



The Success of the AMRAAM DBMS/DAS

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Overview

- Asymmetric Threat
- AMRAAM Development
- Test and Evaluation (T&E) History
- Current AMRAAM Production
- Test and Evaluation Program
- AMRAAM DBMS/DAS Development
- DBMS/DAS Design and Operation
- Resource for Detailed Analysis and Improvement
- Summary

Asymmetric Threat

- United States must expect to face asymmetric threats within the air battle space
- In the future, the US cannot expect an enemy to present the kind of target set that it has seen in years past
- Technology and techniques are always being developed to neutralize the power of the US

AMRAAM Development

- The AIM-120 AMRAAM was developed jointly by the Air Force and the Navy
- The main purpose of AMRAAM was to maintain air superiority
 - All weather radar guided missile
 - Multiple target engagement capability
 - Counter electronic warfare
 - Launch and leave

AMRAAM T&E History

- Full Scale Development (FSD) testing began in 1984
 - Ground tests
 - AMRAAM Captive Equipment (ACE) flight tests
 - Hardware-In-Loop (HIL) Simulations
 - Digital Simulations
 - Pre-programmed flight tests
 - 100 guided missile flight tests

AMRAAM T&E History

- AMRAAM was flight tested and evaluated by the Operational Test and Evaluation organizations to confirm performance with an emphasis on effectiveness and suitability
- Pre-Planned Product Improvement P³I Programs
- Over the last 10 years, AMRAAM continues to be evaluated in the Weapon System Evaluation Program (WSEP)

Current AMRAAM Production

- As of the 6th of October 2006, Raytheon Company received its first production award for the AIM-120D configuration of AMRAAM.
 - Production and delivery will support the U.S. Air Force, Navy and Army.
- The AIM-120D is an enhanced capability missile
- Changing technology and battle space requirements of the warfighter.
- AMRAAM is the most carried air-to-air missile in the U.S. arsenal and is deployed in 32 countries.

(Source Aerospace & Defense News Headlines: Raytheon)

Test & Evaluation Program

- The development process for the AMRAAM weapon system involved a robust Test & Evaluation program
 - Well planned
 - Definitive road map that adhered to the requirements
 - AMRAAM developed in stages
 - The T&E program ultimately proved AMRAAM capability and performance

AMRAAM Telemetry

- The AMRAAM is fully instrumented
- All subsystems and phases of flight are monitored
- The telemetry is recorded at the test ranges and delivered to Wyle for processing and analysis

Time, Space, Position Information (TSPI)

- TSPI is available on DoD test ranges and is used by analysts as a reference datum or 'truth data' in order to quantify weapon system performance.
- Measurements on the launch aircraft, the missile and each target are merged into a common coordinate system.
- TSPI is processed for AMRAAM analysis in the same coordinate system
- Direct comparison
- Global Positioning System (GPS) at all major DoD test ranges.

AMRAAM DBMS/DAS Development

- AMRAAM Joint Systems Program Office (JSPO) developed the AMRAAM Data Base Management System and Data Analysis Software (DBMS/DAS)
- Primary requirements
 - Maintain all data relevant to T&E flight tests
 - Analyze AMRAAM total weapon system performance
- Every AMRAAM launched over the past twenty three years (1984 – present) is maintained in the DBMS and the DAS has been used to evaluate performance.

Data Base Management System (DBMS)

- Evaluate total weapon systems performance
- Support government milestone reviews
- Validate the AMRAAM simulations
- Perform special studies and produce white papers
- Support system upgrades
- Throughout several improvement phases, the task of validating improvements was accomplished using flight test data maintained in the DBMS.

Data Analysis Software (DAS)

- Predefined core set of automated software routines (contexts)
- User Defined Contexts
- DAS streamlines the task of total weapon system analysis.
 - AMRAAM weapon system complexity and the quantity of data transmitted in telemetry
 - Valuable asset during anomaly investigations

DBMS/DAS Operation

- AMRAAM telemetry and TSPI is loaded into the DBMS immediately after a mission
- Data is cataloged with information that pertains to the missile, launch aircraft and targets
- Contexts are run in a batch processing mode to produce data products

DBMS/DAS Operation

- The data products are reviewed, analyzed and inserted directly into the Quicklook report as an appendix
- Contexts are run on a repetitive basis for every AMRAAM mission
- Specialized contexts for anomalies

Weapon System Analysis

- Flight test objectives and requirements.
 - Data analysis and reporting
 - Anomaly Investigations
 - Simulation Validation
 - Special Studies
 - AMRAAM Product Improvement Programs
 - FMS Support

Anomaly Investigations

- The DBMS/DAS is used for anomaly investigations to determine the root cause of anomalies.
- Point anomaly
- Trend analysis

Simulations Validation

- AMRAAM HIL and digital simulations
- DBMS is the primary source of actual flight test data used to validate simulations
- Validation process

Special Studies

- The data contained in the DBMS has been used to perform special studies, produce white papers and develop performance evaluation summaries
- Special contexts
- To date, there are over 45 special studies and white papers produced by the Wyle analysis team

AMRAAM Upgrades

- Since AMRAAM was fielded, there have been many requirements for missile improvements.
- Broad spectrum of scenarios and electronic warfare.
- Validating improvements
- Validate the improvements as they are integrated into the simulation.

Foreign Military Sales (FMS) Support

- The DBMS maintains mission data from AMRAAM flight tests programs conducted by foreign countries to support aircraft integration and In-Service firings.
- FMS countries conduct flight tests in CONUS and OCONUS
- Foreign countries employ AMRAAM from US and foreign aircraft

Summary

- The success of the AMRAAM DBMS/DAS can be measured by its contribution to developing AMRAAM as a world air superiority weapon system.
- Valuable asset to AMRAAM for twenty three years and is still used today
- The Acquisition process for developing a weapon system must include a robust Test & Evaluation program and a DBMS/DAS to maintain and analyze data

Air Force Material Command News Service 10/2/2006

- The need for change is one reason Gen. Bruce Carlson, AFMC commander, chose the test and evaluation enterprise as one of his four AFMC strategic areas under Air Force Smart Operations for the 21st century.
- AFSO 21 serves as an overarching program guiding continuous process improvement throughout the Air Force.
- "AFMC needs a test and evaluation presence at the early stages of an acquisition program in order to help build testability into the program from the outset," said Dr. Jerome, who also is the deputy director of Air, Space and Information Operations at Headquarters AFMC.
- "Involving the testing community earlier in the program development would help to better define test and evaluation strategies for acquisition programs. "
- This will benefit future acquisition efforts by having the right test capabilities -- defined as infrastructure, process and people -- in place to plan and execute developmental and operational testing more effectively and efficiently than we do today,"
- Dr. Jerome said. "Ultimately, it will deliver effective and suitable weapon systems on time and on cost."

Questions?