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GUARDING THE INTENT OF THE REQUIREMENT

27th Annual National T&E Conference

Marriott Tampa Waterside
March 17th, 2011

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Flight Test and Evaluation
Aerospace Systems
Northrop Grumman Corporation

The Challenge – Avoid Creating a product Which Neglects the Warfighter's Needs

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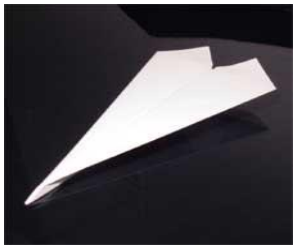
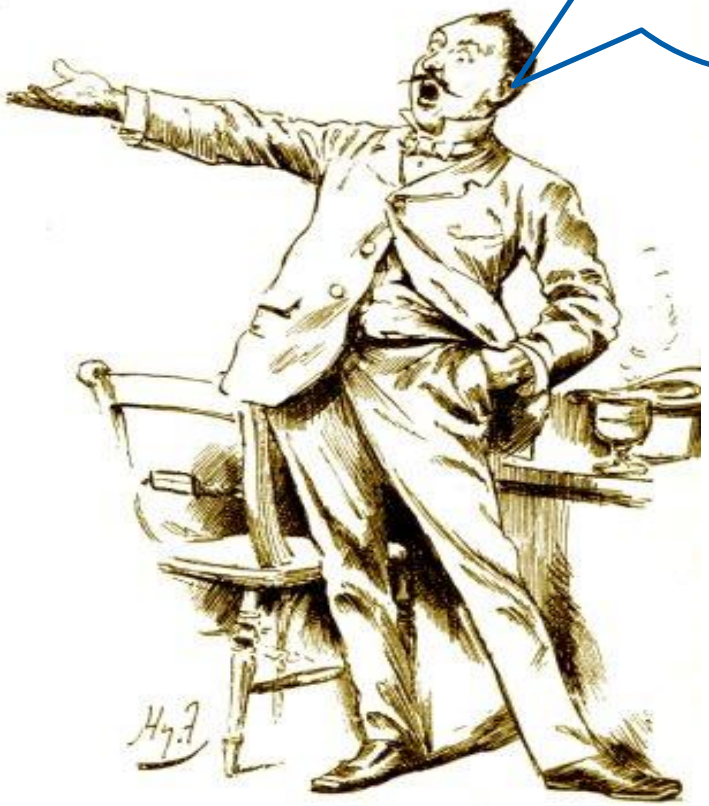


I hear you.. This is what you want

This is exactly what I need



Establishing the Intent

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JCIDS

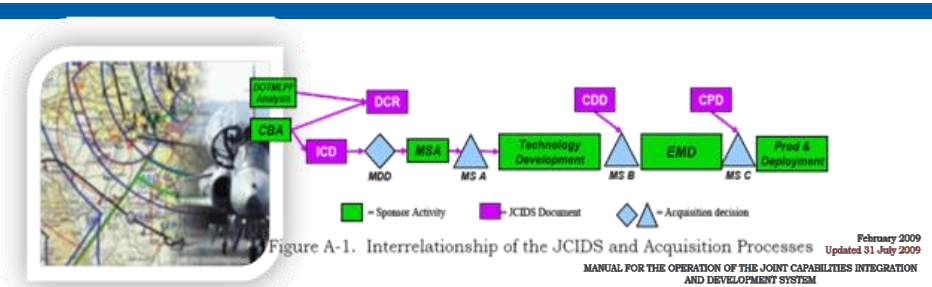


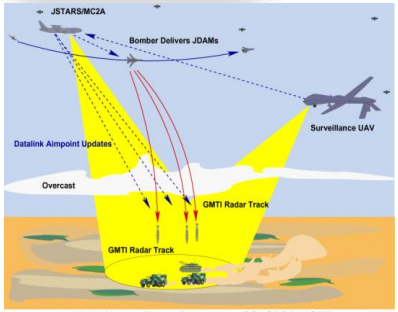
Figure A-1. Interrelationship of the JCIDS and Acquisition Processes

February 2009
Updated 31 July 2009

MANUAL FOR THE OPERATION OF THE JOINT CAPABILITIES INTEGRATION AND DEVELOPMENT SYSTEM

Mission needs result from assessments of current and projected capability requirements. Mission needs may establish a new operational capability, improve an existing capability, or exploit an opportunity to reduce costs or enhance performance. **MIL-HDBK-245D**

