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Effective Test & Evaluation: Capability based System Integration and Automated Test strategies

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Bob Koczat: The SPECTRUM Group

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- **Senior Engineering Fellow: Raytheon (retired 2008) 35 years**
- **DOD PATRIOT Air Defense Systems: Technical director PATRIOT Modernization, Lead Engineer, Systems Integration, Interoperability**
  - ***Engineering Director in systems/software engineering, integration, systems integration & Test, full life-cycle execution, deployments, working with DOD PEO and military organizations***
- **FAA STARS Air Traffic Control Systems: Systems Integration Lead**

- **The SPECTRUM Group, Wash DC: Engineering Consulting**
- **TESTPLANT Consulting: New technology Automated Testing systems in DOD, Aviation, and Aerospace Sectors**
  - **Performance management, Mission critical, Safety critical, "Should Cost" Integration & test program enhancements via TESTPLANT Systems in DOD, Aviation, and commercial sectors**

Agenda

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- **“Should Cost” Programs**
- **A Big Picture ⇔ Effective Systems Engineering, Test & Evaluation: Performance Management Objectives**
- **Capability based systems integration, planning**
- **TESTPLANT Automated testing capabilities & strategies**
- **Summary**

NDIA Viewpoint article: "Should cost" Programs, Performance Management

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- "More than new policies are required to manage rising costs of programs & systems"
- "Need short term Investments that lead to out-year savings"
- "Life cycle focus is essential"
- "A robust efficiency initiative must identify synergies"
- "A sustainable efficiency initiative must start with uncommon problem-solving approaches that eschew traditional assumptions and ways of doing business. Top-down controls must be one of the sacred cows in the kill zone."

Nathaniel H. Sledge Jr.

“Should Cost”

Performance Management Objectives

Systems Acquisition Cycle

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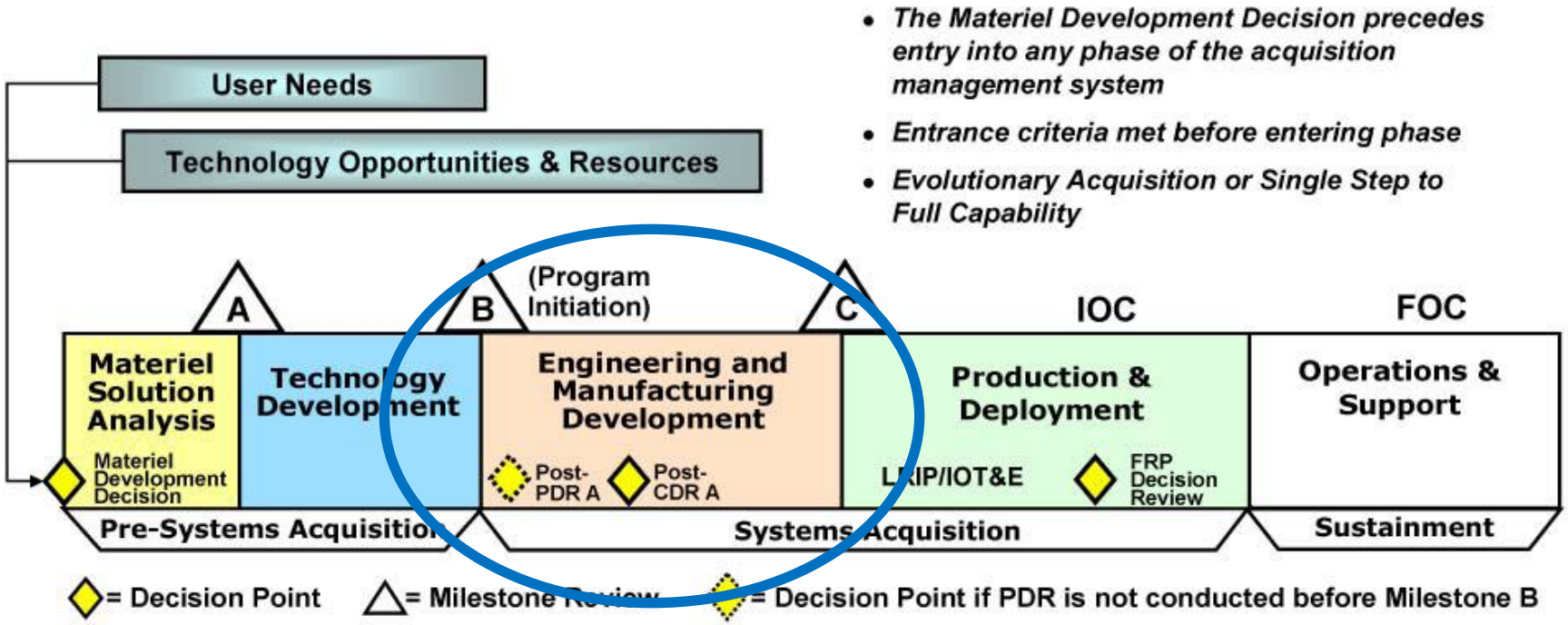

