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ORANGE FLAG: INNOVATING T&E

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EDWARDS AFB, CA

MAY 2018

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EDWARDS AIR FORCE BASE, CALIFORNIA
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UNITED STATES AIR FORCE

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14. ABSTRACT An overview of Orange Flag evaluations. Orange Flags are multi-Mission-Design-Series developmental test events that include dozens of instrumented aircraft from the Air Force, Navy, and Marines. The intent is to provide materiel solutions to problems that result from operating in system of systems environment. The need for this arose from the loss of decomposability – the systems no longer worked the same in isolation as they did when part of a mixed-system force.						
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Orange Flag: Innovating T&E

ITEA Test Instrumentation Workshop
May 2018

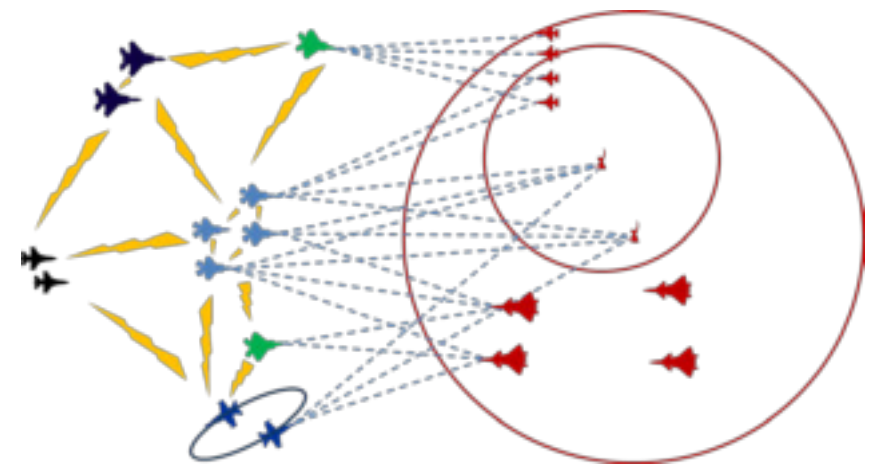
Christopher Klug
412 Operations Group
Technical Advisor



Orange Flag Overview

- Why – Loss of Decomposability
- What – An Instrumented, Dense, Multi-MDS Test Capability
- Where – Location Agnostic
- Who – A Mix of DT & OT and Air Force & Navy
- When – Quarterly Events
- How – Innovation Driven
- Opportunities and Challenges
- Discussion

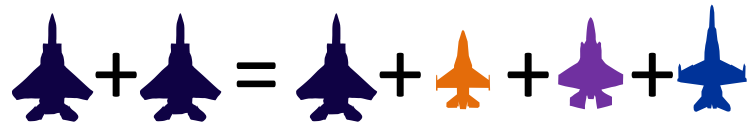
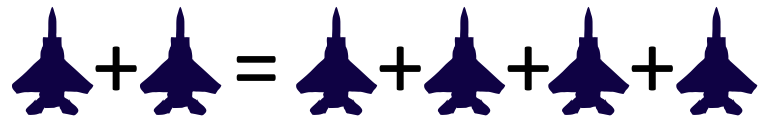
The Near Peer Fight





Why Orange Flag? Loss of Decomposability

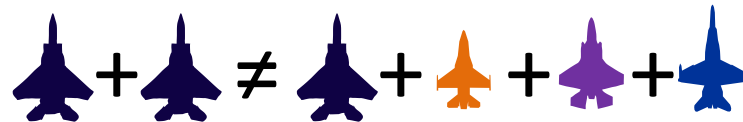
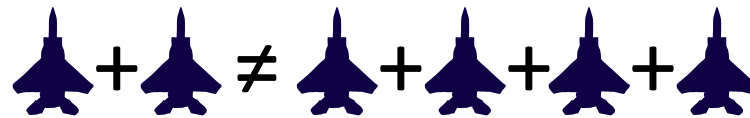
Decomposable*



