Defense Information Technology:
An Integrated Testing and Independent Evaluation Model

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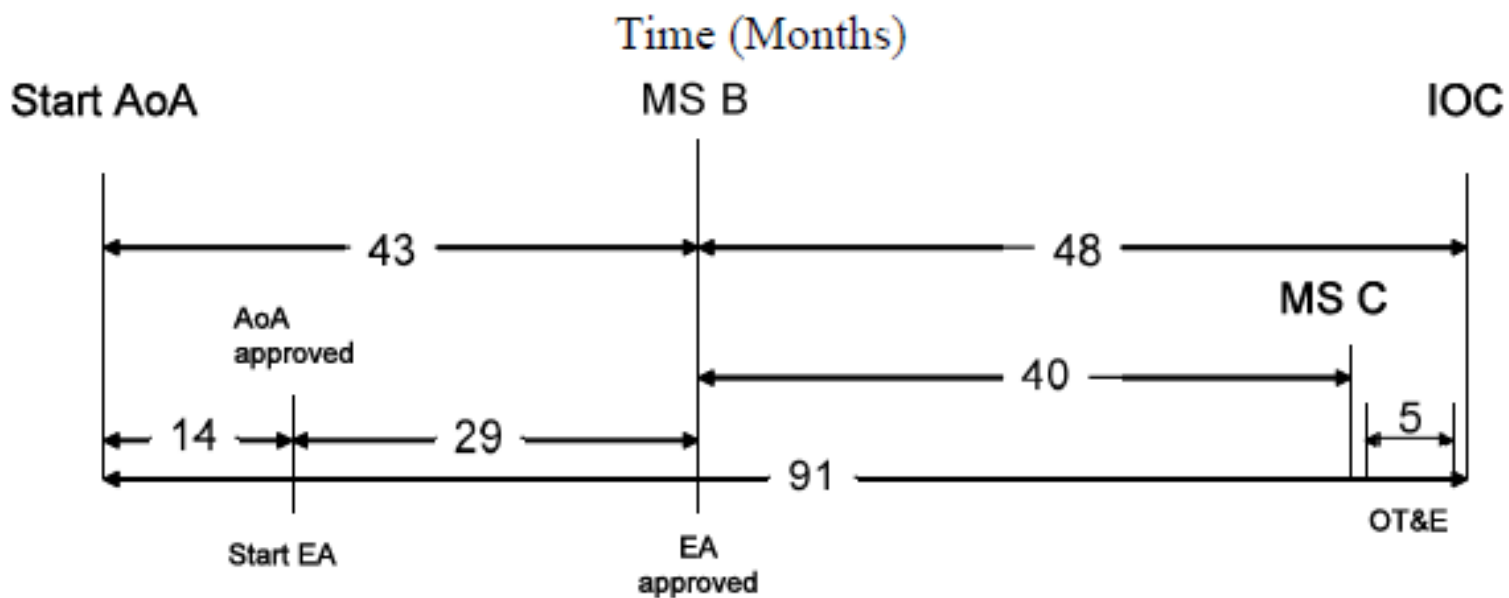
Developmental Test & Evaluation

NDIA Conference

March 2010

Time (Months)

Defense Science Board: DoD Policies and Procedures for the Acquisition of Information Technology, March 2009

