Headquarters U. S. Air Force

Integrity - Service - Excellence

How Systems Engineering Can Support Developmental Test

NDIA Systems Engineering Conference

U.S. AIR FORCE

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Five Things The T&E Process Must Do

- Support early development of requirements
- Reduce technical risk (CT and DT&E)
- Test efficiently - avoid redundant effort
- Collaboration between testers, developers & users
  - Periodic “vector checks” toward IOT&E
- Verify capabilities achieved (IOT&E)
  - Final test report briefings to Air Staff and OSD

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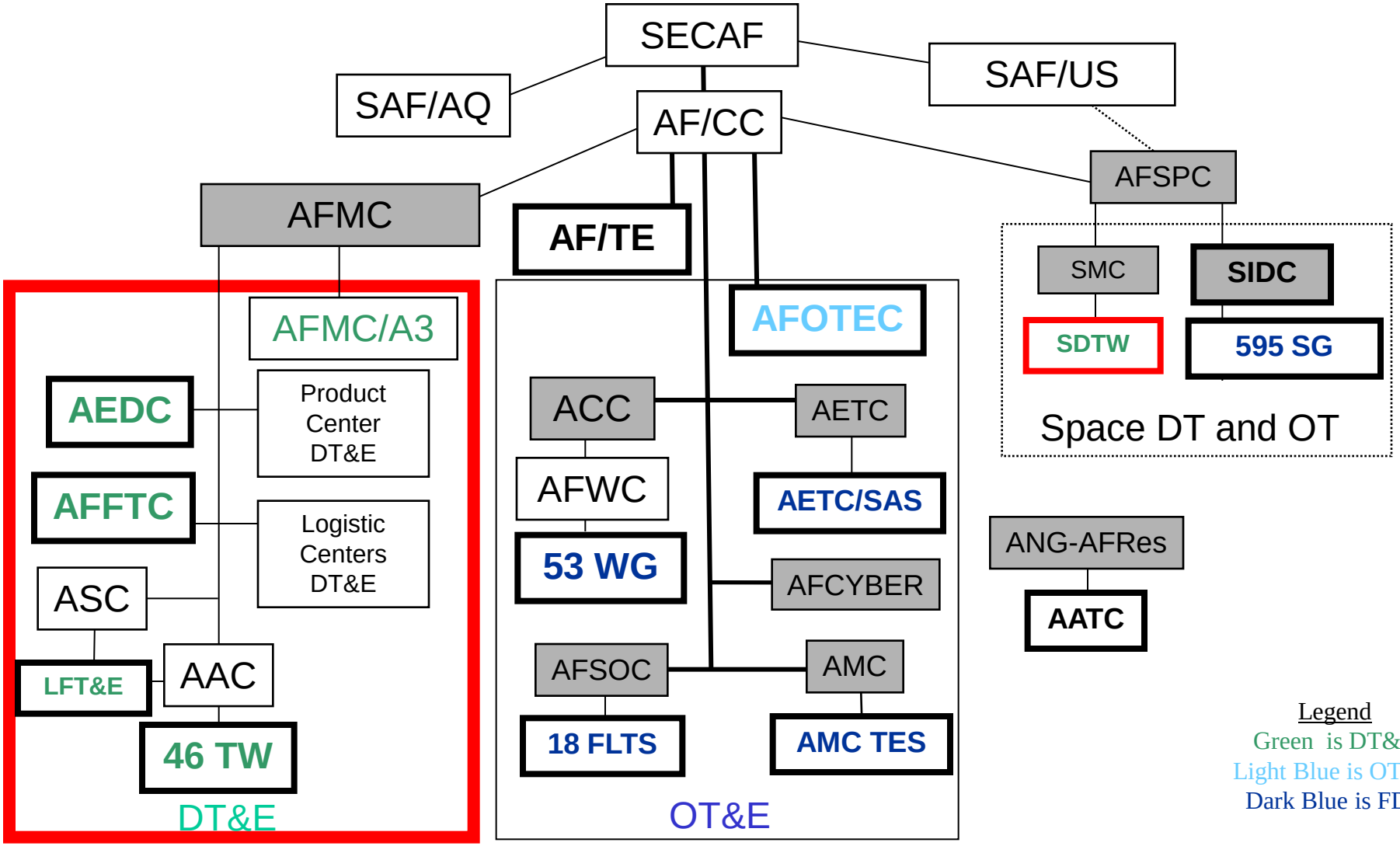
AF T&E Structure



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Systems Engineering at 4 levels

