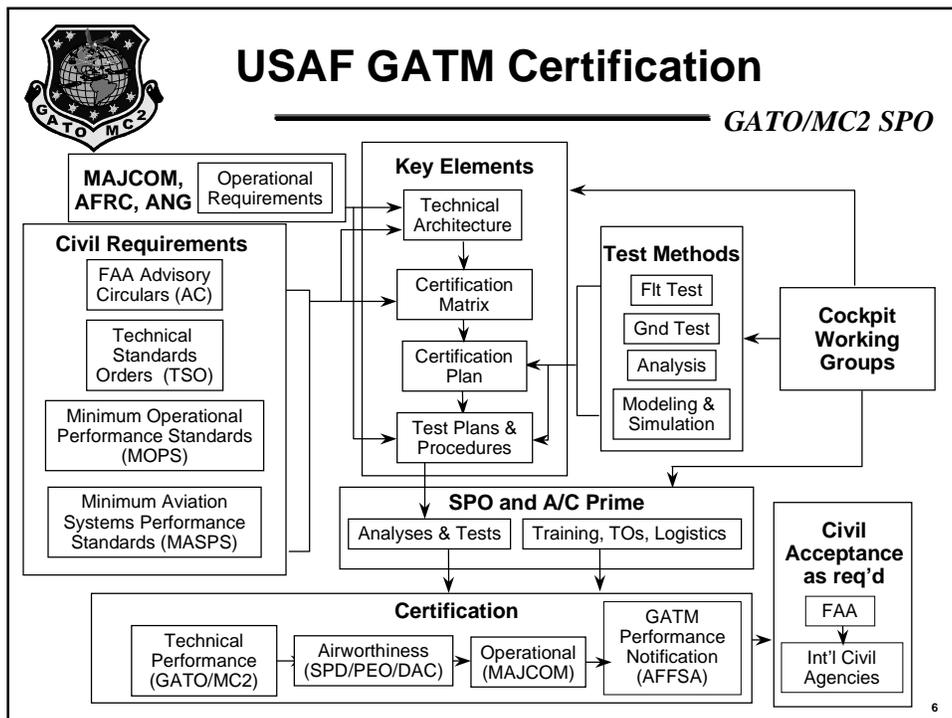
USAF GATM Certification

GATO/MC2 SPO

- **GATO/MC2 verifies Technical Architecture:**
 - » Reduce technical risk by ensuring that the proposed architecture is capable of providing the needed GATM performance, if properly installed on the aircraft

- **GATO/MC2 certifies Technical Performance:**
 - » Ensure that USAF implementations
 - Meet civil standards
 - OR
 - Provide an equivalent level of safety

5



FAA National Software Conference, June 2001

USAF GATM Certification Process



USAF GATM Certification Roles/Responsibilities

GATO/MC2 SPO

- **GATM Certification Involves Multiple Organizations**
 - GATO/MC2
 - MAJCOM, AFRC, ANG
 - SPO
 - Aircraft Prime
 - AFFSA
 - FAA
 - AFMSS
 - NIMA

7



USAF GATM Certification Roles/Responsibilities

GATO/MC2 SPO

- **GATO/MC2**
 - GATM/Nav Safety Technical Architecture Verification
 - GATM/Nav Safety Technical Performance Certification
 - Mil-Unique Subsystem Performance Certification
 - GATM/Nav Safety Sustainment
- **Development of certification matrices**
 - Necessary functionality, as detailed in civil specifications and standards, is documented in GATM certification matrices
 - These generic certification matrices are then tailored to the needs of the individual program office and used to develop Certification Test Plans

8

FAA National Software Conference, June 2001

USAF GATM Certification Process



USAF GATM Certification Roles/Responsibilities

GATO/MC2 SPO

- **MAJCOM**

- Develop and document operational requirements for GATM/Nav Safety
- Identify maintenance CONOPS
- Develop training for aircrews and maintenance personnel for unique GATM/Nav Safety requirements and procedures
- Operational Approval of GATM modified aircraft
- Request frequency allocations for GATM/Nav Safety transmitters/receivers IAW AFI 33-118, Radio Frequency Spectrum Management

9



USAF GATM Certification Roles/Responsibilities

GATO/MC2 SPO

- **Aircraft SPO**

- Implement and sustain GATM/Nav Safety requirements
- Procure certifiable GATM/Nav Safety avionics through GATO/MC2 SPO
- Ensure that Pilot Vehicle Interface supports GATM performance requirements
- Coordinate USAF Testing
- Certify Airworthiness of the aircraft