"An analysis of 32 major automated information system acquisitions… the average time to deliver an initial program capability is 91 months"…"
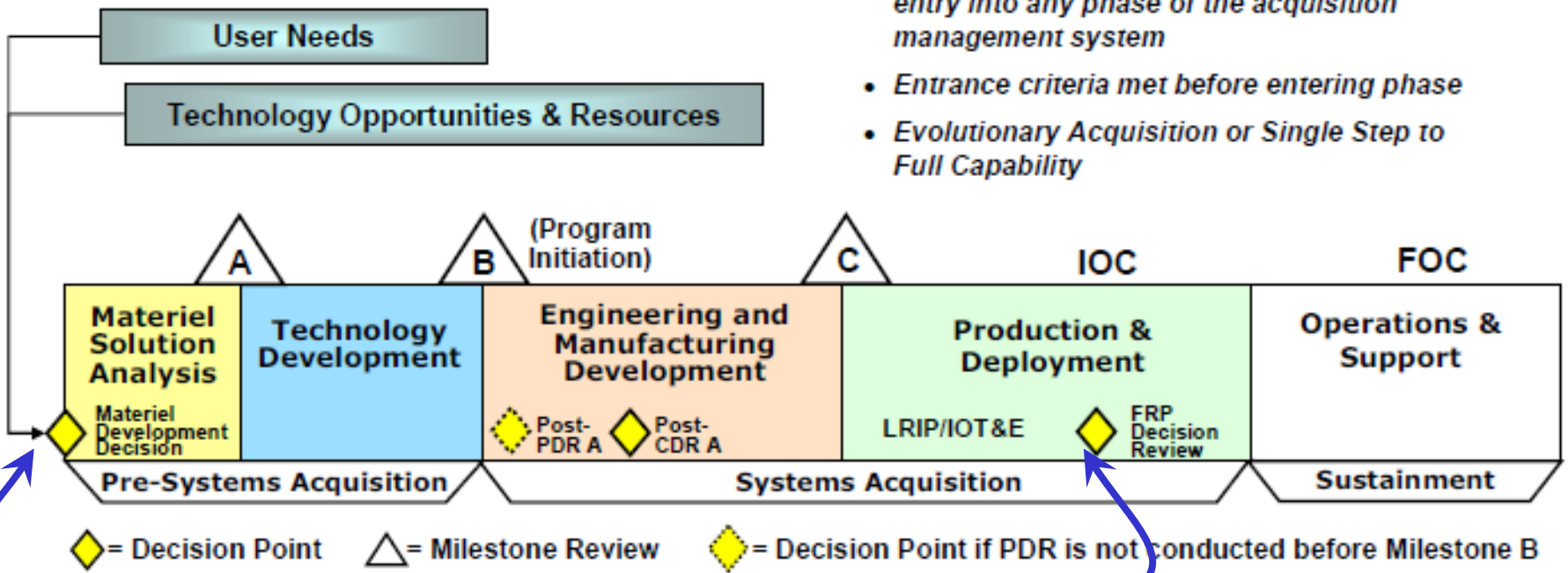
Current Acquisition Model

Figure 1. The Defense Acquisition Management System.
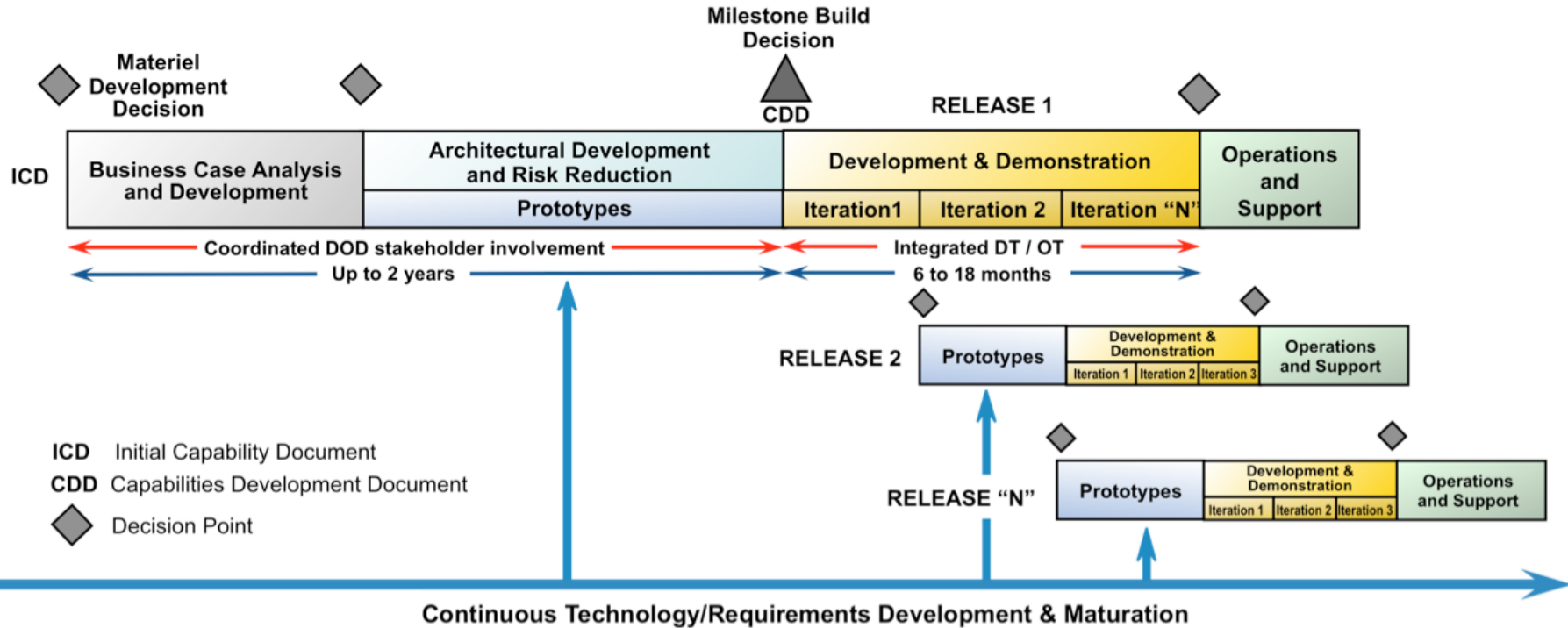
DoDI 5000.02 (December 8, 2008)