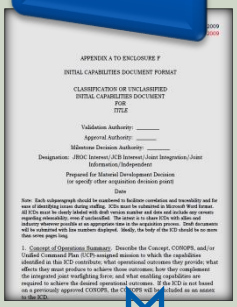
CONOPS



JDAM Moving Target Engagement CONOPS (AMSTE)

Rqmts

ICD

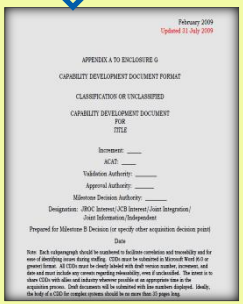


Test

TES

Test & Evaluation Strategy *(TES) is an early Test and Evaluation (T&E) planning document that describes the T&E activities starting with Technology Development and continuing through EMD into Production and Deployment.*

CDD



TEMP

Test and Evaluation Master Plan *The TEMP documents the overall structure and objectives of the Test and Evaluation (T&E) program. ….The TEMP identifies the necessary Developmental Test and Evaluation (DT&E), Operational Test and Evaluation (OT&E), and Live Fire Test and Evaluation (LFT&E) activities.*

This Is What is Needed

Template - ICD - JCIDS Manual - 31 July 2009.docx

https://acc.dau.mil/CommunityBrowser.aspx?id=29065

Flowing the Intent

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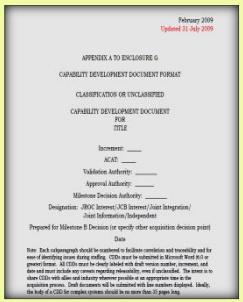
Rqmts

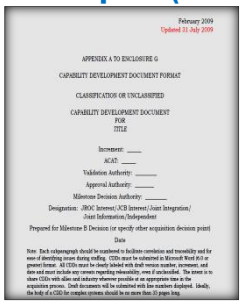
- **Capabilities**
  - Performance / Function / Interface
  - KPPs
- **Design Requirements**
  - Translation of the capabilities to Design Requirements
- **Formal Proof**
  - Agreed to Verification Activities

CDD

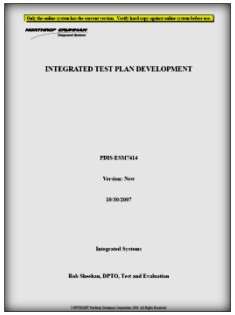


TEMP

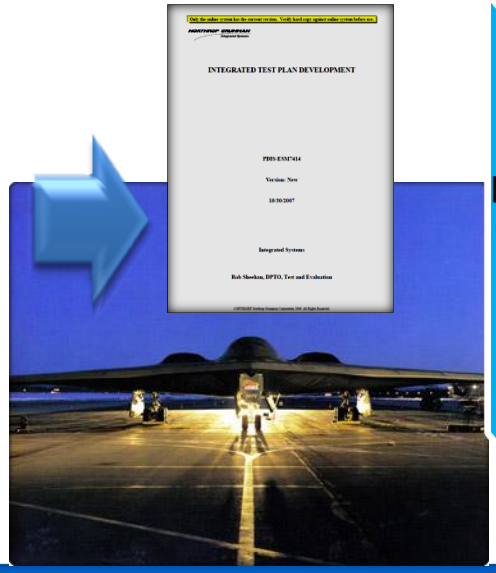
System Spec (Contr)



Verification Plan



Integrated Test Program



Test

- **Integrated Test Program and Strategy**
  - Total Test Approach, Environment, Needs
- **Documented Coordinated Contractor Test Program**
  - Definition of the Test Program (Formal and Informal) Activities Through Product Development