Objective: "SHOULD COST" Engineering Development

Programmatic Top-Down layers: Performance Management

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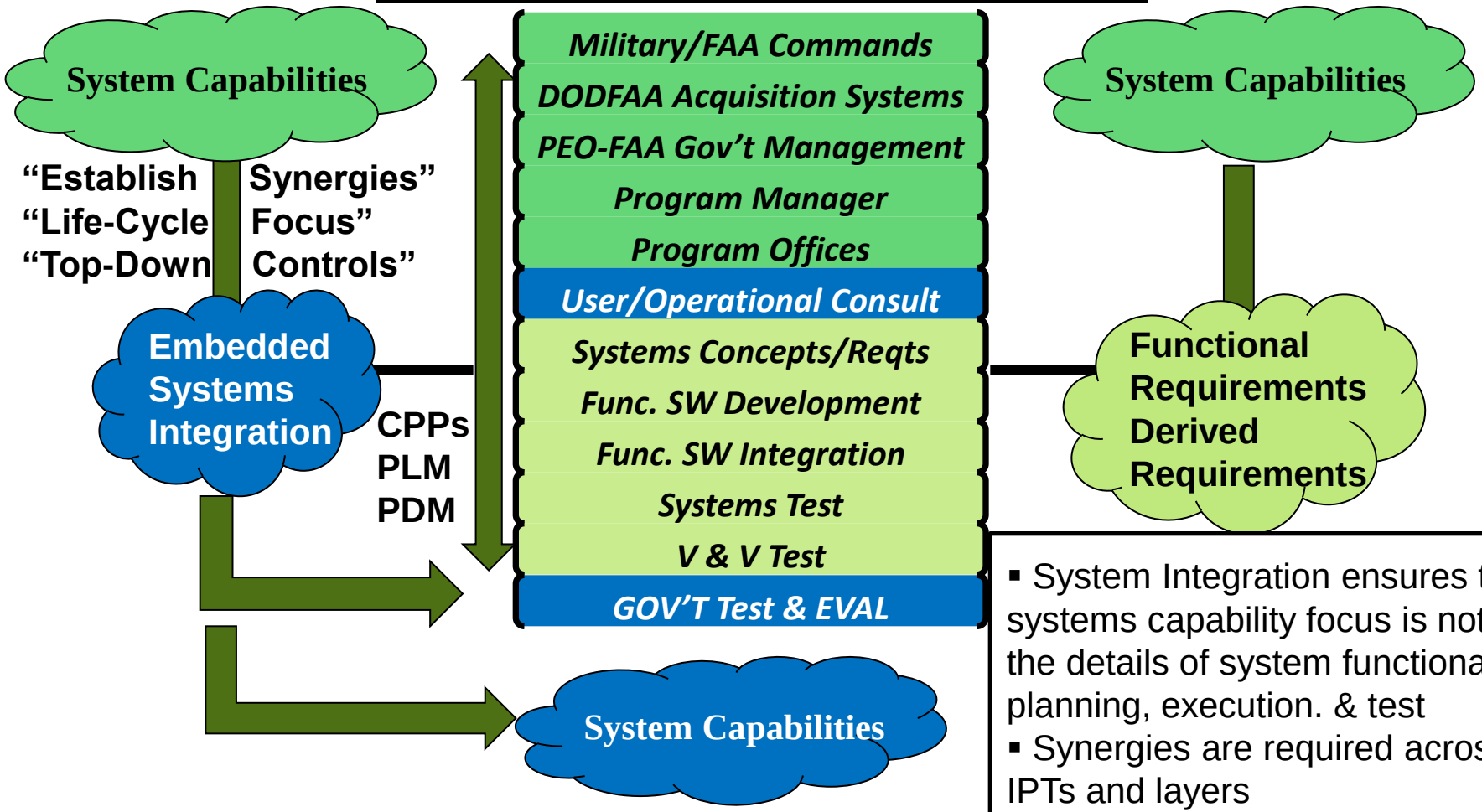
The Program-Project: Building a System