- The Materiel Development Decision precedes entry into any phase of the acquisition management system
- Entrance criteria met before entering phase
- Evolutionary Acquisition or Single Step to Full Capability

Users want shorter cycle times between need identification and product delivery
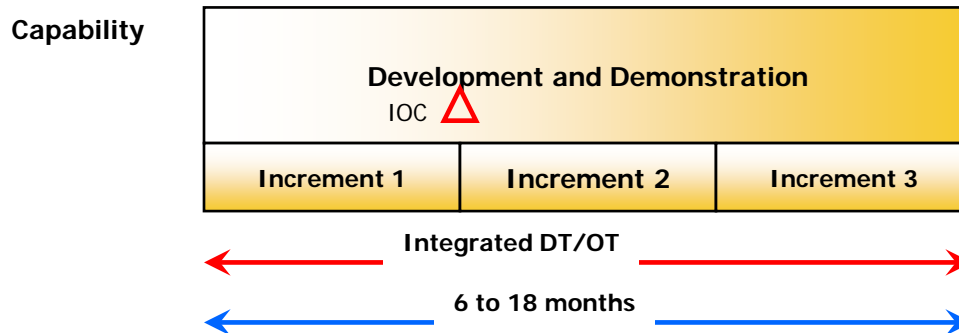
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DSB-proposed IT Acquisition Model

Defense Science Board: DoD Policies and Procedures for the Acquisition of Information Technology, March 2009

DSB-proposed IT Acquisition Model

DSB model based on successful commercial practices:
- Rapid, delivery of initial capability in ~12 months or less
  - Current T&E processes will not support IOC in 12 months or less
- Multiple rapidly executed increments of capability
- Capabilities are sub-divided into multiple increments
- Tested and deployable if deemed suitable and survivable
- "Integrated DT/OT"

Defense Science Board: DoD Policies and Procedures for the Acquisition of Information Technology, March 2009

DoD Goal for Integrated Testing

- "The goal of integrated testing is to conduct a seamless test program that produces credible qualitative and quantitative data useful to all evaluators, and to address developmental, sustainment, and operational issues."

- "Integrated testing allows for the collaborative planning of test events, where a single test point or mission can provide data to satisfy multiple objectives, without compromising the test objectives of participating test organizations."

From Interim Defense Acquisition Guide (DAG), 15 June 2009

Establish Integrated Testing and Independent Evaluation

- ## The way ahead:
  - Establish a T&E WIPT and an Integrated Test Team (ITT)
    - Design an Integrated Testing and Independent Evaluation Model based on the program's Acquisition Category (ACAT), System Development Life Cycle (SDLC) phase, and assessed risk
    - Initiate innovative approaches to T&E
    - Develop an inclusiveness across the T&E continuum
    - Implement significant changes to the current T&E process