A Testing Program Aligned to the Intent of the Warfighter Needs

Guarding the Intent - A Lifecycle Look

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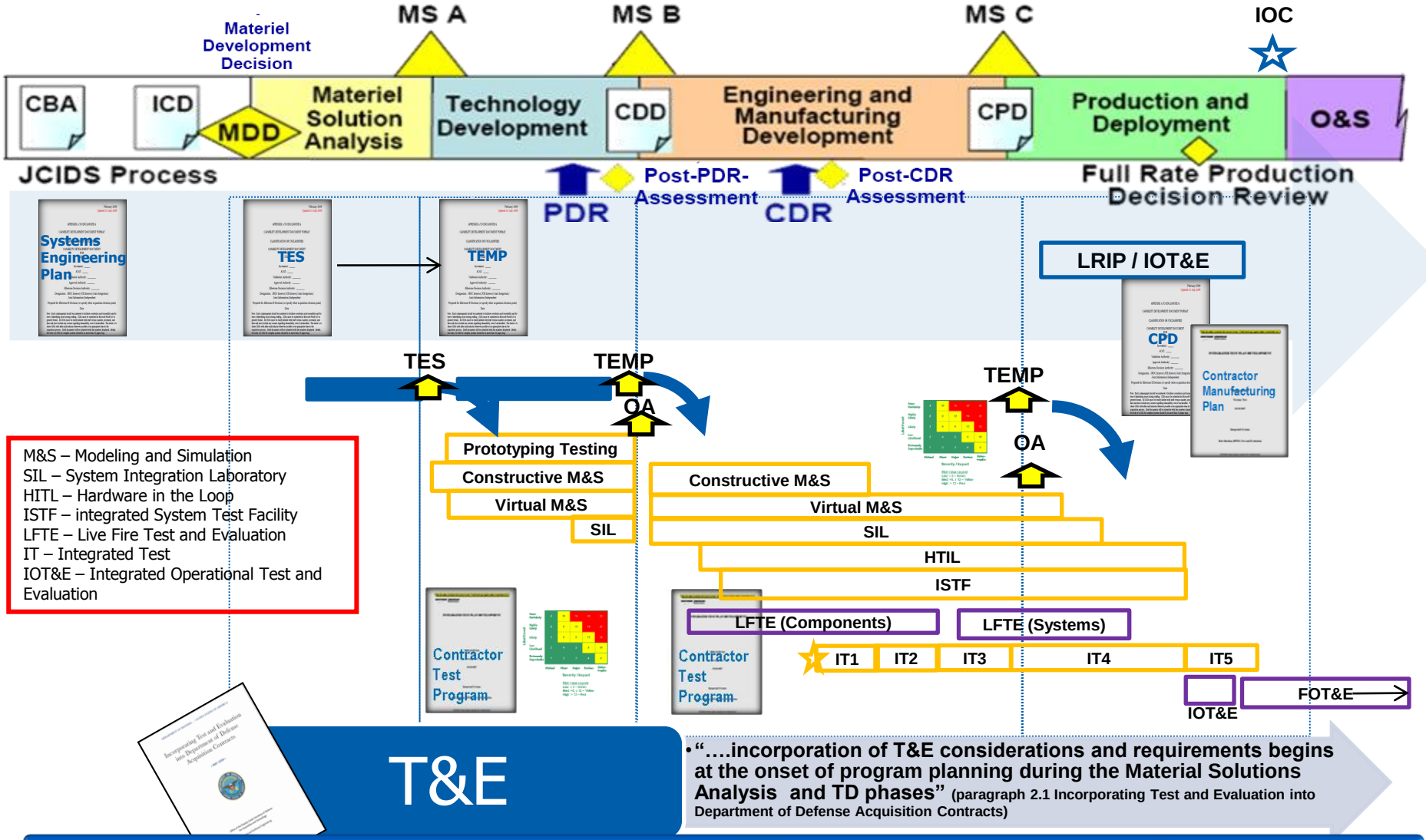

Intent must be maintained throughout the programs lifecycle to ensure warfighter need is provided

Pre-Milestone A Pitfalls & Solutions

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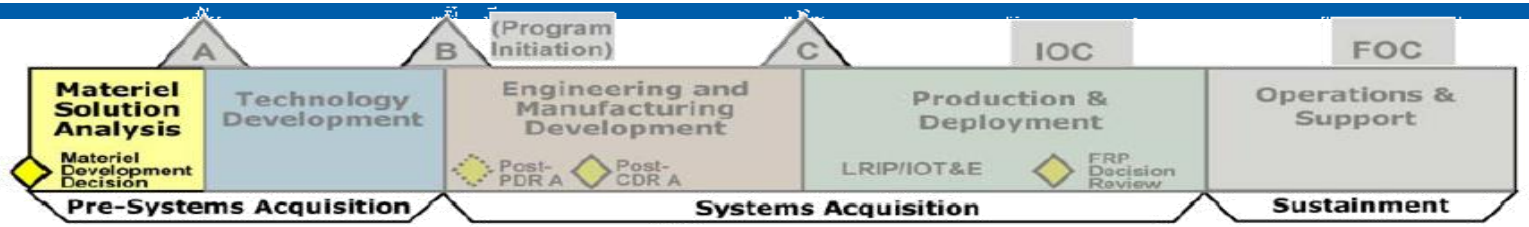