- System Integration ensures that systems capability focus is not lost in the details of system functional planning, execution. & test
- Synergies are required across all IPTs and layers
- Big picture visibility, understanding is essential across project life-cycles, up ⇔ down layers

DEPLOYMENT

Systems Engineering, Effective Test & Evaluation: "Should Cost" Objectives

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- Early visibility into the system, hardware, and software operational condition
- System capability situational awareness throughout engineering development and Program Life-Cycles (PLM), Phases
- A midgame-endgame mechanism to adapt to requirements & software agility, make assessments; managing the chaotic phases
- Achieve Test & EVAL operational readiness, limitations plan
- Ability to conduct a cost effective, quality evaluation and assessment of system and operational performance during GOV'T Tests

➢ Performance Mgt. thru Capability based Systems Integration

Capability Based Systems Integration

Capability Based Systems Integration: Objectives

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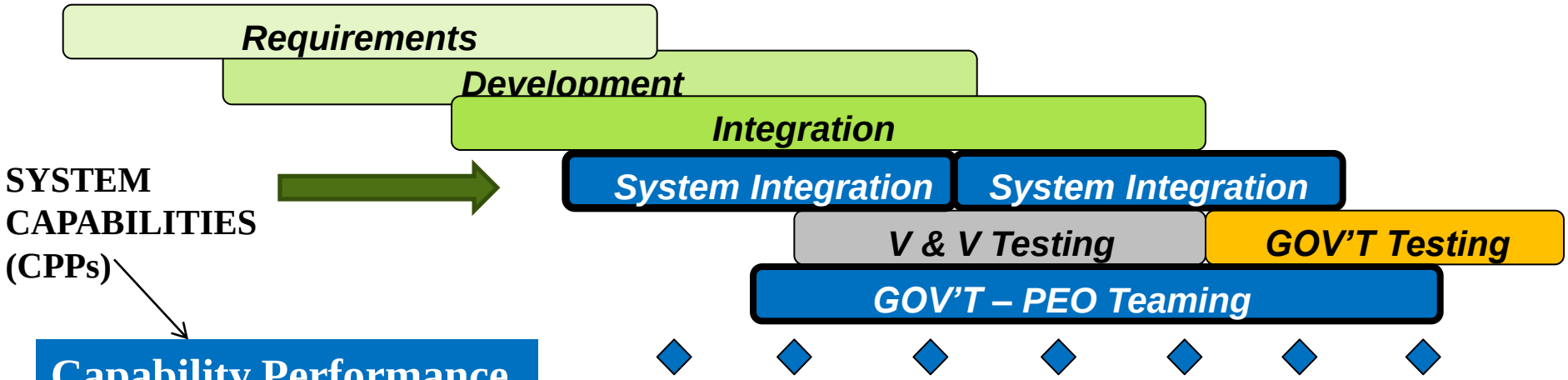
➢ **Effective Test & EVAL requires Systems Integration to be embedded in the critical path of the engineering development Life-Cycles (PLM) , project planning, software integration, V & V testing, and system & operational testing**



SI using TESTPLANT Automated Testing Strategies

- Configuration Integrity
- Capability Performance management
- Regression and non-regression test
- Incremental Base-lining
- System Config./Infrastructure established early (DCOL, Analysis Tools, Diagnostics, INIT)
- Automated Test component orchestration