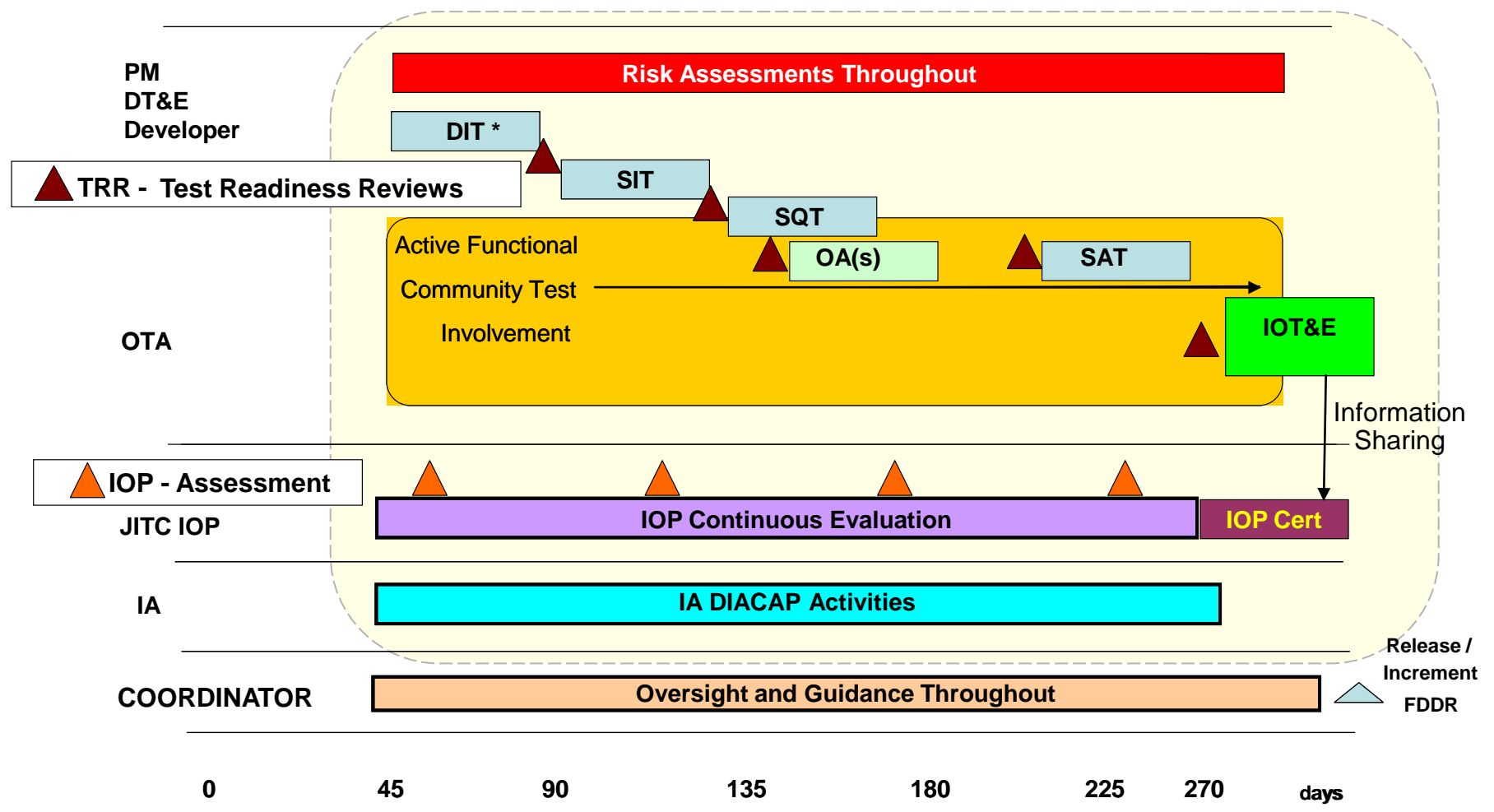# Establish a T&E WIPT and ITT

- **Establish T&E WIPT and ITT charters to define roles and responsibilities of participating members:**
  - Developmental Test & Evaluation (DT&E)
  - Operational Test & Evaluation (OT&E)
  - Information Assurance (IA)
  - Interoperability (IOP)
  - Functional Proponent (FP)
  - Program Management Office (PMO)
    - System Engineering (SE)
    - Configuration Management (CM)