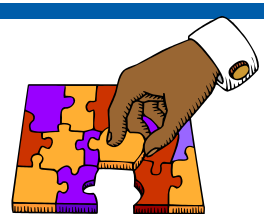

A lack of clear communication between those setting requirements and those in the acquisition process turning requirements into acquisition plans and contract specifications.

HOUSE ARMED SERVICES COMMITTEE PANEL ON DEFENSE ACQUISITION REFORM FINDINGS AND RECOMMENDATIONS March 23, 2010

"The Act [WSARA 2009] recognizes that 'unrealistic performance expectations' and 'immature technologies' are among the root causes of trouble in defense programs,"

DOT&E Director J. Michael Gilmore Feb 24 2010 Aviationweek.com

"… early stages of an acquisition program are in many ways the most critical. It is in the early stages that investments must be made in systems engineering, in acquiring technical data rights to support competition and system sustainment, and in robust developmental testing"

HOUSE ARMED SERVICES COMMITTEE PANEL ON DEFENSE ACQUISITION REFORM FINDINGS AND RECOMMENDATIONS March 23, 2010

Solutions

Fund The Program Correctly
Establish A robust Systems Engineering Community
Government / Industry Working Groups
Technical Reviews
Coordinated Capabilities– ICD
Contract Language Supporting Integrated Testing
TES – Test Strategy

5000.02

"The test and evaluation community can, during the requirements-setting process, identify such potential problems early in the life of programs."

DOT&E Director J. Michael Gilmore Feb 24 2010 Aviationweek.com

Starting a program right is essential to program success

Technology Development Phase Pitfalls & Solutions

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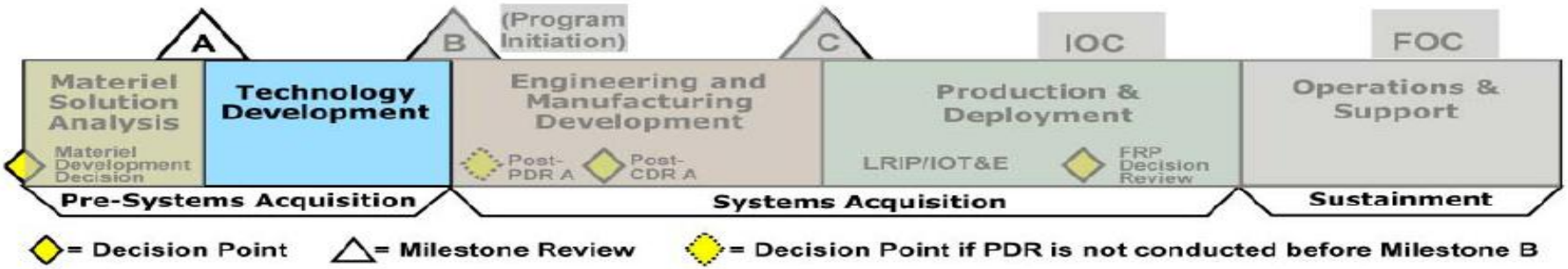


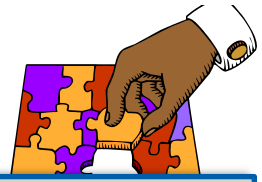
'….and 'immature technologies' are among the root causes of trouble in defense programs'

DOT&E Director J. Michael Gilmore Feb 24 2010 Aviationweek.com

Technology Development and Risk Assessment lacks Connectivity to Operational Mission "immature technologies" entering EMD

Former DOT&E Director Charles McQueary Feb 2008 NDIA

Solutions



- **A sound Technology Development Plan (TRL Maturation)**
- **A coordination between the TES and TEMP**
- **A capability Development Document that details the operational performance parameters for the anticipated system**
- **Test Planning establish Integrated Test Plans accounting for Risk Related Activities**
- **Implement Integrated Test Concept WIPT / CTF**

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Technology Development must be performed within the intended operational environment