- Contractor (Prime & Sub) Level
  - Design Definition based on contract requirements
  - Attempts to tie design features to contract requirements
- DT Organization Level
  - Utilize Systems Engineering processes to improve testing
  - Testing to requirement correlation
  - Improved Systems-of-Systems understanding for testing
- Program Office Level
  - Operational Requirements to System Design Requirements
  - Provide framework for verification requirements of DT
  - Balance program schedule, risk, costs throughout lifecycle
- SAF/AQ and OSD Levels
  - Evaluate program schedule, risk, costs throughout lifecycle at SAF/AQ and DOD Levels

Systems Engineering

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SE Process

Enabling Concepts

JCIDS
MAC/CL &
RFP

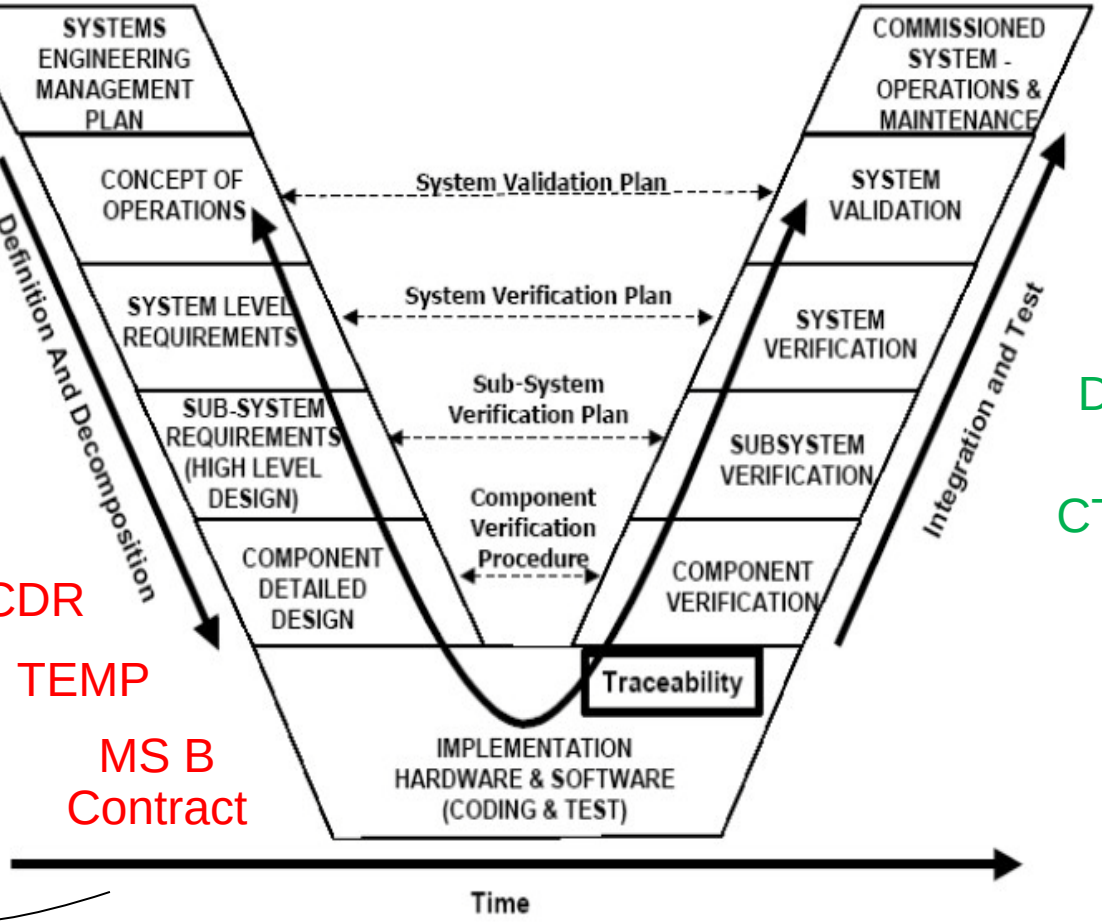
PDR

More T&E Involvement Needed Here

CDR

TEMP

MS B Contract



Sustainment

FDE

FOT&E

OT&E

LFT&E

DT&E

CT

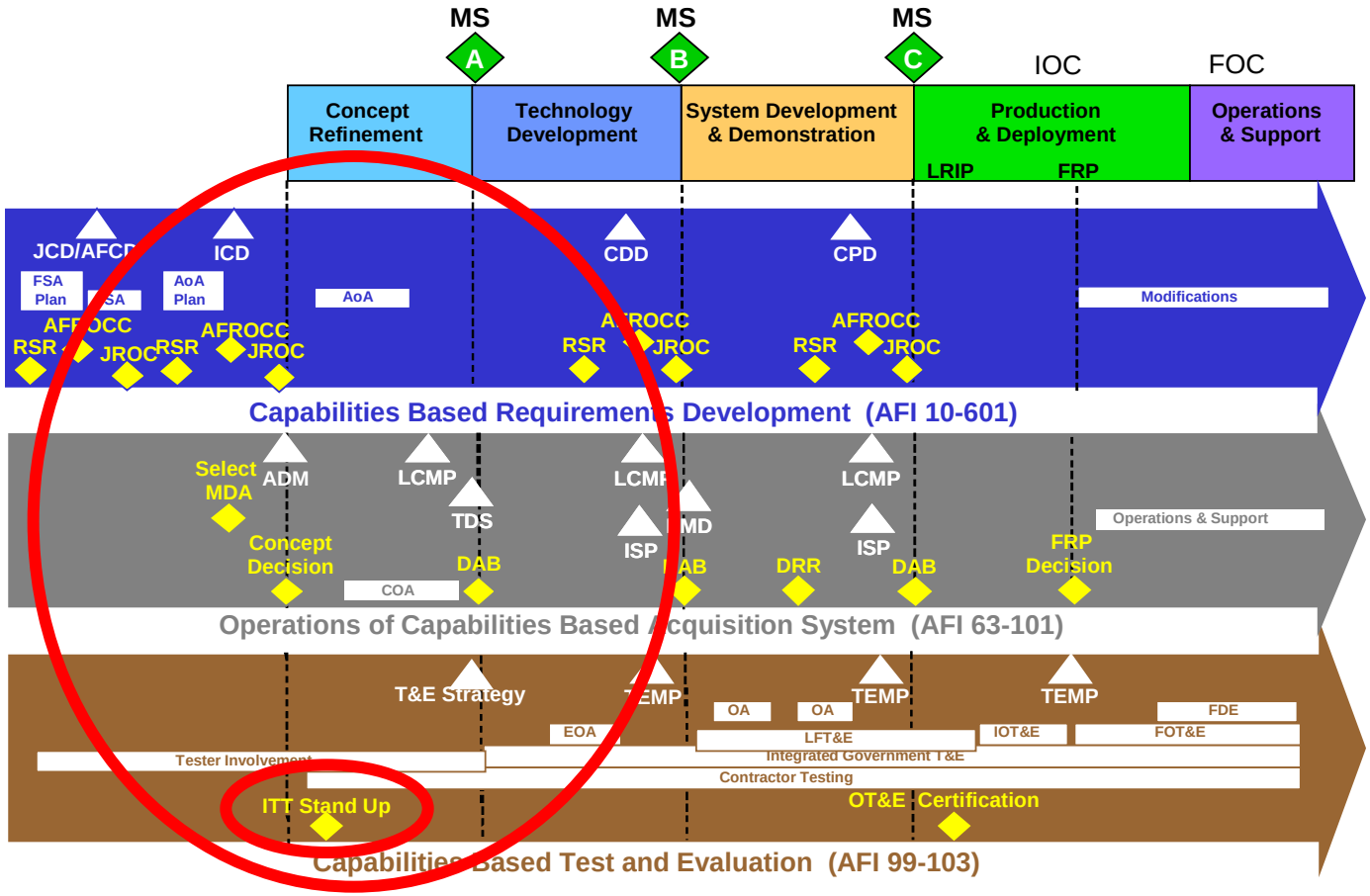
3 Major Processes Aligned -- Requirements, Acquisition & T&E

All 3 AFIs have same outline, use same terminology, and show this figure:

AFI 10-601
(Requirements)

AFI 63-101
(Acquisition)

AFI 99-103
(Test & Evaluation)



More T&E Involvement needed prior to MS B

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DT and SE Collaboration

- SE can aid DT by providing
  - Opportunities for early DT involvement beginning at MS-A
  - Assistance to AF/A3/5 in requirements definition
  - Early insight into schedule and risk assessments
  - Early insight into technical and test resource risks
- DT can aid SE by providing
  - Early input on definition and testability of requirements
  - Insight into test capabilities and limitations
  - Early detection of system Deficiencies and risks
  - Unique Lessons Learned from other programs earlier in development cycle
- Collaboration will improve early DT planning and increase understanding of system capabilities and risks

Challenges

- Requirements Definition
  - Ensure operational requirements are clear, testable, and verifiable
  - Ensure realistic and achievable technological goals (and avoidance of unobtainable conditions)
  - Achieve buy in from development/acquisition community
- Future Systems Integration and the NR-KPP
  - Requires significantly more systems engineering
  - DT knowledge of systems integration
  - Systems-of-Systems integration and testing
- Balance of DT and OT, and how to integrate them
- Development of SE knowledge base in DT