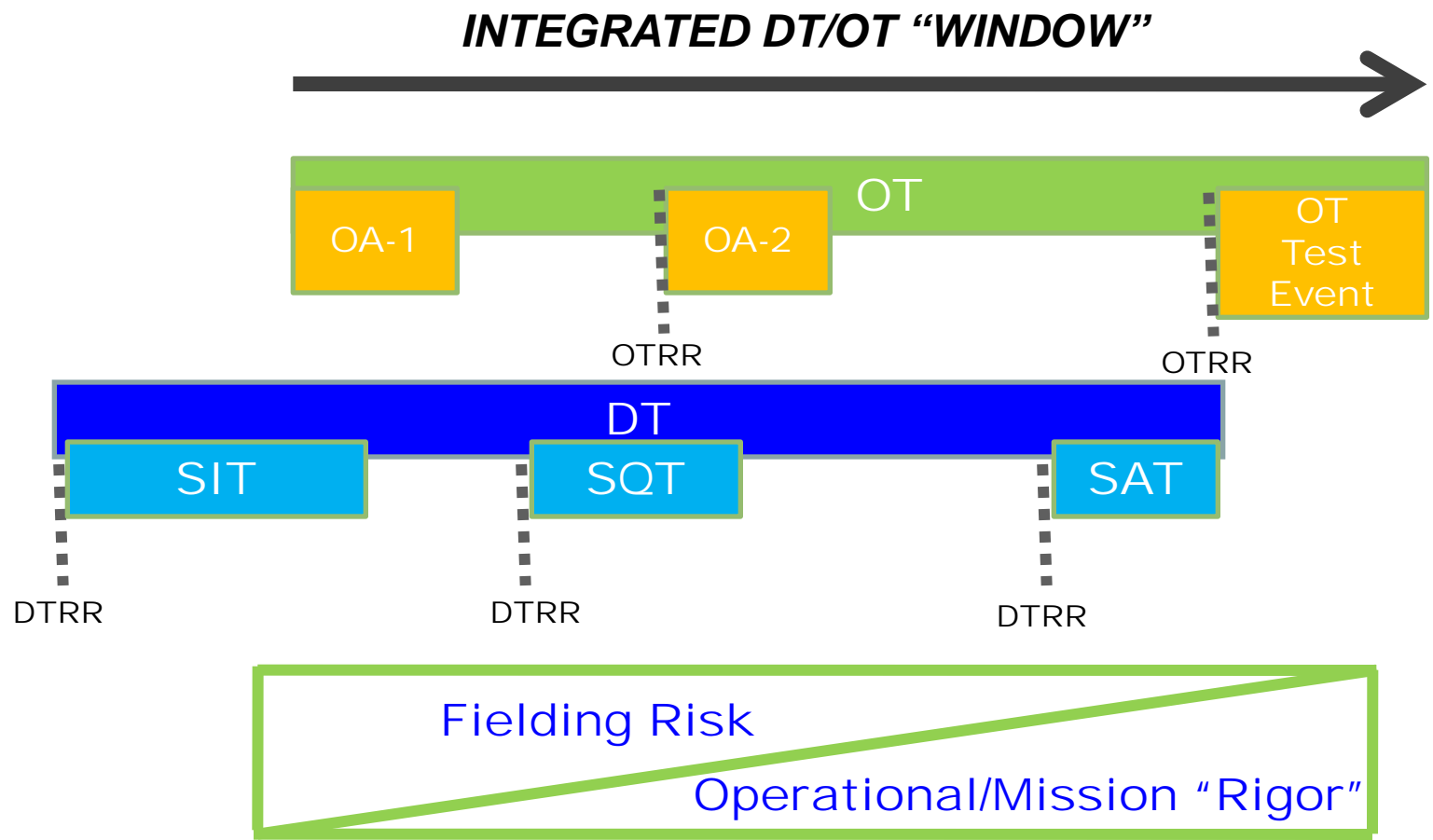# An Integrated Test and Independent Evaluation Model

Integrated Test and Independent Evaluation Model Example

INTEGRATED DT/OT "WINDOW"

OT

OA-1 OA-2 OT Test Event

OTRR OTRR

DT

SIT SQT SAT

DTRR DTRR DTRR

Fielding Risk

Operational/Mission "Rigor"

Desirable features of an Integrated Test and Independent Evaluation Model

- **Establish a chartered T&E WIPT and ITT**
  - Include chairs, membership, roles, responsibilities, authorities, how often the charters be updated, and how often the T&E WIPT and ITT meet