- **Aircraft Prime**

- Support matrix tailoring
- Perform required analyses and testing
- Supply required artifacts for USAF certification

10

FAA National Software Conference, June 2001

USAF GATM Certification Process



USAF Database Certification Roles/Responsibilities

GATO/MC2 SPO

- **AFFSA**
 - Coordinates with the FAA on GATM equipage issues
 - Notifies the FAA of USAF compliance with civil requirements and provides requisite supporting documentation
 - Assist with operational interpretation of civil performance requirements
 - Human Factors evaluation, through Cockpit Working Groups
- **FAA**
 - Supplemental Type Certification of Civil Derivative Aircraft
 - TSO Certification of Civil Avionics Systems
 - Maintains registry of certification for flight in controlled civil airspace

11



USAF GATM Certification Roles/Responsibilities

GATO/MC2 SPO

- **AFMSS**
 - Compliance with civil standards in the processing of aeronautical data, including but not limited to Digital Aeronautical Flight Information File (DAFIF) and Digital Terrain Elevation Data (DTED)
 - » Aircraft load, storage, and computational processes
 - » Air Force Mission Planning Systems storage and computational processes
 - Provide Mission Planning Environment to support route planning for GATM airspace
- **NIMA**
 - Compliance with civil standards in the production of aeronautical data (including but not limited to DAFIF and DTED)

12

FAA National Software Conference, June 2001

USAF GATM Certification Process



USAF GATM Architecture Verification

GATO/MC2 SPO

- **Purpose of Architecture Verification**
 - Provide an independent validation of the proposed design
 - Lower program technical risk
 - Identify issues early to prevent cost escalation due to GATM/Nav Safety impacts
- **Ideally, architecture verification should commence during source selection and lead to timely inputs to performance certification**

13



USAF GATM Architecture Verification

GATO/MC2 SPO

- **List of typical deliverables for Architecture Verification, from Aircraft SPO to GATO/MC2**
 - System specification and accompanying analyses
 - System architecture diagram
 - System Functional Hazard Assessment & Preliminary System Safety Analysis
 - Parts list that includes manufacturer, part number, and quantity used in the modification (include available software part numbers)
 - Subsystem Specification sheets
 - Any other supporting documentation deemed appropriate by the aircraft SPO

14

FAA National Software Conference, June 2001

USAF GATM Certification Process



USAF GATM Performance Certification

GATO/MC2 SPO

- **Purpose is to provide formal verification that performance either meets civil standards or provides the equivalent level of safety**
- **Performance certification package:**
 - Documents GATM/Nav Safety Performance
 - Documents verification methodology used in performance assessment
 - Supports FAA, and consequently, international acceptance of USAF self-certification

15



USAF GATM Certification of Mil-Unique Equipment

GATO/MC2 SPO

- **Not a standard path to certification**
 - Level of risk inherent to this process (e.g. no TSO pursued)
 - Must demonstrate applicability to other military platforms
- **Only the LRU/module/software performance is self-certified, not the specific installation or particular aircraft type**
- **Installed performance verification must be performed separately**

16

FAA National Software Conference, June 2001

USAF GATM Certification Process



DO-178B Certification Issues

GATO/MC2 SPO

- **USAF aircraft have a large amount of previously developed software (PDS) for which no certification basis exists (from a civilian aviation perspective)**
- **The technical steps and processes used to apply DO-178B to PDS are established**
- **The problem is the perception (true or not true) that applying DO-178B will be expensive - requiring more time and money than realistically available**

17



Considerations for S/W DERS Consulting USAF Programs

GATO/MC2 SPO

- **To deal with the extensive amount of previously developed software and COTS, what can be done with Product Service History?**
 - The USAF is in a situation similar to the FAA ground side.
 - How will the FAA and other civilian aviation agencies apply DO-178B on the ground side?
- **How can the USAF software development processes be used towards compliance with DO-178B objectives?**
- **How can USAF safety processes be used?**

18

FAA National Software Conference, June 2001

USAF GATM Certification Process



Considerations for S/W DERS Consulting USAF cont'd

GATO/MC2 SPO

- What alternate means are available for compliance with specific DO-178B objectives?
 - For example, can particular testing and/or analysis be used in lieu of complying with some of the process/planning objectives?

