



The AF Vision for Capability Development

From Concept to T&E:

An MS&A Infrastructure Transformation



8 Mar 2017

Dave Panson
MS&A Lead

AF Strategic Development Planning
& Experimentation



Air Force Capability Development

...AF leadership needs a mechanism to recognize the highest priority operational challenges and opportunities and align them with strategy, planning, programming, requirements and acquisition activities across the enterprise.” - Signed by SECAF, CSAF – May 2016

- **CDC - Capability Development Council**

- Identify Priority Challenges – Commission new ECCTs
- Drive CSAF approved ECCT Recommendations into SP3



- **vCDB – Virtual Capability Development Board**

- GO level group vetting for CDWG to CDC



- **CDWG – Capability Development Working Group**

- Working group to vCDB and CDC
- Review and assess progress on Capability development



AF/A5R & SAF/AQR
Co-Chairs

- **SDPE - AF Strategic Development & Experimentation Office**

- Organize, Train and Equip ECCTs
- Oversee ECCT Flight Plans and COAs
- Run AF Experimentation



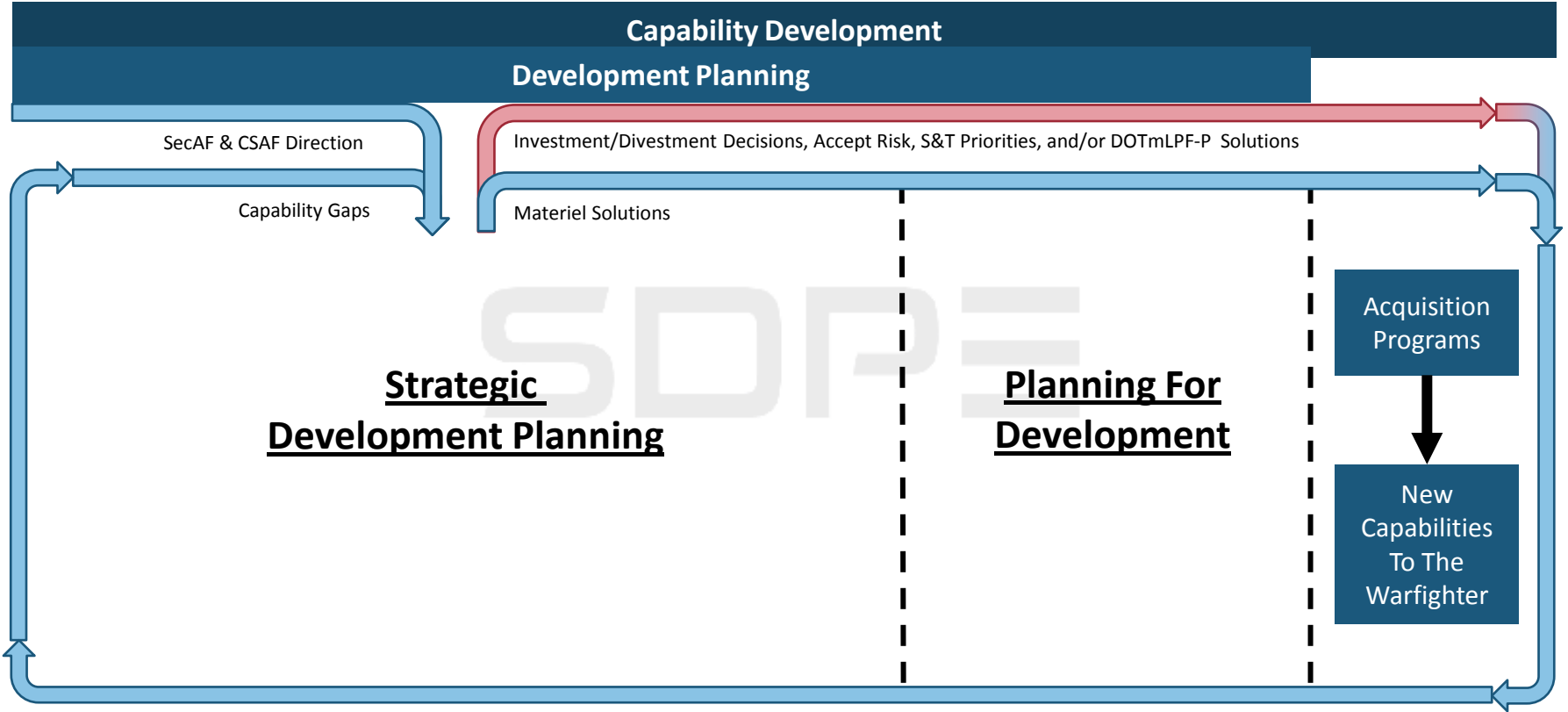
Director

Enterprise Capability Collaboration Team (ECCT)

Cross-AF team tiger teams focused on multi-domain challenges



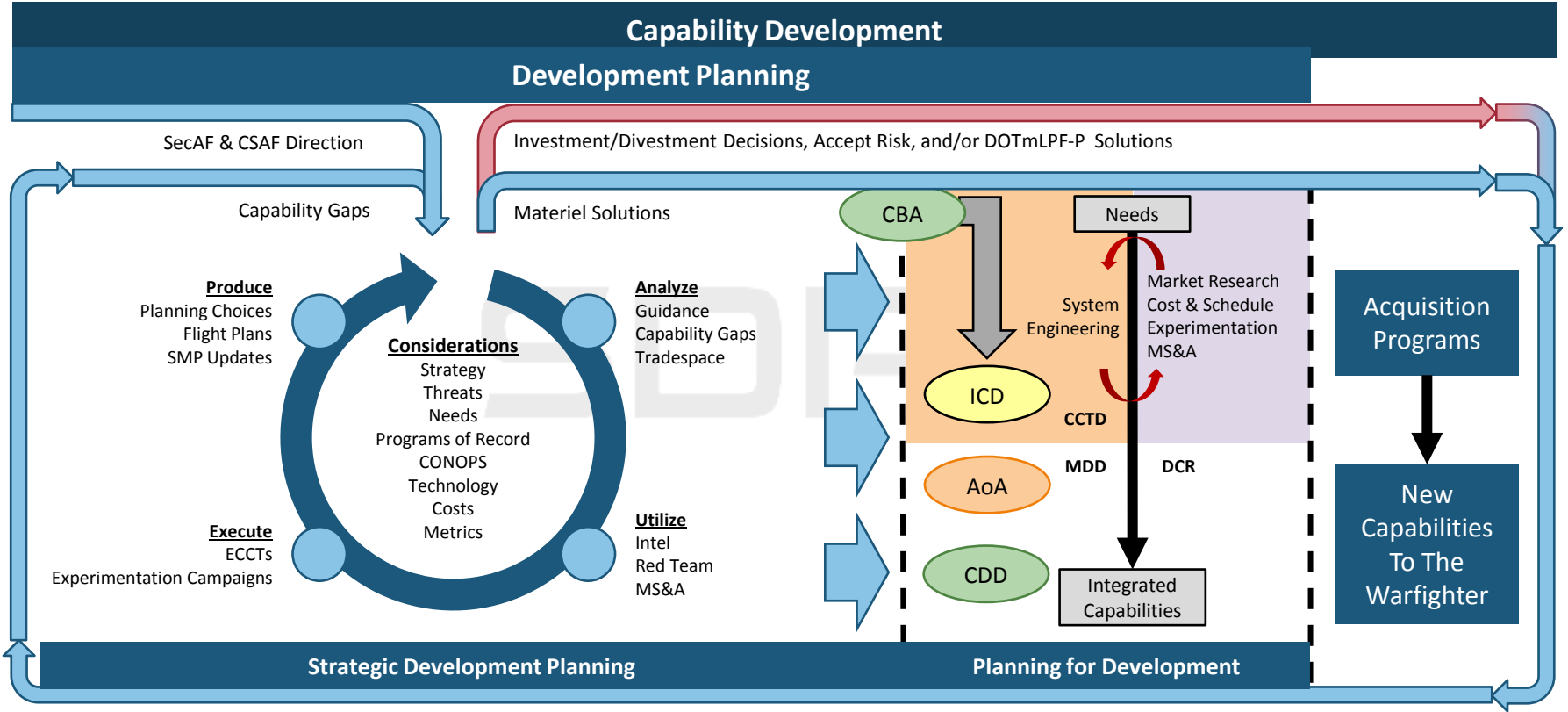
Development Planning Process





Processes & Products

Strategic Development Planning and Planning for Development





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Air Force Strategic Development Planning