Systems Integration Execution

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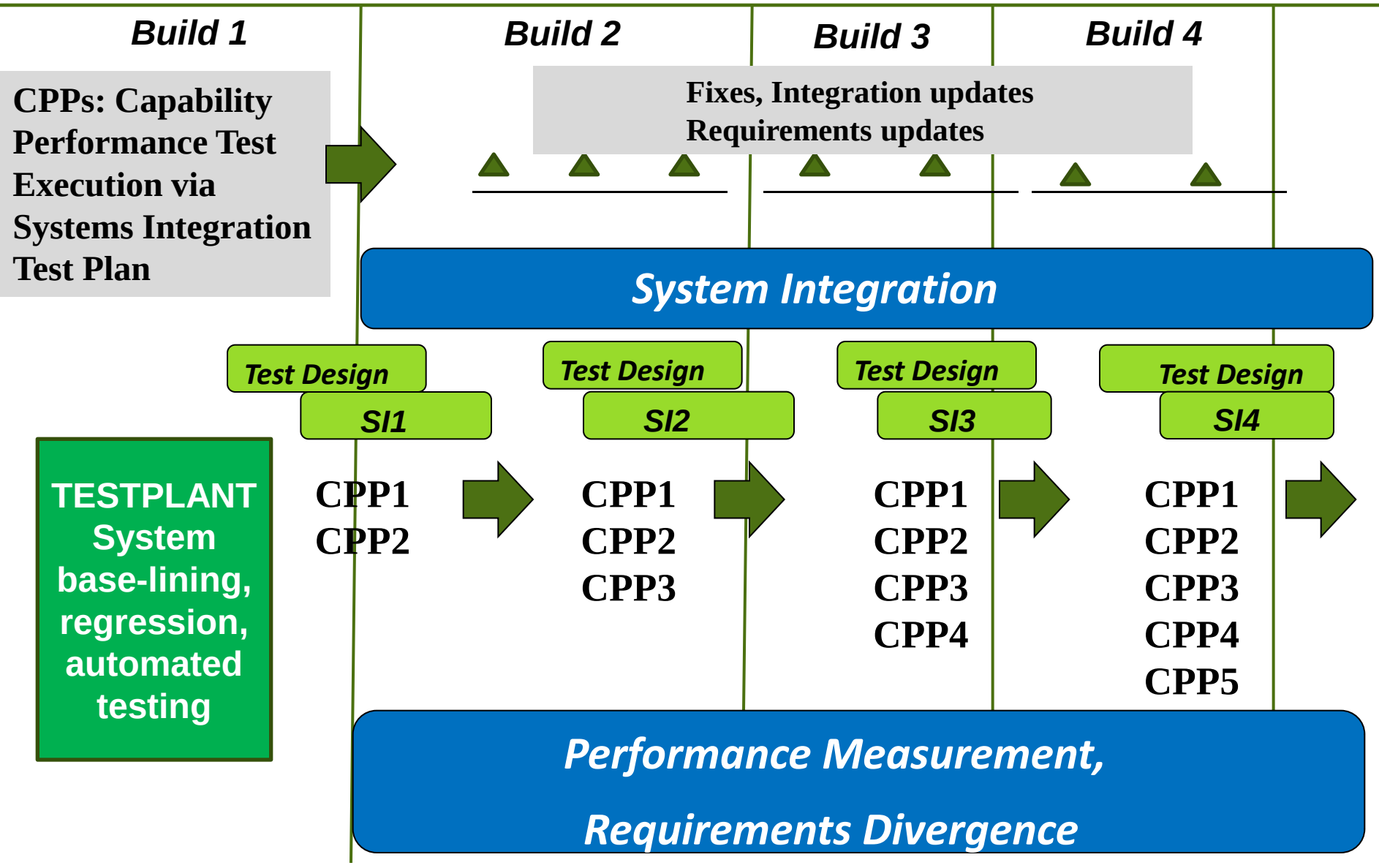