19



DO-178B Certification Issues

GATO/MC2 SPO

- USAF aircraft have a large amount of previously developed software (PDS) for which no certification basis exists (from a civilian aviation perspective)
- The technical steps and processes used to apply DO-178B to PDS are established
- The problem is the perception (true or not true) that applying DO-178B will be expensive - requiring more time and money than realistically available

20

FAA National Software Conference, June 2001

USAF GATM Certification Process



Example Certification Case

GATO/MC2 SPO

KC-10 Navigation Database Certification

21



Navigation Database Chain

GATO/MC2 SPO

Data Transfer



DAFIF Data

Data Preparation



Mission Planning Environment

Data Transfer



Navigation Image



DAFIF Data: NIMA produces DAFIF data and delivers the files on CD-ROM

Mission Planning Environment: The System Administrator (AMC) receives the NIMA CD-ROM. Using BAE SYSTEMS software (TASM AWE), he loads the DAFIF onto the system, creates a navigation image, and transfers the image to a Data Transfer Device.

Navigation Image: The DTD is then carried out to the aircraft and the navigation image is uploaded into the FMS.

22

FAA National Software Conference, June 2001

USAF GATM Certification Process



KC-10 Database Certification Working Group

GATO/MC2 SPO

- Air Mobility Command (AMC)
- AFMSS (ESC/ACU)
- GATO/MC2 (ESC/GAT)
- KC-10 SPO
- Boeing KC-10 Program
- Boeing DAS
- BAE Systems
- Honeywell
- NIMA

23



KC-10 Database Certification Roles/Responsibilities

GATO/MC2 SPO

- **USAF / Boeing DAS relationship:**
 - **Roles & Responsibilities:**
 - » **USAF ESC/AC to perform supplier management function with Sanders (BAE Systems)**
 - » **USAF ESC/GAT responsible to the DAS for Sanders for schedule, content and performance commitments, providing letter to Wichita DAS upon completion**
 - » **Wichita DAS to coordinate & perform certification oversight of nav db compliance**
 - » **Wichita DAS to approve certification aspects of the nav db to DO-200A/201A & provide feedback to the USAF ESC**

24

FAA National Software Conference, June 2001

USAF GATM Certification Process



KC-10 Database Certification Roles/Responsibilities

GATO/MC2 SPO

- **ESC/GAT**
 - Developed generic DO-200A matrix
 - Certifies that NIMA and AFMSS have complied with the aspects of DO-200A and DO-201A identified with Aircraft Certification
 - Provide letter of compliance to Boeing DAS at completion of process
- **AMC and KC-10**
 - Responsible for compliance with the aspects of DO-200A identified with Operations

25



KC-10 Database Certification Roles/Responsibilities

GATO/MC2 SPO

- **AFMSS**
 - Compliance with civil standards in the processing of aeronautical data, including but not limited to Digital Aeronautical Flight Information File (DAFIF)
 - » Air Force Mission Planning Systems storage and computational processes
 - » Aircraft load processes
- **NIMA**
 - Compliance with civil standards in the production of aeronautical data (DAFIF)

26

FAA National Software Conference, June 2001

USAF GATM Certification Process



KC-10 Database Compliance

GATO/MC2 SPO

- **AFMSS compliance**
 - Covers Portable Flight Planning System (PFPS) and Aircraft/Weapons/Electronics (A/W/E) mission planning software for these aircraft (ground use only)
 - AFMSS will select and format the DAFIF IAW the KC-10 interface definitions
 - Assumes compliant data supplied by NIMA as an approved source

27



AFMSS Implementation for TASM Aircraft

GATO/MC2 SPO

- **PFPS software**
 - Highly compartmentalized and utilizes several databases
 - Development resources are not currently available to include the compliance requirements in PFPS software
- **Therefore, the compliance will be achieved in the A/W/E software for each aircraft**

28

FAA National Software Conference, June 2001

USAF GATM Certification Process



Demonstration of Compliance

GATO/MC2 SPO

- To ensure that all requirements are fulfilled, reviews and audits will be conducted
- External audits will be conducted by a government team comprised of ESC/AC, ESC/GAT, and Mitre
- Tool Qualification is being accomplished IAW DO-200A

29



Summary

GATO/MC2 SPO

- USAF has a defined process for achieving GATM certification
- Software certification presents unique challenges within this process
- Real-world cases underway
- Ideally, a forum involving the military and civil communities should work together towards the solutions

30