Modeling, Simulation & Analysis

“This analytical effort requires **modern tools** and **knowledgeable analysts** to perform the multivariate analysis needed to enable definition of the required force that meets the needs, assures robustness, and maintains flexibility while operating in the fiscal constraints facing the nation and the Air Force today. **The Air Force appears to lack these tools and the analyst cadre to use them.**” *Finding 2.8*

- **MS&A is an essential component for USAF level success**
- **Facilitate ECCT’s, Experimentation Campaigns, etc...**
- **Must support:**
 - **Cross domain, multi-service, multi-agency/organization, & coalition**
 - **Very broad trade spaces, rapidly, system-of-systems, future operating concepts**
 - **Development of virtual prototypes and putting the ‘warfighter in the loop’**
- **Threat representation (performance/modes/doctrine/TTPs)**
- **Advanced technologies/concepts**



SDPE MS&A Roadmap

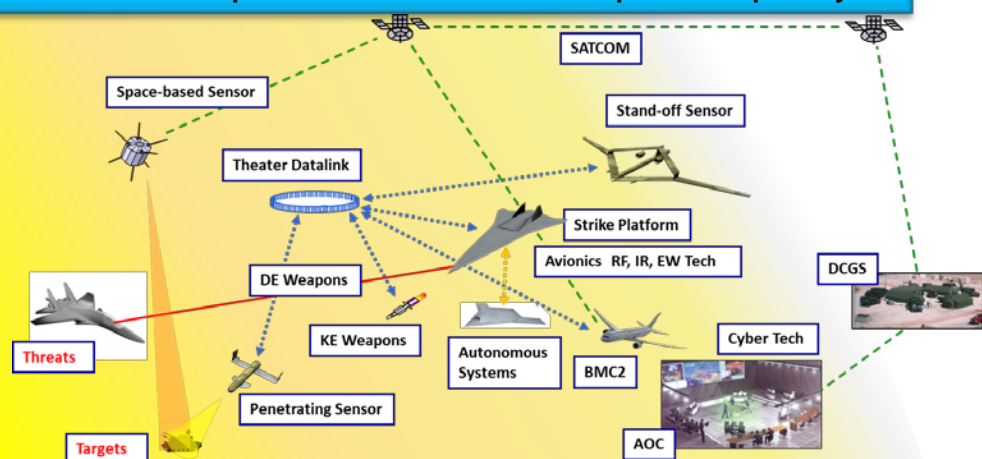
- **Identify, evaluate, and prioritize investments in MS&A infrastructure to:**
 - Enable agile ECCT assessments & Experimentation Campaigns
 - Provide consistent, credible, and timely DOTmLPF-P trade-space and cost capability analyses
- **Process:**
 - Determine MS&A capabilities required to support strategic development planning
 - Develop a framework for investigating and assessing current MS&A capability to support strategic development planning
 - Prepare a roadmap to identify, prioritize, and sequence improvements in MS&A capability to support strategic development planning



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Transformation ~~MS&A Infrastructure Lacking~~ for Multi-Domain Analysis