Engineering and Manufacturing Development- Pitfalls & Solutions

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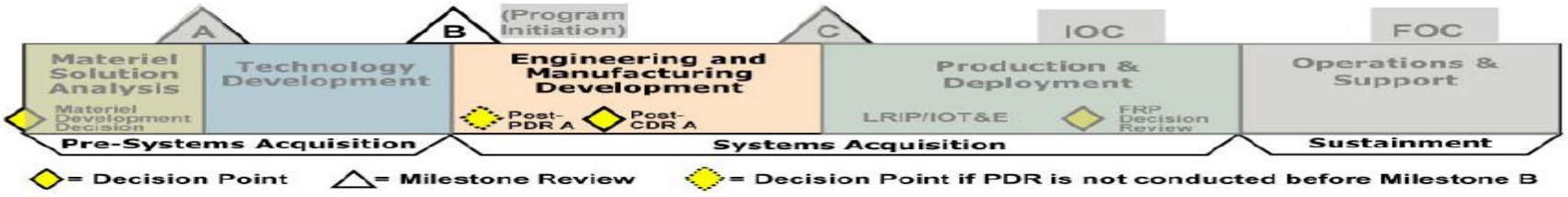


Requirements Creep - preclude destabilizing requirements changes 5000.02 Dec 08

PROCESS Charles "Pete" Adolph NDIA May 2010

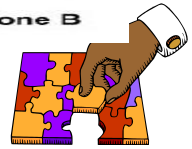
" What is important to the user is strengths and weaknesses, capabilities and limitations, not specification compliance."

Section 231 Report to Congress Core T&E Principles - 2007

Verify technical design throughout normal operating envelope ASAP Fly Before You Buy

PROCESS Charles "Pete" Adolph NDIA May 2010

Solutions



- Early and effective employment of systems engineering, applied in accordance with a well-structured Systems Engineering Plan.
  - Technical reviews that align capabilities to specifications
  - Identify potential management risks and issues in a timely manner.
- Configuration Steering Boards used to avoid requirements creep
- Integrate DT and OT test activities
- Evaluations shall include a comparison with current mission capabilities
- Use of WIPT / CTF concept ensuring Alignment of Government and Contractor Test Plans
- Contractors Development of a Modeled Executable Test Program that demonstrates excitability and accounts for the operational environment
- Coordinated data Sets to support OA's

Integrated Testing

Avoid Mindless Specification Verification / Test as you will Fly
Share the Data

Production and Deployment Pitfalls & Solutions

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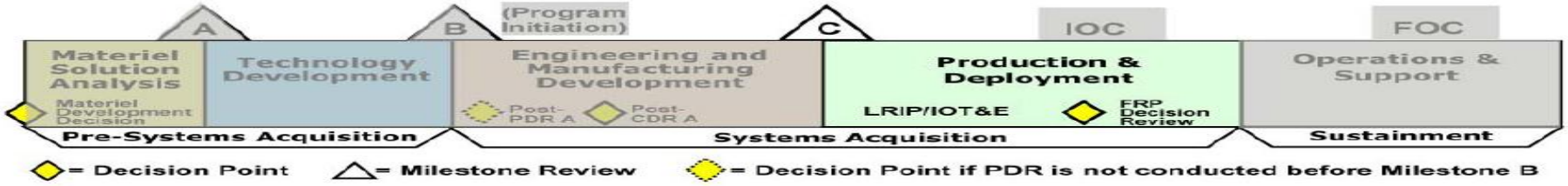
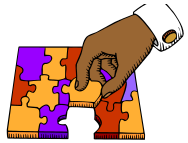


Solutions



Requirements Creep - preclude destabilizing requirements changes 5000.02 Dec 08

PROCESS Charles "Pete" Adolph NDIA May 2010

Incomplete OA Assessments Prior to Authorization to LRIP / Production

Former DOT&E Director Charles McQueary Feb 2008 NDIA

- Updated TEMP and Comprehensive Capabilities Product Document (CPD)
- Contractor Production Plan consistent with CPD
- ATP's test with proper environment where applicable
- Implement Block update acquisition policy "Evolutionary Acquisition"

