



AMRAAM VV&A

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AMRAAM Simulations

■ *All-digital*

- *Legacy Sims; Complex Seeker, ASP*
- *Post-Acq Reform Sims; TEAMSIM, ARS*

■ *Hardware-in-the-Loop (HWIL)*

- *RF SIMFAX; Raytheon, Tucson*
 - *Plus smaller S/W Development labs*
- *RFS/GWEF; Eglin AFB, FLA*
- *Navy HWIL; NAWCWD Pt. Mugu*

AMRAAM All-Digital Sims

■ *Legacy Sims used for:*

- *Older Missile Versions (e.g. AIM-120A)*
- *Cases not covered under existing team relationships*

■ *TEAMSIM*

- *Full 6-DOF with actual missile software and environmental models*
- *Operated under license agreement with Raytheon*
- *Used for nearly all project work*

■ *ARS*

- *3-DOF kinematic sim with effects models*
- *Used primarily by Aircraft programs for LAR generation, etc.)*

HWIL Simulations

■ *RF SIMFAX*

- *Primary AMRAAM HWIL Facility*
- *Contractor owned and operated*
- *Used for: Software development and qualification*

■ *RFS / GWEF*

- *USAF AMRAAM HWIL*
- *Customers include Raytheon (SIMFAX Overflow), FMS*

■ *Navy HWIL*

- *Navy-operated*
- *Used for*
 - *F-15/16/18 / AMRAAM system performance testing (post-delivery)*
 - *Pre/postflight tests, special investigations*

VV&A Definitions (AMRAAM version)

■ *Verification:*

- *Improvements made to sim do what they are designed to do*

■ *Validation:*

- *Sim results match flight results within appropriate bounds (e.g. 3-sigma)*

■ *Accreditation*

- *Customer is convinced data you give him will be useable*

HOW AMRAAM Does V&A

■ *All-digital Sims*

- *Legacy Sims; Extensive documented V&V 1985-1998*
- *TEAMSIM & ARS; Cooperative V&V with Raytheon*
 - *Participated in pre-release V&V testing (2000)*
 - *Any problems found now are forwarded to Raytheon for eventual attention*

■ *HWIL (Navy lab)*

- *Prior to 1995; non-formalized process*
 - *Old lab, Bldg 760*
- *1995 - present; formalized V&V with new lab, Bldg. 3015*
 - *Active V&V program;*
 - *Documented test plans/reports via review board*
 - *Lab mods., new jammers, match flight results*
 - *Uses approx. 15-20% of available lab shifts*

Major Lessons Learned

- *V&V is much harder than it looks*
 - *Must match motor thrust, target track, umbilical info., datalink history, missile weight/c.g., missile internal H/W config., etc., etc.*
- *Priorities: Project Work vs. V&V*
- *The harder you look, the more you see*