Air Warfare Example w/Cross domain solution space –air/space/cyber

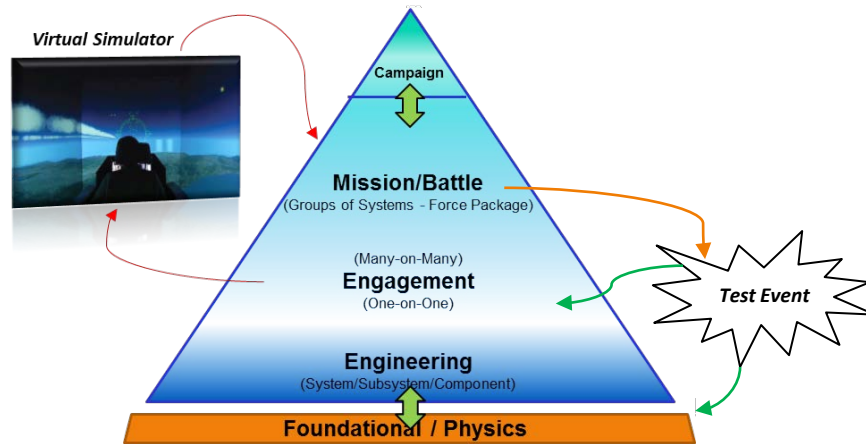
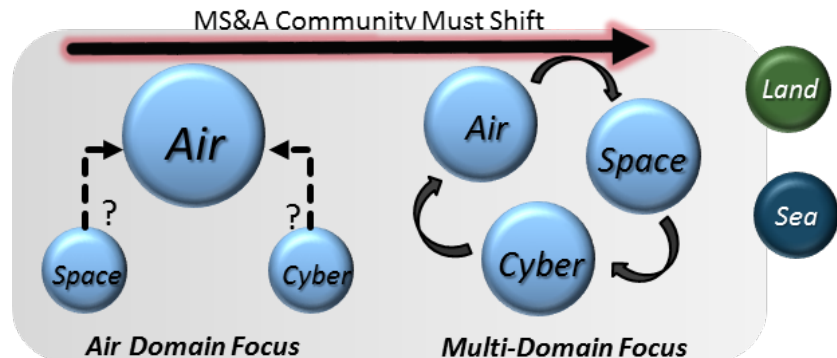


Air Force Enterprise Holistic Process

USAF MS&A Infrastructure:

- Tools – robust, re-usable
- Data – standardized, accessible
- People – trained, USAF matrixed teams
- Processes – streamlined, efficient
- Partnerships – full DOTMLPF, multi-service, industry, & coalition

TDP3



Streamlined, efficient, holistic USAF enterprise approach needed to enable faster, better, cheaper analysis

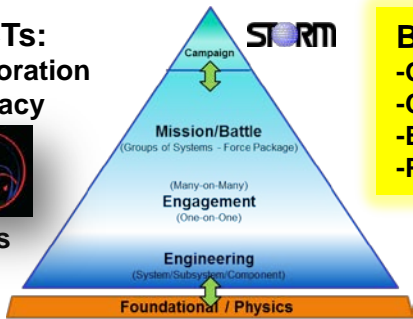
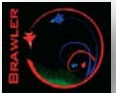


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USAF MS&A Enterprise Infrastructure Streamlined Tools, Data, and Processes

Early Experimentation/ECCTs:

- Rapid, broad trade-space exploration
- USAF M&S Toolbox-new & legacy tools
- Constructive emphasis
- Linkages to HPCs & foundational/physics level tools
- Govt & industry partners



Broad Use Case Applications:

- Operations Research
- CBA's, AoA's, Force Capability Assmnts, ...
- Experimentation & **Wargaming** Support
- Programs, plans, and ops



Mature Experimentation:

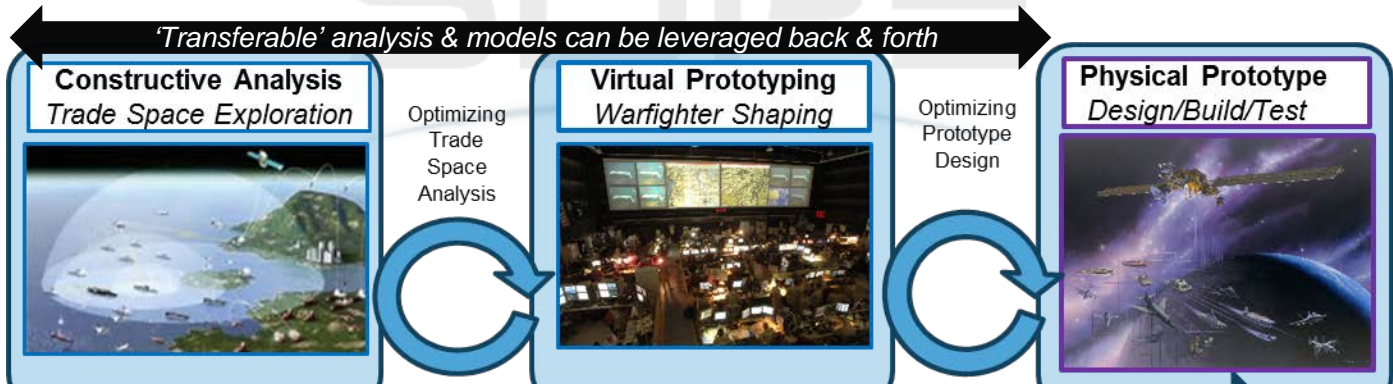
- War-Fighter in the loop
- JSE/SIMAF
- Virtual Prototyping
- Flight test/OTE
- Govt & industry partners

A paradigm shift is underway to enable faster analysis across an engineering-engagement-mission level modeling *continuum* w/linkages to foundational and campaign levels as needed



Integrated tools/environment for doing LVC operations at high framerates for 5th Gen platforms

Common baselines, data pedigree, common frameworks, interoperable, re-useable, multi-layered security, ORSA's/SME's, cross domain, multi service



Enabling Integrated Capabilities by measuring Mission Effect Chain performance



Common Framework Example: AFSIM

What is AFSIM?

A generic simulation framework allowing rapid scenario composability across *engineering to mission level* simulation needs

AFSIM is more than an IADS Simulation

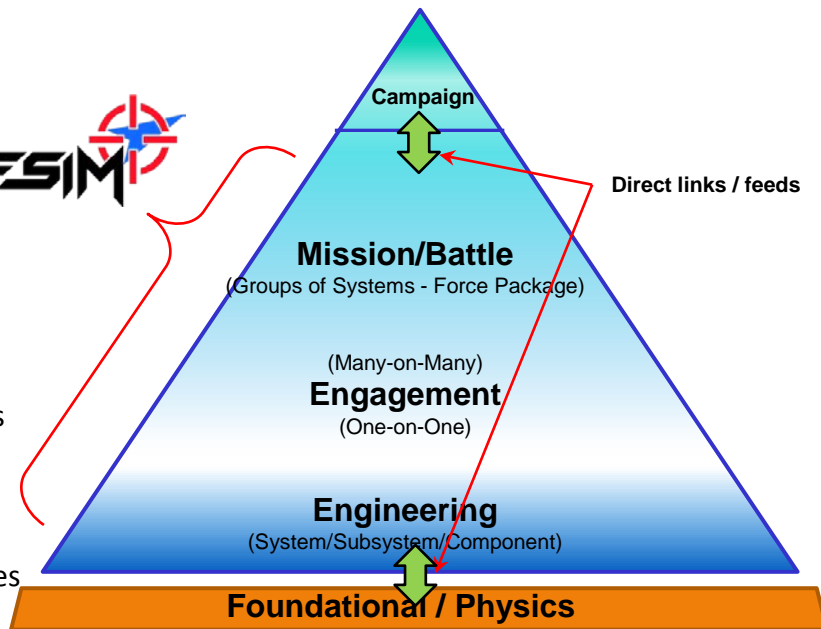
- Allows for simulation creation from **subsurface to space**
- Multi-Resolution modeling: parametric to full 6-DOF
- Analytical framework executes a single simulation utilizing the traditional Engagement to Mission Level approach or combine all the capabilities
- Available flexible Artificial Intelligence entity control mechanisms
- Unique 'commander-in-the-loop' capabilities for M&S supported wargames
- Inherent 'Design of Experiments' and HPC center linkages

Why was AFSIM Developed?