Systems Integration Team

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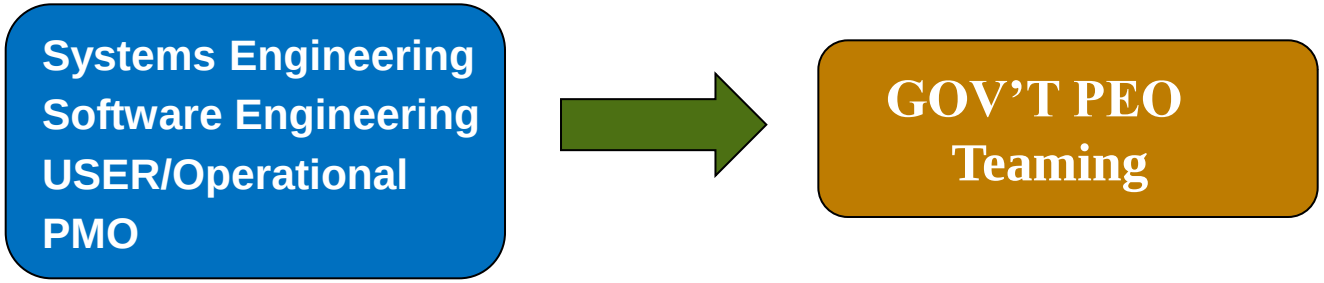
The CMMI Product Integration process area describes system integration strategies supporting effective Test and Evaluation execution, such as:

- ***Setup a team, identify stakeholders, team roles & responsibilities:***



- Establish a System integration plan via "system capability" testing, tracking, and capability/limitation measurement techniques through base-lining, regression, & auto testing
- Coordination of integration, V & V, system Test, and operational Test "system shall" test coverage, breadth & depth
- Establish and utilize entrance and exit criteria disciplines to form the basis of readiness review meetings and critical release decisions
- Establishment of integrated lab facility and test site resources, Build/Test tools, and an instrumentation/analysis logistics plan
- Execute an incremental plan for achieving "full" system level integration by testing with "live" hardware, with a planned mix of simulators in the total system

TESTPLANT Automated Testing Strategies

TESTPLANT : Automated Testing Strategies

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TESTPLANT automated testing systems capabilities:

- Remote systems: non-invasive testing
- User friendly scripting, scenario development, Test Designs
- Execution of automated tests
- Verification of system execution expected results
- Thru Display image recognition & Storage capabilities
- Data collection,Test reporting and analysis tools

Used for:

- Functional GUI and C2 Display Testing
- System Capability, Limitation Assessments (Decision Criteria)
- Regression & Non – Regression testing
- System Integration
- Verification & Validation test
- System Engineering Test
- Systems Interoperability, SOS
- Test Orchestration & Coordination

TestPlant in FMS Aviation Systems

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TESTPLANT automated testing in FMS Aviation Systems

