

412TW-PA-18251



ORANGE FLAG: INNOVATING T&E

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EDWARDS AFB, CA

MAY 2018

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412TW-PA-18251

412TH TEST WING
EDWARDS AIR FORCE BASE, CALIFORNIA
AIR FORCE MATERIEL COMMAND
UNITED STATES AIR FORCE

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. **PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.**

1. REPORT DATE (<i>DD-MM-YYYY</i>) 03-05-2018		2. REPORT TYPE Briefing Slides		3. DATES COVERED (<i>From - To</i>) 15-17 May 2018	
4. TITLE AND SUBTITLE Orange Flag: Innovating T&E				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S) Christopher Klug				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) AND ADDRESS(ES) 412th Test Wing 195 E Popson Ave Edwards AFB CA 93524				8. PERFORMING ORGANIZATION REPORT NUMBER 412TW-PA-18251	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) 412th Test Wing 195 E Popson Ave Edwards AFB CA 93524				10. SPONSOR/MONITOR'S ACRONYM(S) N/A	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release A: distribution is unlimited.					
13. SUPPLEMENTARY NOTES International Test and Evaluation Association (ITEA) Test Instrumentation Workshop (TIW) / Las Vegas, NV / 16-17 May 2018					
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.					
15. SUBJECT TERMS OFE(Orange Flag Evaluations), Decomposability, Interoperability, DT(Developmental Test), OT(Operational Test), Governance, Information Age.					
16. SECURITY CLASSIFICATION OF: Unclassified			17. LIMITATION OF ABSTRACT None	18. NUMBER OF PAGES 11	19a. NAME OF RESPONSIBLE PERSON 412 TENG/EN (Tech Pubs)
a. REPORT Unclassified	b. ABSTRACT Unclassified	c. THIS PAGE Unclassified			19b. TELEPHONE NUMBER (<i>include area code</i>) 661-277-8615



Orange Flag: Innovating T&E

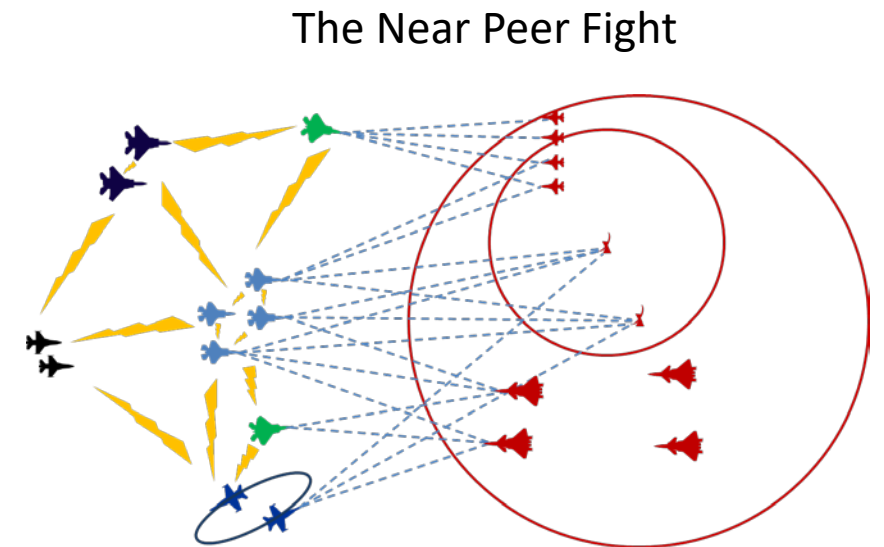
ITEA Test Instrumentation Workshop
May 2018

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Orange Flag Overview

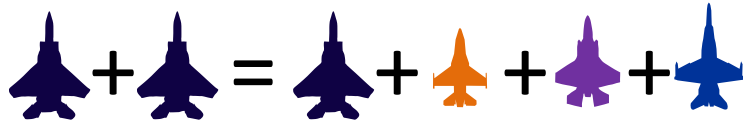
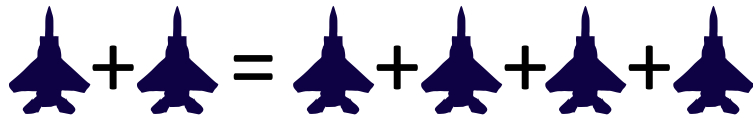
- Why – Loss of Decomposability
- What – An Instrumented, Dense, Multi-MDS Test Capability
- Where – Location Agnostic
- Who – A Mix of DT & OT and Air Force & Navy
- When – Quarterly Events
- How – Innovation Driven
- Opportunities and Challenges
- Discussion





Why Orange Flag? Loss of Decomposability

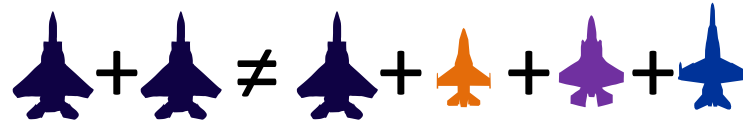
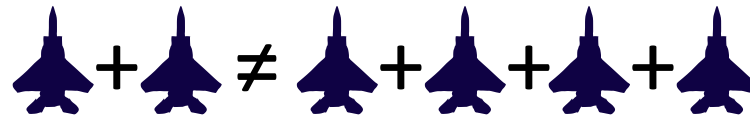
Decomposable*