5000.02

Build what you Intended – No More – No Less

Lessons Learned

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Program Problem	Issue	Fix
Incomplete and Ambiguous Requirements	Lack of Early Program Skill Mix inside SEIT prevented complete requirements Set Definition	Introduce and Program for Complete SEIT Skill including Specialty Engineering and Test and Evaluation Personnel Establish early verification program
Risk program not aligned with realistic operational environments	Technology development inconsistent with needs	Test Plan Integrated with SEP established Risk program waterfalls, planned early Contractor Test Program Integrated with TES and TEMP
Test Plan Intent not used during EMD	Test Plan not maintained throughout the EMD test program	Collaborative Test Plan Model Maintained throughout the Program Lifecycle (SE Model Tools Used to support Collaboration and Modeling) Contractor Test Plan Aligned with Requirements Verification and TEMP though SE traceability tool set
Data Rights Not Negotiated	Prevents OA using early test data	Good Contract Language and Propriety Information Agreements Established Early in a Program

Maintaining the Original Intent Delivers the Right Product to the Warfighter

Test Verification and Planning Guarding the Intent
A Contractor's Look at A Hybrid Solution

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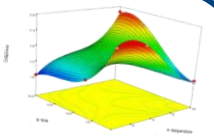
CDD, Requirements, TES TEMP, Risk Plan, Product Architecture, SEP, Program Management Plan

Test Verification &Planning

Integrated Test Team, Verification Requirements, Test Unique Requirements, Test Planning, Test Plan Modeling and Schedules, Architectural Refinement

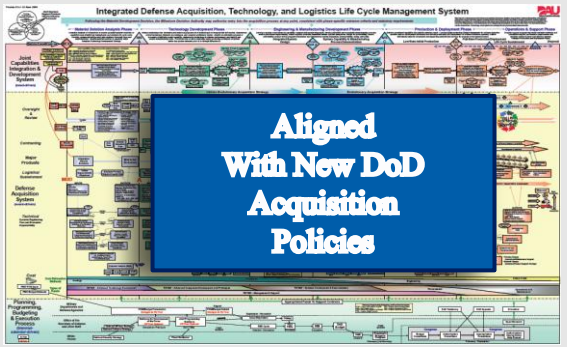
Team Products



- **Test Plan Strategy Developed and aligned with the TES and TEMP**
- **Test Strategy Coordinated and Optimized with ITT**
- **Major Range Coordination / Long Lead Planning Requirements Established**
- **Integrated T&E Strategy and Approach Addressing the Total Program Lifecycle**
- **Event Driven, Measurable Modeled Test Approach Logically Sequenced and Optimized**
- **Operationally Realistic Environments and Measurements Defined**
- **Verifiable Requirements with Established Completion Criteria**
- **Unique Test Requirements Needed to Complete the System Design Requirement Set**
- **Integrated Test Plan aligned with Program Risk Plan**

Program Values

- **Early Test Plans and Facilities Definitions.**
- **Requirements Based on Tested Architecture**
- **Streamlined Testable Architecture**
- **Event Based Test Schedule Developed**
- **Integrated Risk Program**
- **Scientific and Statistical methods applied to Test Plan**
- **Verifiable Requirements &Verification Statements Developed**
- **Test Unique Design Requirements Developed.**
- **Embedded Operational Realism in Test Program**
- **Support to Operational Sustainment Assessment As Required**



TV&P Ensure Intent is Captured in the Verification Program

Conclusions:

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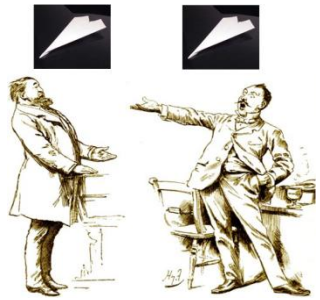
- Maintaining the original intent of the product is mandatory for the Warfighter's success.
- Intent is sourced from multiple places
  - Mission Statement, TES , TEMP, OPSCON / CDD
- Attention to the intent must be maintained throughout the program's lifecycle
- Avoid the temptation to complete requirements verification to the "Letter of the Spec", remember how the product must perform the requirements.



- Tools and processes exist today to help avoid these pitfalls.
  - Modeled Test Plan
  - Modeled Tests
  - Coordinated Working Groups
  - Data Plan supporting a Program's Lifecycle including early will help offset total program costs
- Too many programs are driven by cost and schedule at the expense of performance
  - PMs must embrace the idea of Integrated Testing
  - Ensure Programs start with the proper skill mix

Questions

Contact Information

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