- **Define T&E events that are event-driven**
  - All events must contain action lists that are characterized by entrance and exit criteria

- **Define risk management approaches and evaluation methods to govern the intensity of test events, to include when to do performance testing following small and large releases**

- **Establish integrated testing strategies based on risk assessments and capability definitions**
  - Existing OSD policy supports risk-based T&E, to include support for T&E envisioned for rapid or agile IT acquisitions
    - Examples are DOT&E Guidelines for OT&E of Software Intensive Systems, IA, and Net Ready Key Performance Parameter (NR-KPP)
  - However, significant reengineering, reorganization, and resourcing at the DoD Component level is needed to fully implement rapid or agile IT T&E across the enterprise

Desirable features of an Integrated Test and Independent Evaluation Model (cont.)

- Scalable, repeatable, rigorous T&E processes are required that are aligned to the assessed risk-based levels of testing for agile IT cycle times

- Establishment of DoD Component Responsible Test Organizations (RTOs) needed to provide sufficient agile IT T&E expertise

- Investment in tools required to support agile T&E planning, management, execution, reporting, and oversight efforts across the enterprise
  - Examples include information portals, automated test tools, and workflow management tools, that are accessible to the cognizant T&E enterprise

- **Define the test program's data management strategy**
  - What data elements need to be collected as well as when, and why they are needed
  - What tools are being used to share and leverage data amongst all T&E activities and organizations

- **Metrics, data sources, and collection methods that are measurable, aggressive yet realistic**

- **Product processes and product templates**
  - Briefing guides
  - Test plan
  - Report guides
  - RFP verbiage
  - Tool kits

- **T&E budgeting driven by rules of thumb:**
  - Historical data and test category of Work Breakdown Structure elements, i.e., custom development, modified and/or existing COTS and/or GOTS development, and/or integration effort

- **Establish detailed lists of documentation required to support T&E planning/execution**

Integrated Testing and Independent Evaluation Model should focus on Critical Risk Areas

Manual

INPUT

Automated

Processes (E B R*)

Users

OUTPUT

Interfaces to Systems

Configuration and RICEF Objects**

TEST POINTS

ITT
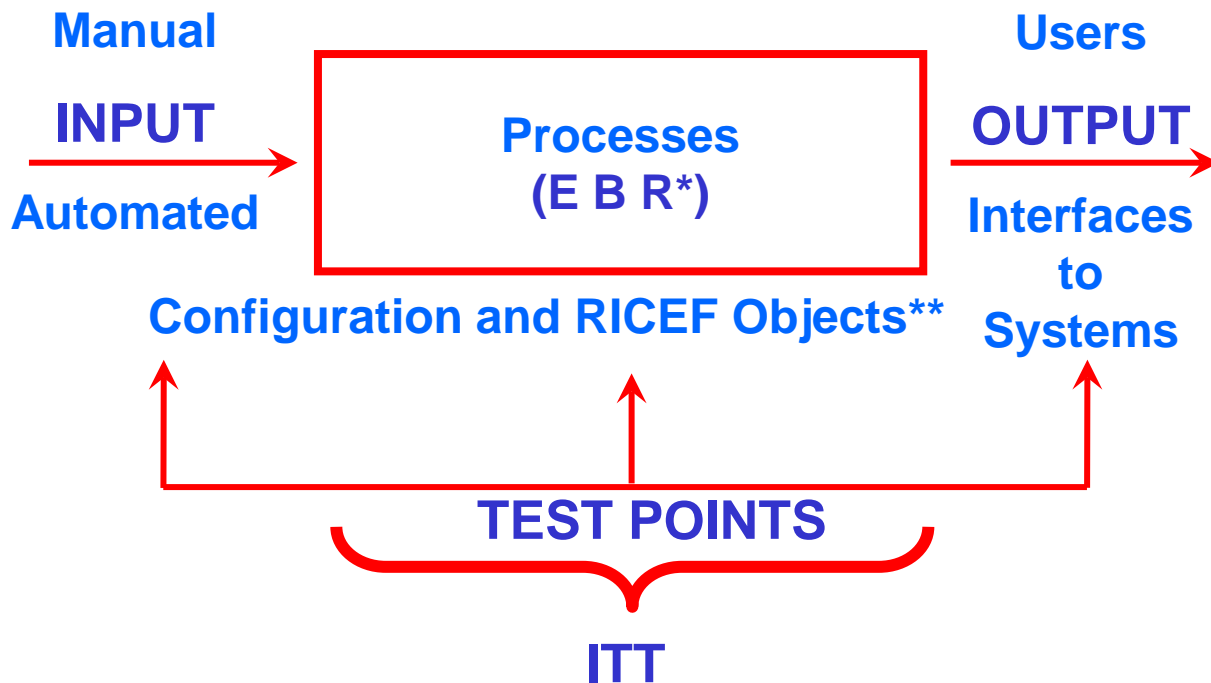
* Enhanced Business Rules
** ERP example