- Needs of some users within the analysis community were not being met
- Traditional gov't sims lack flexibility for advanced concepts and technologies

Air Force Tool

- Cross Org USAF CCB, gov't & industry requirements board, managed by AFRL
- Available to gov't & **industry** at no cost - Includes source code, **available for IRAD**

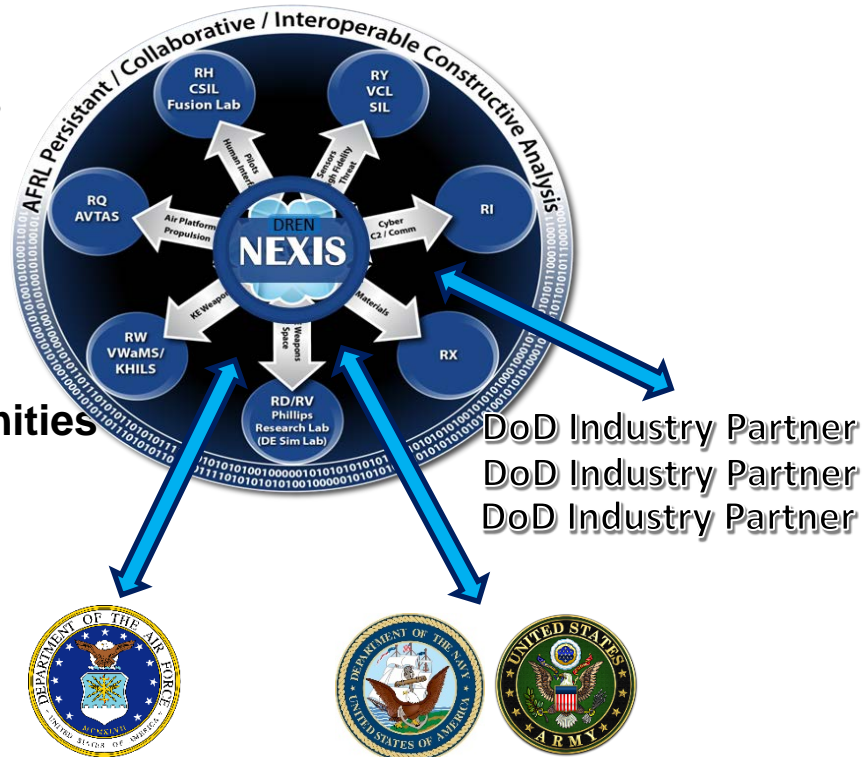


AFSIM rapidly becoming an Air Force standard – AFRL, A9, AU, AFIT, AFLCMC,... & NAWCWD, CAA, ERDC, Boeing, Lockheed, Northrop, Raytheon, Rand, GTRI, JHU...



Collaborative Networking Example: AFRL

- **Leverage AFRL's VICE Lab**
 - Expands capability and use of existing labs
 - Utilize for virtual events & constructive collaboration
 - Integral part of corporate MS&A strategy
- **Desire to expand to other AF components, services, and industry venues**
 - Increases efficiency, collaboration opportunities
 - Facilitates smarter investment decisions



*VICE – Virtual Interoperable Capabilities Exploration





MS&A Roadmap Approach



What **Questions** are being asked during Development Planning to support a more balanced approach to Planning Choices?

What **Information** is needed to answer those Questions?

What **MS&A Capabilities** are needed to generate the Information required to answer those Questions?

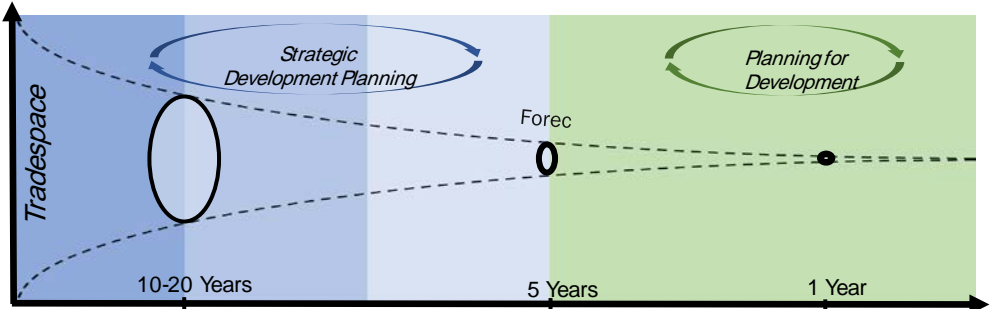
What **Tools, Data, People, Processes, & Partnerships (TDP3)** are necessary to deliver those MS&A Capabilities?