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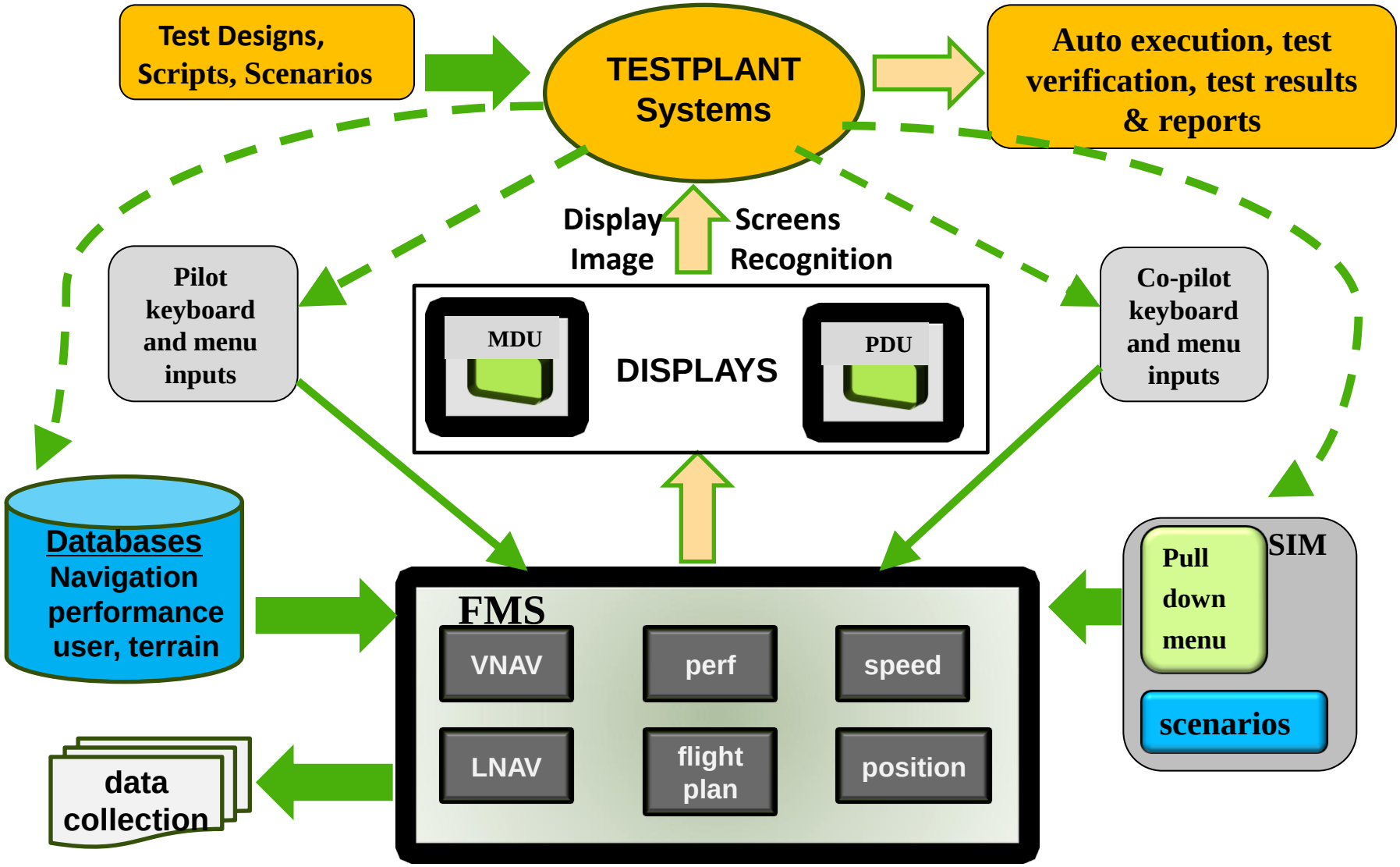

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U.S. patent 7,870,504. Other patents pending.

TESTPLANT Capabilities: CPP Testing

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SCRIPTING	Auto Execution	TEST Verification	Analysis
Auto Test Designs via Image, Mouse, Switch, Keyboard capturing, scripting	**Auto Test Execution via display scripts, scenario events, designed sequences**	**Verify executed Test events via captured real time displays, image recognition capabilities**	**Generate Test Reports from Tests run, events, results**
• Automatic script creation • Script DISPLAY commands, & Test event sequences • Create events on captured images, contingencies • Script elaboration, editing, tailoring • Loops, delays, pause, continue • Expected Results • Build in Auto-Image Verification tests, Pass/Fail • Saved, organize into suites, scenarios, ***REGR*** tests, functional libraries	• Perform Actions on images in scripts • Mouse actions • Keyboard actions • Switch actions • Script, suite, library, scenario selection • Test scheduling • Test management • CM organization • Execution storage of data • Provide repeatability base-lining & regression testing for dynamically changing configurations of Software/Hardware updates/fixes	• Display screens sent back to eggplant • Auto verify expected results built into scripts • PASS/FAIL, bug detection • Save/store results, screens • STOP or Continue test execution	• Test displays, screens saved • Resultant actions during test • Test action timing data • Test results vs. expected • Pass/Fail data saved • Script/Suites ID run, date/time • Correlate Test Results, Reports to operational data

Testplant in Air Traffic Control Systems

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TESPLANT comments from Major Industry Users: DOD & Aviation

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"We have been tasked to implement test automation for a number of our test cases in an effort to free up test times and focus on more exploratory testing."

