Tucson Embedded Systems

TES SAVi AWESUM™

Information Briefing & Demonstrations
TES-SAVi MBSE processes and tools
for next-generation complex system-of-systems development

Rapid Developing and Qualifying FACE Open Systems and Applications onto multiple US Aviation Systems

Presented to
Hon. Martha McSally, Congresswoman (AZ-02)
U.S. House of Representatives

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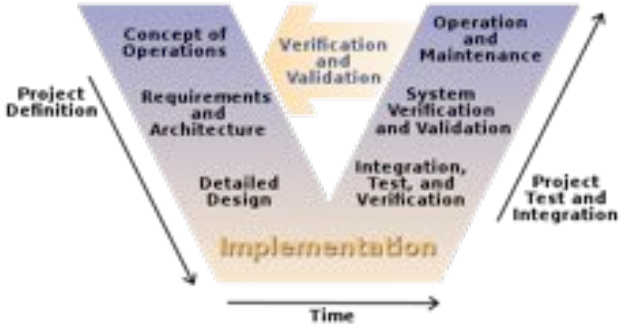
Stephen M. Simi
VP & PM for Military Aviation Programs
Tucson Embedded Systems, TES-SAVi AWESUM®
StephenS@TucsonEmbedded.com, https://tes-savi.com

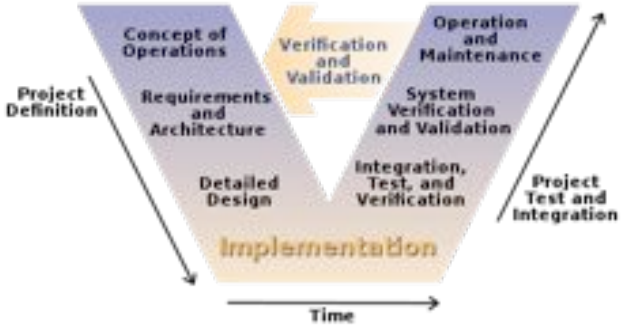
What If?



What if a ~90% Process Improvement awaits SoS E&I?

TES SAVi AWESUM™

What are?



What are the logical next steps to *Change Business as Usual*?

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Outline

- Introduce Promising Approaches
- Introduce TES-SAVi MBSE Capabilities, and how we got here
- Preview how we will apply these to Military Aviation opportunties
- Tour our Lab and demonstrate Virtual Operations

Promising Approaches – MOSA & MBSE

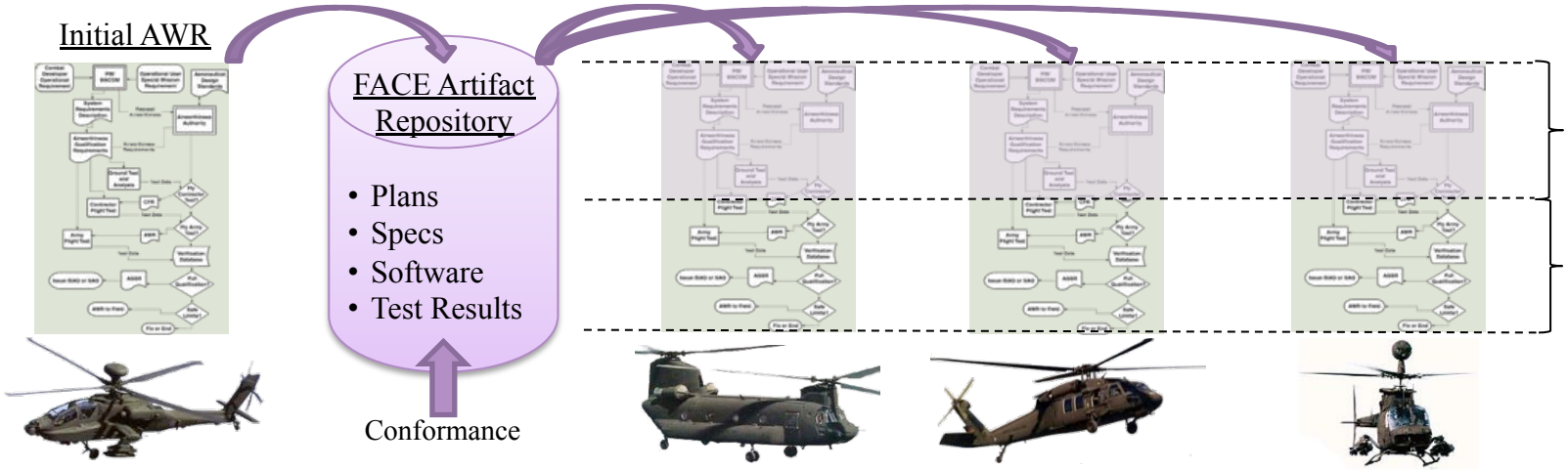
- ***Promising Approaches*** - Rapid development and deployment of advanced highly-integrated system(s)-of-systems of flight-ready capabilities applied to existing fleet, and next-generation future vertical lift family of systems

  - Modular Open Systems Architecture (**MOSA**), like FACE™ – Future Airborne Capability Environment), combined with
  - Model-Based Systems Engineering (**MBSE**) processes and tools -- provide ability to represent complex systems, develop and qualify at increase speeds

- Collectively MOSA/FACE & MBSE stand-ready to provide many benefits
  - Government-own interfaces based on Open Standards; portable, reusable software capabilities addresses obsolescence and encourages innovation; reduction of program schedules and costs, speed capability integration; increase capability interoperability – improves battlespace situational awareness
  - Regain ownership (control) of aircraft interfaces – promote *aviation plug-n-play*
  - Break-up Platform and OEM stove-pipes, and change the business as usual, and
  - Procure reusable portable capabilities (applications)

