No Doubt – The LRAS3/FS3 Story of Mission Assurance

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Agenda

• Introduction to Raytheon
• LRAS3/FS3 Overview
• Sound Engineering Processes
• Partnership With The Customer
• Results Speak For Themselves
• Summary
Introduction to Raytheon

• Raytheon is an industry leader in defense and government electronics, space, information technology, technical services, and business aviation and special mission aircraft

• Network Centric Systems (NCS) develops and produces mission solutions for networking, command and control, battlespace awareness, and air traffic management
Introduction to Raytheon – continued

- RTIS Policies & Procedures
- RTIS Integrated Product Development Process
- Software Sigma & Cycle Time
- Level 4 IPI
- Level 5 CMMI

Key Events:
- 1989: Level 2 Repeatable
- 1990: Level 3 Defined
- 1991: Self-assessment Software Improvement Team Formed
- 1992: Baldrige Award Level 2
- 1993: 10x Fault Density Improvement
- 1994: Level 3 Baseline Validation
- 1995: Level 4
- 1996: Level 4 Optimizing
- 1997: Level 4/5 Managed/Optimizing
- 1998: Level 5

Abbreviations:
- IPI: CMM-based Internal Process Improvement Assessment
- RTIS: Raytheon/TI Systems
- CMMI: CMM Integrated

Raytheon

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LRAS3/FS3 Overview

• The LRAS3/FS3 is a long range reconnaissance and surveillance multi-sensor suite system with the capability to determine far target location (FTL) coordinates, and to provide real-time target detection, recognition, and identification capability to the scout while permitting 24-hour adverse weather operations. In addition, the FS3 variant provides laser designation of a target for laser guided weapons.
LRAS3/FS3 Overview – continued

• FS3 product supports Knight fire support missions. The LRAS3 product supports scout operations and is operable in both a stationary vehicle mounted configuration and in an autonomous dismounted configuration. The host vehicle for the system is the High Mobility Multi-purpose Wheeled Vehicle (HMMWV) and Stryker Armored Vehicle.
Sound Engineering Processes

• SW engineering processes assessed as CMMI Level 5, in 2003

• Rigorous approach to engineering practices, key examples include:
  – Requirements Management
    • Used DOORs tool to support bi-directional traceability
    • Ensures that the impact of changes to requirements is understood and addressed through out the system
  – Configuration Management
    • Used through out the life-cycle of the product from Requirements Definition, through design, implementation, test and maintenance
    • A multi-tiered approach that has different requirements for different artifacts and for different points in an artifact’s lifecycle

Engineering process supports Mission Assurance
Sound Engineering Processes – continued

• Additional engineering practices that played a key role in the mission assurance success of LRAS3/FS3:
  – Peer Reviews
    • Not the “glamorous” part of the process, but rigorous application pays off
    • Verification by Quality Engineering
  – Verification, Validation
    • An iterative approach
    • Back to basics, back to the requirements
  – Quality Engineering
    • Maintained independence, but an integral part of the program
    • Ensured adherence to defined processes
    • Worked with program to find solutions

Engineering process supports Mission Assurance
Partnership with the Customer

• A series of demonstrations and user juries were conducted to refine the Raytheon understanding of the customer requirements:

  – User Jury #1
    • Combined with PDR (Preliminary Design Review) to ensure requirements are understood

  – User Jury #2
    • Paper copies of the display screens
    • End user participation requested (several different ranks)
Partnership with the Customer – continued

Demonstrations and User Juries were key tactics
Partnership with the Customer –
continued

• Demonstrations and user juries (continued):

  – Engineering Confidence Test: Demonstration #1
    • Fire LDM (Laser Designator Module) from external run box
    • External mounted camera - alleviate delays for packaging/fabrication
    • Insert filters in front of camera to simulate end system performance

  – Program Gate: Demonstration #2
    • Interim demonstration of more integrated system at longer ranges

  – Tactical Demonstration
    • After completion of the Vehicle Sensor Mount and end system development

Demonstrations and User Juries were key tactics
Partnership with the Customer – continued

• Customer participation in major reviews
  – PDR – Preliminary Design Review
  – CDR – Critical Design Review
  – TRR – Test Readiness Review
  – IPR  – Interim Progress Review

  – All of these reviews involved customer participation and an agreement regarding actions and authorization to proceed
Partnership with the Customer – continued

• Field Service Representative in place to facilitate maintenance issues for deployed systems.

Maintaining systems assumes high priority.
Results Speak for Themselves

- Software CPI has consistently stayed within organizational limits for several years

Achieved Budget as well as Mission Assurance
Results Speak for Themselves – continued

- Software SPI has consistently stayed within organizational limits for several years

Achieved Schedule as well as Mission Assurance
Results Speak for Themselves – continued

- Defect containment metrics for software remained within organizational limits over multiple development efforts
Results Speak for Themselves – continued

• To date, there have been two follow-on software maintenance contracts in addition to development effort to enhance software and hardware.
Results Speak for Themselves – continued

• Positive feedback from in-theatre user community
  – Highly positive feedback in multiple applications
  – Not originally designed for mounting on buildings, but modified and used on rooftops to monitor borders / surveillance

No Doubt – A Mission Assurance Success Story
Results Speak for Themselves – continued

"Best damn investment the Army ever made" ..Army Scout

No Doubt – A Mission Assurance Success Story
Summary

• Sound Engineering Processes coupled with a partnership with the Customer have led to success for the LRAS3/FS3 program, Raytheon, and the Army:

  – A program that is within budget and on time

  – A product that performs – with no doubt

No Doubt – LRAS3/FS3: A Mission Assurance Success Story
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