MS&A Capabilities and Architectural Components

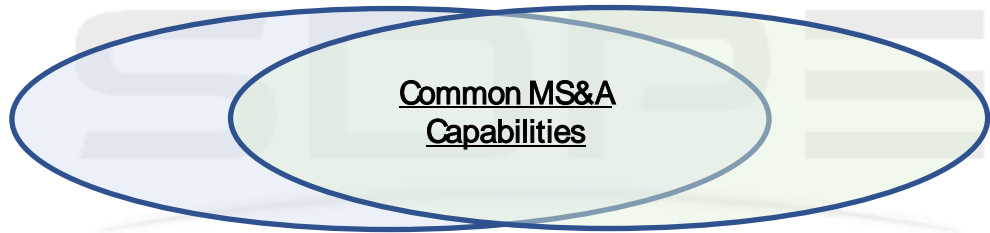
SDPE MS&A Capabilities

PFD MS&A Capabilities



- Open Architecture
- Agile Experimentation
- Tradespace Analysis
- Cost Capability Analysis

- Scalable Architecture
- Knowledgebase
- Entity Library
- Flexible Modeling



MS&A Architecture Components

Tools	Data/ Infrastructure	People	Processes	Partnerships
<ul style="list-style-type: none"> • Models • Decision Support • Analysis 	<ul style="list-style-type: none"> • Architecture • Protocol • Security 	<ul style="list-style-type: none"> • SME • Analyst • SE 	<ul style="list-style-type: none"> • Planning • Resourcing • Execution 	<ul style="list-style-type: none"> • USAF orgs • Acquisition • Industry • Academia

MS&A Production Factory powers agile build, measure, test, innovation, and trade space analysis cycles



- **What are the linkages to the T&E community & Industry**
 - Tools, facilities, capabilities
 - Potential experimentation support
 - Support to strategic solution space and gap identification/prioritization
- **Modeling & Simulation Enablers**
 - Use of models/scenarios in a common environment to describe, illustrate, articulate USAF problems/issues
 - Establish/expand shareable repository of M&S models, tools, data, templates
 - Explore network connectivity venues to link facilities; move data, virtual experiments, etc.
- **Facilitate cross domain/joint service T&E**
 - Can SDPE efforts support T&E community or vice versa



Way Ahead - SDPE MS&A Roadmap

- **Support planned ECCTs and experimentation campaigns**
 - Provide MS&A infrastructure to inform flight plans, technology maturation, risk reduction, prototyping, and evolving CONOPS
 - Apply lessons learned to SDPE MS&A Roadmap
- **Conduct SDPE MS&A gap analysis**
 - Determine MS&A capabilities required to support strategic development planning
 - Develop a framework for investigating and assessing current MS&A capability to support strategic development planning
- **Identify, evaluate, and prioritize investments in MS&A infrastructure to:**
 - Enable agile ECCT assessments & experimentation campaigns
 - Provide consistent, credible, and timely trade-space and cost capability analyses
- **Collaborate with HAF/A9 and SAF/AQ**
 - Engage with broader community & industry

Building an MS&A production factory to support the full range of Strategic Development Planning & Experimentation



SDPE

STRATEGIC
DEVELOPMENT
PLANNING AND
EXPERIMENTATION

Air Force Strategic Development Planning and Experimentation

Dave Panson

**Modeling, Simulation & Analysis
Lead**

1864 Fourth St Bldg 15

Wright-Patterson AFB, OH 45433

(937) 904-6539

david.panson@us.af.mil