Illustrate What we Desire

- We know – Smart Designs and Processes have Benefits
  - Smart Designs – Modular Open Systems, FACE Future Airborne Capability Environment promote the development of advanced avionic applications with well-defined interfaces
  - Smart Processes – MBSE processes and tools present systems engineers with opportunities
- Therefore, we are positioned to achieve the Goal
  - Rapid Acquisition (Development, Qualification, *and cross-platform Integration*) of reusable Aviation Capabilities [cyber-physical systems on complex SoS aircraft]
  - Regain ownership (control) of aircraft interfaces – promote aviation plug-n-play
  - *Procure reusable portable capabilities (applications) and field them*



Introduce TES-SAVi's MBSE capabilities

- Introduce TES-SAVi's MBSE capabilities applied to development of FACE™ products, and demonstrate the systems architecture virtual integrations (SAVI) and operations of these products in a virtual systems integration lab (V-SIL)

- We have developed advanced capabilities aligned to FACE technical standard, and will demonstrate flight operations of 3 military aircraft (manned and unmanned) in a hostile environment to verify and validate integrations and operations of our design and development efforts

- 14 years in the making; *how did we get to this point*?

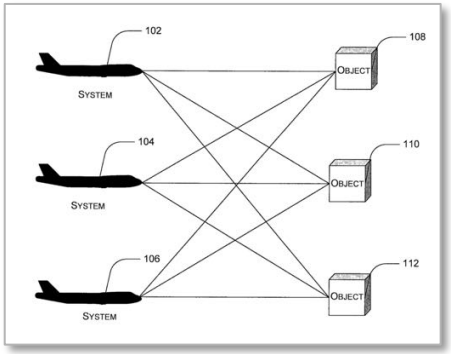
A: It was "Luck"

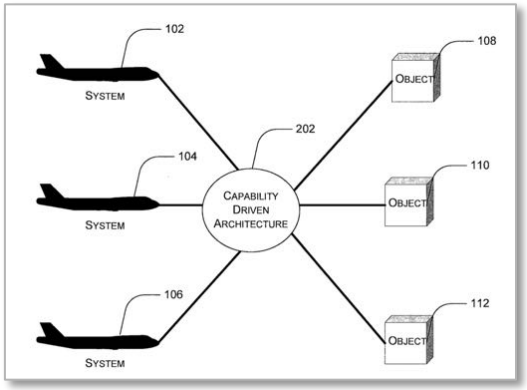
"Luck" – *When proper planning, meets opportunity*..."
Ref., John Piasecki, PiAC – Aviation Historic Family

How Did We Get Here? - Background

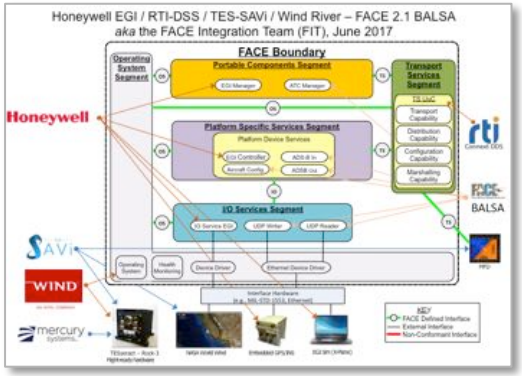
- Contracted PEO-AVN 2003 – investigate addressing Stove Pipe Integration issues
  - performed on the Common Software Initiative (CSI)
  - concluded in Common Software demonstration to PEO-AVN 2006

- TES Intellectual Property - Capability-Drive Architecture (CDA), Patent 2010





- Joined FACE Consortium at inception, 2010
  - performing as a major contributors (next slide)



How Did We Get Here? - Background

- TES-SAVi established 2013 at the FACE Tucson Member's meeting
  - To support FACE Ecosystem - develop model-based tools, and produce product to FACE™
    - Our product line, AWESUM™, and engineering services will speed capability integration using our end-to-end unified life-cycle tool suite
  - Actively defining FACE Standard and processes, we fly and meet every 6-8 weeks, past 7-years
  - May 2014, TES-SAVi FACE VA became officially approved and is sanctioned to serve as a registered FACE Verification Authority (VA), *industries' first* FACE VA
  - TES developed *US Army's first* FACE Verified Product, R2C2 (Reusable Radio Control Component), August 2016, using US Army AMRDEC FACE VA
  - TES-SAVi verifies Wind River VxWorks 653 v2.5, Operating System Segment – *first FACE RTOS*. Conformance on 15 March 2017
  - TES services developed the baseline, and TES-SAVi verified Honeywell's Embedded Global Positioning System Inertial Navigation Systems, Platform-Specific Services Segment. Conformance on 6 April 2017
  - FACE Leadership Roles:
    - co-Lead Data Architecture Working Group (DAWG), and
    - co-Lead in Integration Workshop (IWS), twice-weekly calls, +++ hours
  - Helped organized, exhibited, and presented technical papers at every FACE TIM (Army, NAVAIR, and Air Force) since 2012

How Did We Get Here? – FACE Experts

- TES-SAVi established 2013 at the FACE Tucson Member's meeting
  - Helped organized, exhibited, and presented technical papers at every FACE TIM (Army, NAVAIR, and Air Force) since 2012

TES Demonstrating FACE Capabilities to Air Force General Moore, Spring 2013. And demonstrated collaborative battlespace of 5 Army aircraft (Apache, Chinook, Black Hawk, Kiowa Warrior and unmanned Grey Eagle) at FACE Tucson 2013 to Army General Crosby, Fall 2013.

Questions? then Let's go Tour – TES-SAVi