Tech Adequate <~2013

*Decomposable to single MDS

Non-Decomposable**



**Decomposes to $2^n - (n+1)$ if each A/C is decomposable

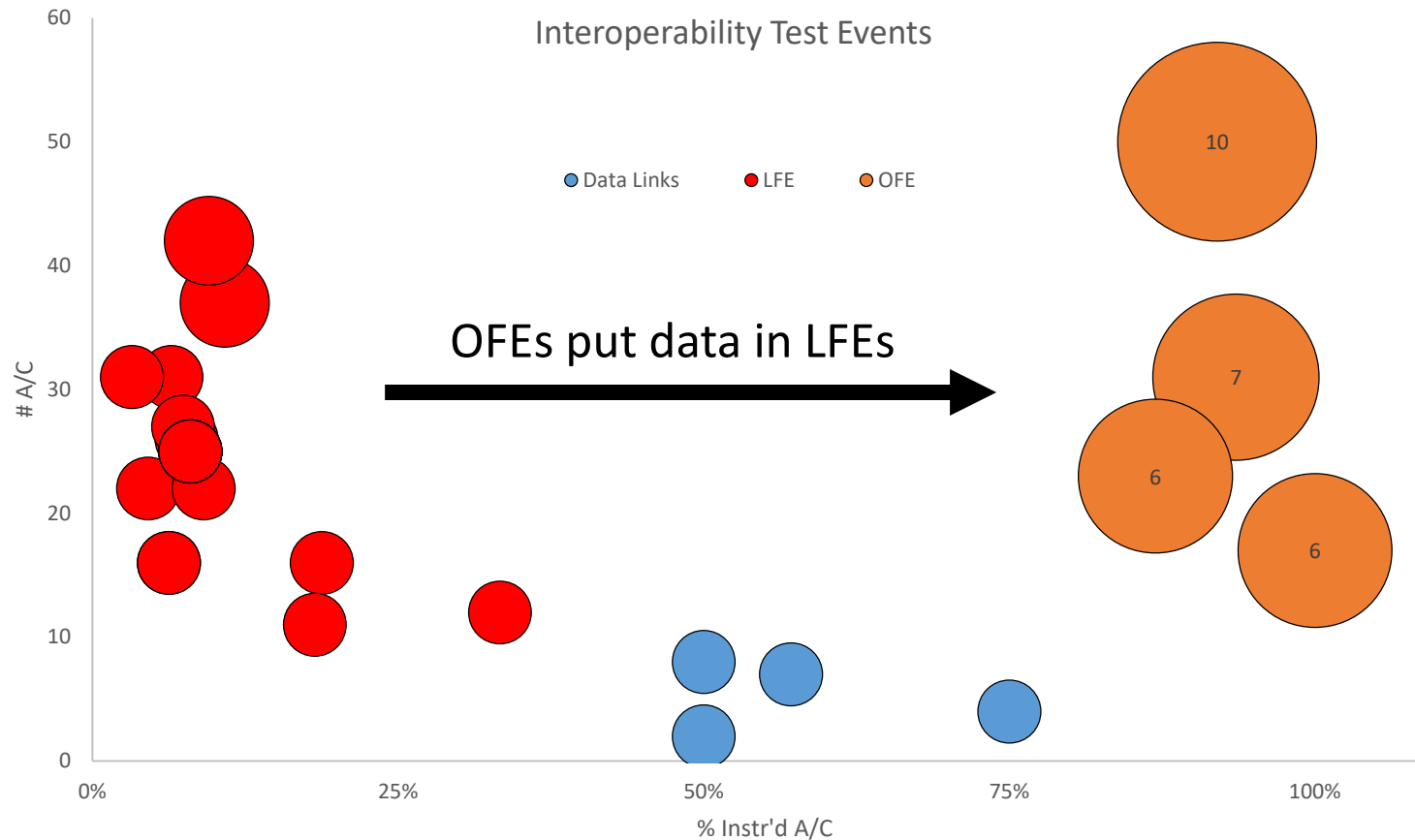
Example: 27 SI'd A/C decomposes to 134M missions

Loss of Decomposability:
Systems do not work the same in isolation as they do when part of a mixed-system force

Non-Decomposability Requires Dense Multi-MDS Test Cape



What is Orange Flag? Instrumented LFE



of Instr'd MDSs: 1 2 6+

Orange Flag Events:

- Instrumented
- Dense (many players)
- Multi-MDS
- Test Events

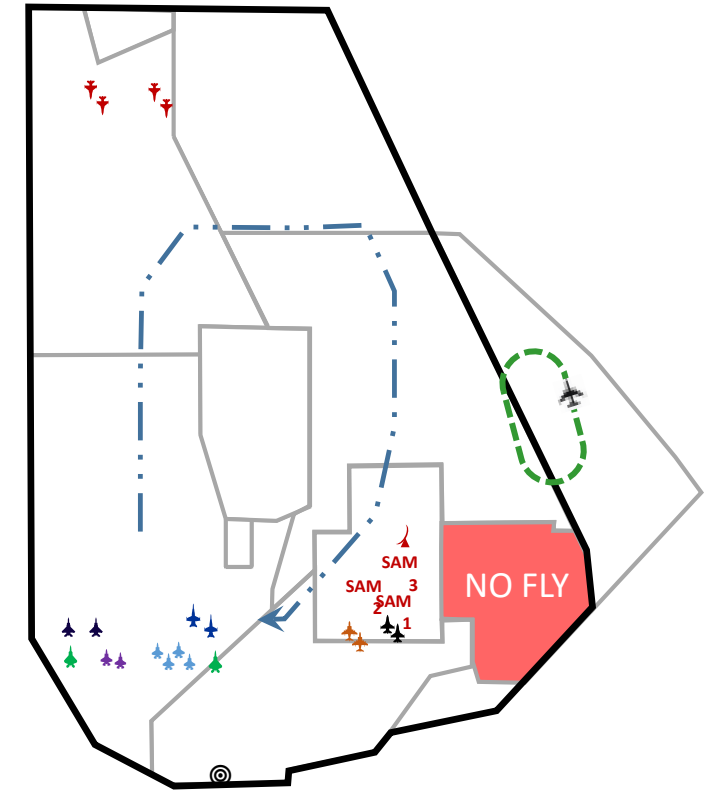
Instrumentation:

- Onboard Recording
- Some Telemetry
- TSPI



Where? Location Agnostic

- **Airspace Agnostic (So far on West Coast)**
 - R-2508
 - Sea Test Range
- **Requires Large Restricted Airspace**
 - LFE style coordination
 - Semi-scripted flow – tactically representative
 - Scenarios stress systems in relevant manner
- **Participants Not Required to be Co-Located**
 - Most participants take off from home field
 - Coordination primarily VTC/Phone





Who Participated in Orange Flag?

- Multi-Service: Air Force, Navy, and Marine Aircraft
 - Fighter/Attack: F-15C/E, F-16C/D, E/F/A-18C/D/E/F/G, F-22, F-35A/B/C, AV-8B
 - Bombers: B-1
 - Command & Control: E-2C, E-2D, E-3
- Developmental Test & Operational Test
 - A collaborative effort across DT & OT
 - DT = materiel solutions & OT = TTP solutions
- Collaboration = Lethality for the Warfighter
 - Innovation impacting technological superiority
 - Provide capability more quickly & for less costs





When & How? Quarterly & Innovatively

When – Quarterly Event

- 2017 Events = June & October
- 2018 Events To Date
 - 15 Feb – featured on CBS News
 - April event over the water
- Test Requirement Driven
 - Test plans/points
- Regular Events Enable Planning
 - More specific test planning

How – Innovation Driven

- First Event Driven by Optimization
 - Several MDSs had similar test points
 - Common targets saved support lines
- Demonstrated $\text{Whole} > \sum \text{Parts}$
 - Generated unique data sets
 - Answered ‘burning’ questions
- Executed in Organizational Seams
 - No one ‘owns’ Orange Flag
 - Collaboration at its best



Opportunities & Challenges*

- Unique Data Sets Require Unique Data Analysis
 - Opportunity: Innovation opportunity to develop cross-platform analysis tools
 - Challenges: Accomplishing data analysis w/ traditional practices
- Collaborating with Data Analytics/Big Data Subject Matter Experts
 - Opportunity: Leverage commercially available data analysis capabilities
 - Challenge: Collaborating on flight test data in a classified environment
- The Acquisition & Test Communities Have Single-MDS Governance
 - Opportunity: There is no one to say 'no' to the coalition of the willing
 - Challenge: Success is dependent upon the willing v. institutionalized

* Examples of Information Age Execution in an Industrial Age Organization



Discussion