"Testplant works but putting very little load on the System Under Test SUT".

"The scripting language (SenseTalk) is very easy to use and that was another selling point to us. We are a test team, not developers, so we needed a product that we could develop scripts"

"If we need to, we can simply keep repeating and analyzing, with the software presenting its 'search and compare' results without us having to employ additional manual testers to repeat tests. It's important that we have cost-efficient and scalable testing methods. eggPlant enables both."

"The very act of planning scripts has made us consider our approach. This has led to some very small but very important changes in the HMI layout which makes user interaction better and flow better. In that respect TestPlant has helped with the design of the system. It may seem a strange benefit but that's what has happened."

Summary

Systems Evaluation: The ENDGAME

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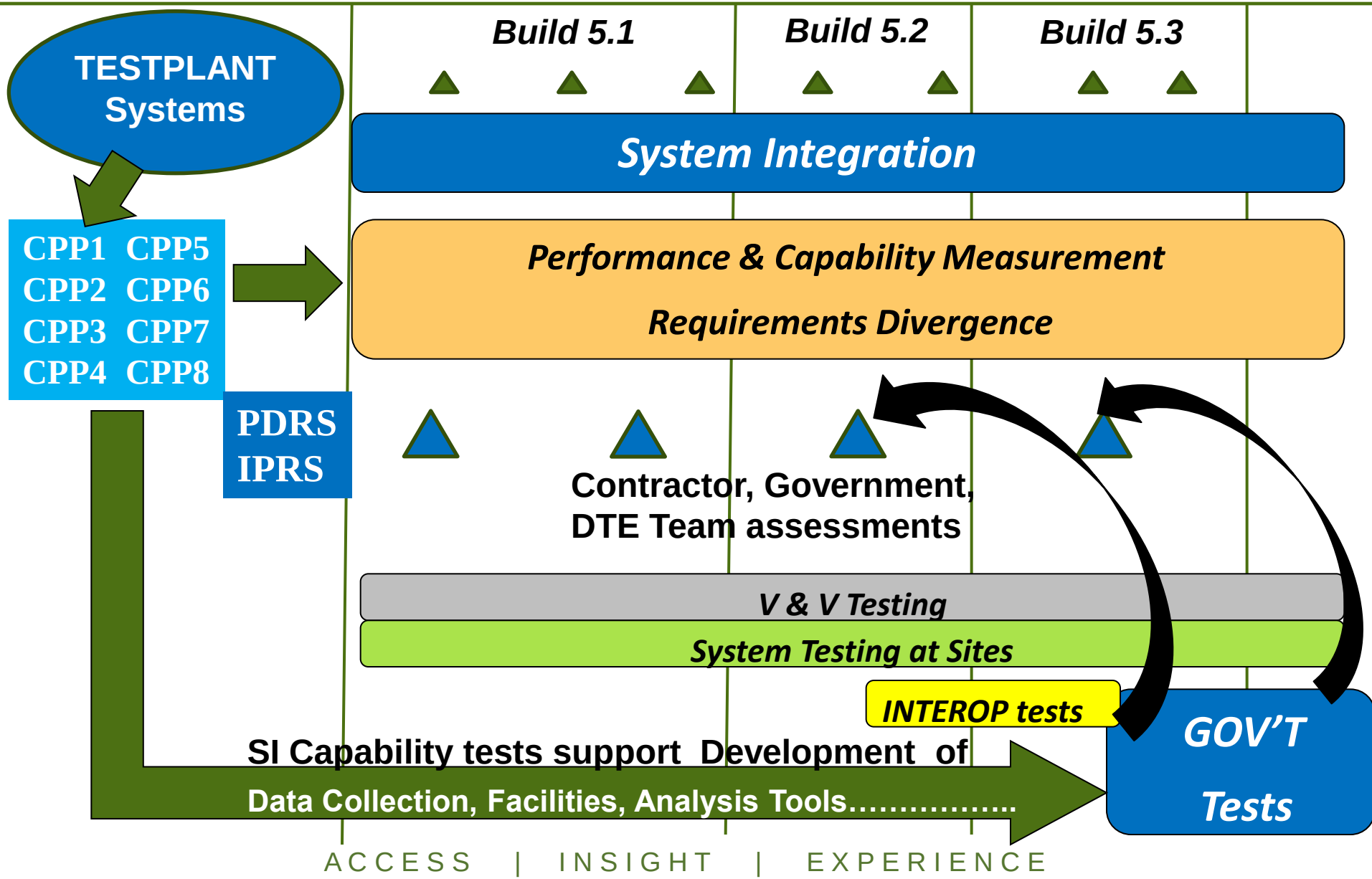