Tech Adequate <~2013

*Decomposable to single MDS

Non-Decomposable**



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

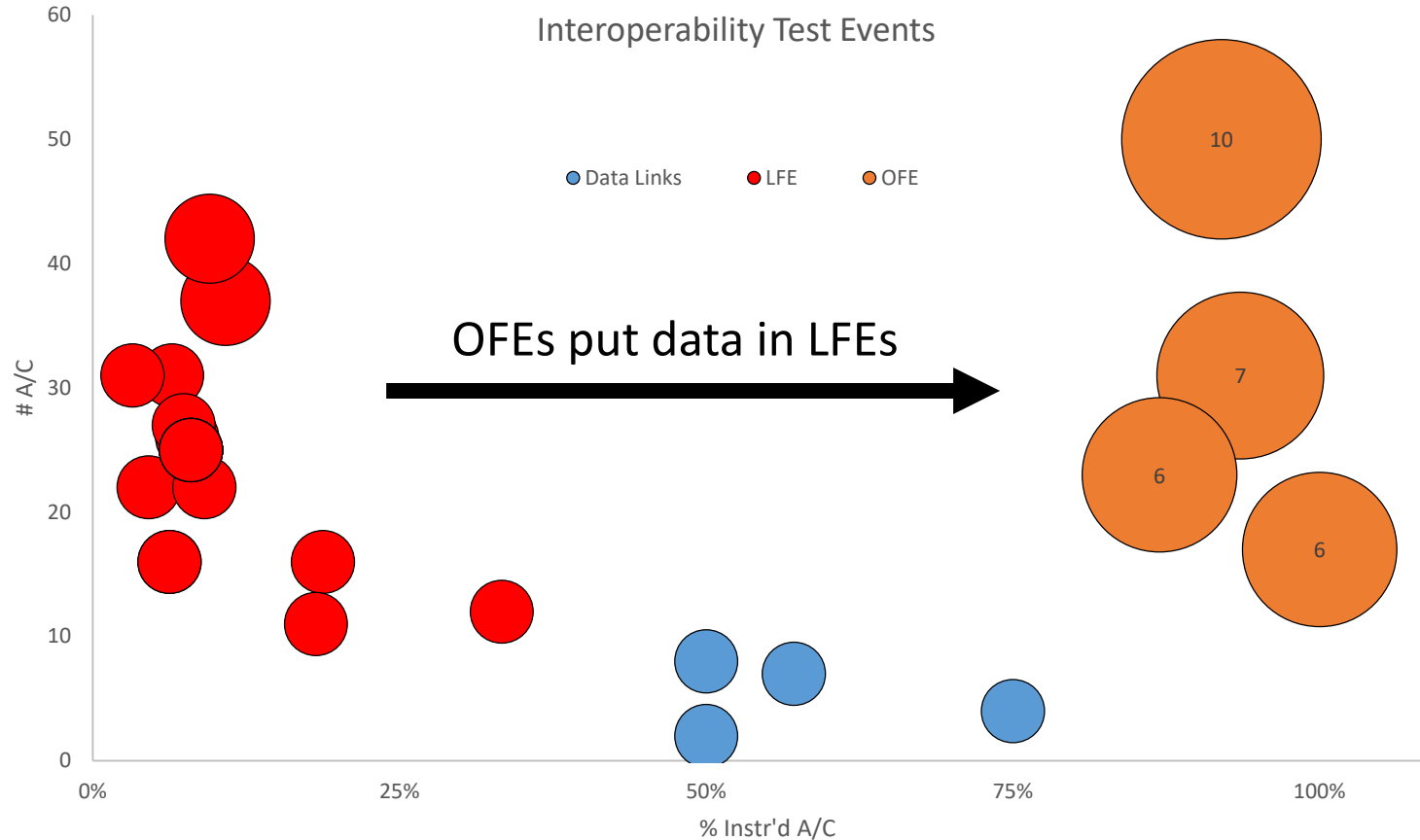
Example: 27 SI'd A/C decomposes to 134M missions

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

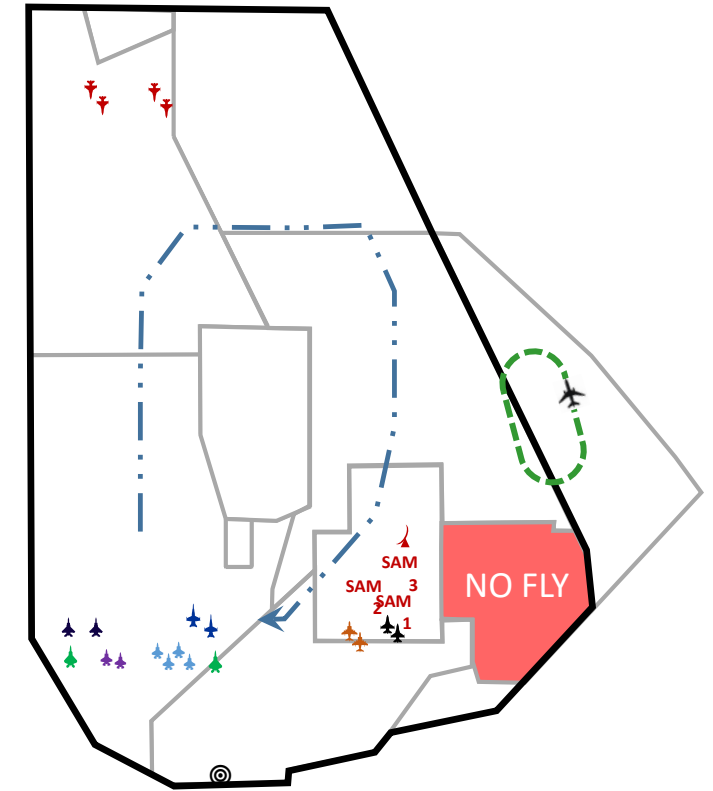
Instrumentation:

- 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