High Level Approaches

- **"Once the COIs and tasks/subtasks are understood, the Critical Technical Parameters, Measures of Effectiveness, and Measures of Suitability can be developed and presented in the Evaluation Framework, thus ensuring direct traceability and linkage of system characteristics, key performance parameters/key system attributes, specifications, and user requirements, to a mission or missions. Such a structured approach also ensures that all test activities are necessary, duplication is eliminated, and that no areas are missing in the overall T&E effort"**

From Interim Defense Acquisition Guide (DAG), 15 June 2009

High Level Approaches (cont.)

- **"One method used to develop integrated testing is to perform a mission analysis by decomposing the Critical Operational Issues (COIs) into tasks and subtasks"**

- **"Breaking the COIs into tasks and subtasks will ensure system designers, developmental testers, operational testers and user representative are all in agreement concerning the missions, tasks, and defined capabilities"**

From Interim Defense Acquisition Guide (DAG), 15 June 2009

Independent Evaluation Framework

COI	COIC (Army)	MOE/ MOS	KPP/ SPP	CTP	IA	IOP	Test Case	Test Event	Test Limitation

Summary

- **Integrated Testing and Independent Evaluation Model success is based on active support and resourcing of all agencies**

  - Needed to:

    - Be responsive to rapid, iterative development and evolving requirements/priorities
    - Provide testing that is appropriate to the identified level of program risk and is capability based
    - Facilitate T&E planning, execution, and reporting timeframes that accommodate the rapid deployment strategy, e.g., using automated test tools
    - Identify and commit users to early participation

- **Additional analysis is needed to determine if changes are required to Title 10 and DoDI 5000.02 to facilitate seamless and more efficient integrated testing**

Contact

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The right information, to the right decision maker, at the right time, for *better* decisions

Questions?

Back-Up

What is Integrated Testing?

- **Integrated Testing is defined by OSD Memo, "Definition of Integrated Testing," dated 25 April 2008 (online at: http://www.acq.osd.mil/sse/pg/index.html):**

- *"the collaborative planning and collaborative execution of test phases and events to provide shared data in support of independent analysis, evaluation, and reporting by all stakeholders, particularly the developmental (both contractor and government) and operational test and evaluation communities."*

From Interim Defense Acquisition Guide (DAG), 15 June 2009

"**Integrated testing is not an event or separate test phase, nor is it a new type of test. Integrated testing is a process intended to result in resource efficiencies (time, money, people, and assets) and an enhanced data set for separate evaluations. For example, the data from an integrated test could be used by the contractor for design improvements, by the developmental evaluators for risk assessments, and the operational evaluators for operational assessments. However, integrated testing does not replace or eliminate the need for dedicated Initial Operational Test and Evaluation required by 10 USC 2399, "Operational Test and Evaluation of Defense Acquisition Programs" And DoD Instruction 5000.02.**"

From Interim Defense Acquisition Guide (DAG), 15 June 2009

Integrated Testing Goals

- **Improve the overall quality of DoD IT products**

- **Help reduce delivery time of product to market while being consistent with high quality**

- **Enhance acceptability by end users**

- **Effective use of limited T&E resources**

- **Program capabilities clearly articulated**

- **Documented operational concept**

- **Outline a Tailored Information Support Plan (TISP)**

- **Automated Early Deficiency Resolution – provides efficiency and economy**

- **Event-driven schedules and exit criteria**

- **Seamless verification – "Integrated T&E"**

ITT Activities

Form the ITT and focus on:

1. **Engineering Processes**
   - Risk areas, e.g., reliability
   - IA
   - IOP
2. **Required Documents**
   - Statement of Capabilities
   - Test & Evaluation Strategy (TES)
3. **Cost Estimates**
4. **RFPs - SOW**
   - T&E – CDRLs
   - T&E environments
5. **CM**
6. **NR-KPP**
7. **Identify C&A considerations**

From architecture to ITT:

1. **Design changes**
2. **Design review**
3. **System design**
4. **Data strategy**
5. **IA and IOP considerations**

Appropriate T&E Environment Established

- **Clear Government and developer roles**
- **RFP with core T&E environment including engineering**
- **Integrator to look at M&S to support engineering**
- **CM and T&E automated tools**
- **Appropriately sized/equipped development/T&E environment**
- **Centralized repository for everything: Test Plans, Test Reports, Test Results, Severity Codes, etc.**
- **Data Management (Joint/Engineering)**
- **T&E addressed in contract, e.g., specification contains CMMI level for the integrator/developer**
- **Governance**

- **Capabilities**
  - Data Integrity
  - Data Accuracy
- **Direct and Indirect Interfaces (Manual and automated)**
- **Timelines**
- **"illities"**
- **Certifications**
- **Laws, rules, etc.**
- **Define scope**
- **Modules created/changed**

- **Integration**
- **Roles and responsibilities**
- **Auditable**
- **CONOPS**
- **IA**
- **IOP**
- **Business reengineering**
- **CONOPs**
- **MOEs/MOSs**
- **Engineering**
- **T&E**

- **Examine mission context**
  - Determine if the system meets the user's daily mission
  - Identify the operational needs
  - Identify the Critical Mission Functions
  - Identify the End-to-End business processes
    - Determine what supports decision making
- **Determine what is needed to move forward into DT&E and OT&E**
  - Identify realistic scenarios
  - Include SMEs/development in the planning process
  - Identify potential metrics for development, reliability, etc.
    - Identify and include metrics from developers to help reveal progress

TEMP (ITT has Lead)
– Acquisition Strategy, APB
– Ensure T&E is consistent
– Use TES
– Capabilities definition, when, complete support
– Schedule
– MOEs, KPPs, User Functional Proponent
– Signed CDD
– Charter

T&E Continuum (Beginning to End)
– "Seamless"
– PM keeps his side of the bargain
– Integrator/developer contract
– Hold to DT&E events
– Entry / exit criteria / done criteria

PMs are Responsible for:
– SPPs
– CTPs
– COIs
– COICs
– AIs

BCL - One Acq – CAE
– One Functional Rep
– One T&E/OTA community

TEMP Section 3
– Now structured to support integrated testing methodology

Planning for These Test Events
SIT
OA
SQT
OA
SAT
IOT&E

Build a Viable Set of Metrics
– Visibility of metrics
– Scoring criteria – standard T&E definitions
– Add to TEMP – Including Severity Ratings
– Requirements Traceability
– BEA compliance and verification

- **AoA**

- **TEMP**

- **SEP**

- **TISP**

- **Acquisition Strategy**

- **CONOPS**

- **Capabilities or Business Case Document**

- **In the DoD, we have 4 basic types of IT systems characterized as follows:**

  - Custom coding plus COTS modules

  - COTS, component aggregation, "glue code"

  - COTS with major configuration and business rule modification

  - 90%+ COTS and minor configuration modification , i.e., "shrink wrap" usable with setup parameters

- **Local Processes**

- **Architectural Alignment**

- **Test & Evaluation**

- **Baseline Management and CM**

  - Functional

  - Allocated

  - Production

- **Interoperability**

- **COOP**

- **Security**

- **CONOPS**

- **Training**
  - Administrative
  - Testers
  - End Users
- **Supportability**
- **Technology Refreshment**
- **Licensing**
- **COOP**
- **Security**
- **CONOPS**
- **Architectural Products**
- **NR-KPP**

- **Test events conducted in an operational setting with typical end-users**
  - Combined test planning by the ITT
  - Reduce cost to the greatest extent possible
  - Reduce time of the events
  - Collect test data in a central repository
  - Tests should be as seamless as possible
  - Test objectives should be based on risk