Systems Acquisition Cycle

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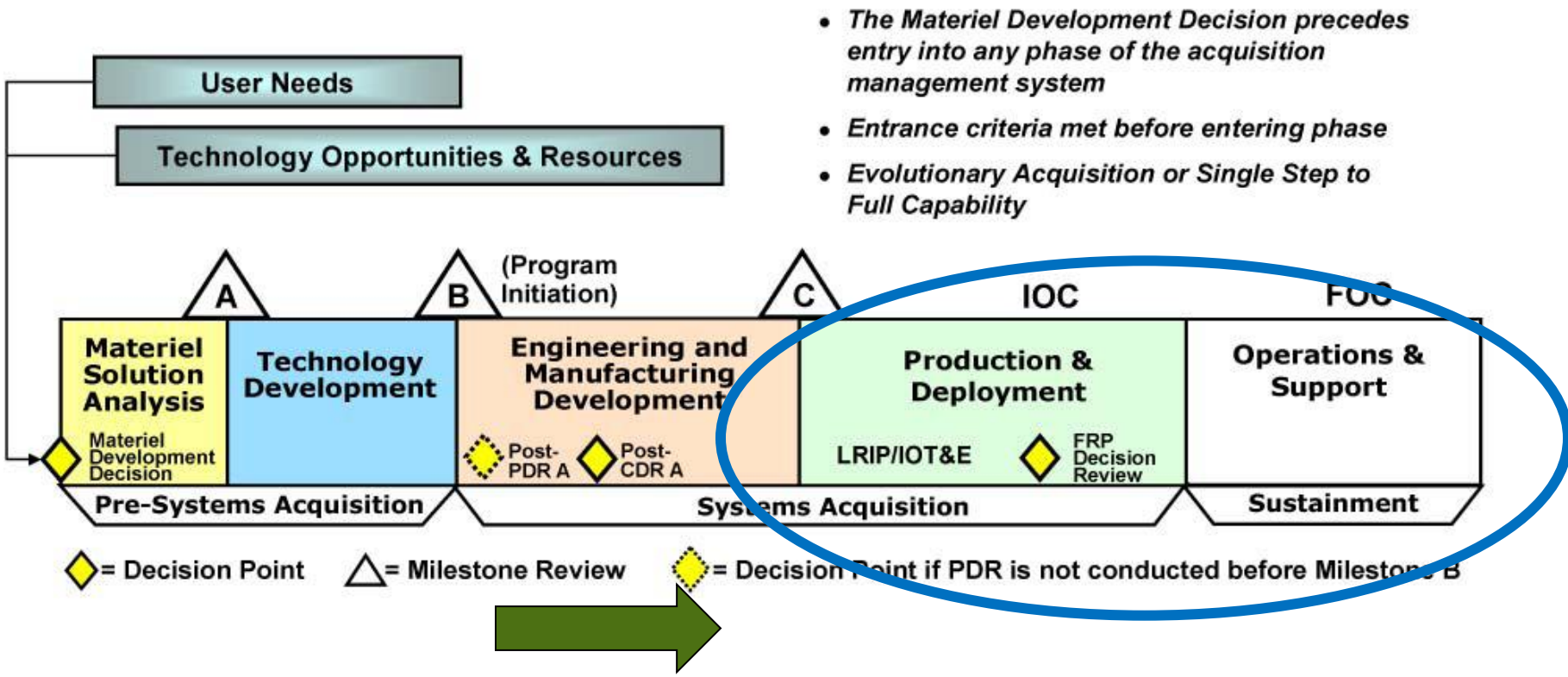

"SHOULD COST" ACHIEVED

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