Agile Software Development—
A Starting Point for AF Innovation

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Scope and Mission Areas

**Mission**: Expedite delivery, and effectively support, warfighting battle management systems in partnership with users and industry

**Vision**: Our people make the Digital Directorate the most proactive and effective DoD life cycle management organization

**Goal 1**: Plan and execute extremely well achieve 85% on-time or early for planned critical events in FY19 to build the trust and confidence of our stakeholders

**Goal 2**: Speed, innovation, and technology: the majority of our programs include innovative approaches to speed capability to the warfighter

**3574 Total Manpower**
- MIL: 445
- CIV: 1528
- CTR: 1319
- OTHER: 282

**$12B Total AY & FMS**
- RDT&E: $1.5B
- PROC: $3.8B
- O&M: $1.5B
- FMS: $5.624B
“The United States must bolster its **competitive military advantage**—which the NDS sees as having eroded in recent decades—relative to the threats posed by China and Russia.”

Summary of the National Defense Strategy

“The **traditional requirements-driven process** that the DoD has to deal with for acquisition has become more than inefficient ... it’s become dangerous.”

Milo Medin, Alphabet Inc.
Defense Innovation Board
- rapid application dev (RAD)
- rational unified process (RUP)
- scrum, dynamic sys dev method
- crystal clear, extreme programming (XP)
- feature driven development

- agile manifesto, snowbird UT

- >20 years behind commercial innovation

- visit to Dell/Pivotal
- 1st funds oblig for AOC Pathfinder
While commercial innovation was happening, we’d been doing this …
Stunning implications

• DoD 5000.02 was a completely wrong approach for rapidly changing technology and evolving threats

• Major defense primes were not using commercial best practices ... in part because we were not asking them to

• Single large prime contract approaches meant sub-optimizing somewhere ... often in several areas

• We did not learn agile devops from anywhere in the DoD, traditional OEMs, or FFRDCs
#innovation

- Embraced outside influences—DIB, DDS, and DIUx
- Convinced Congress to fund “AOC Pathfinder”
- Convinced OSD to delegate to the Air Force
- Micro-services contracting strategy (30+ SB contracts)
- Launched in WeWorks space in downtown Boston
- Organically-led coding teams using extreme programming
- Achieved first continuous ATO
- Established first continuous delivery to warfighting AOC within months
- Selected non-acquisition leader with the right skills to lead
Personnel Recovery C2
ISPN Msn Planning and Analysis System
ISPN Nuclear Planning and Execution System
ISPN GAP CIE
NCR-IADS
Mission Planning CSAR Pedro King
C-sUAS Medusa C2
C2AOS/C2IS
Targeting and GEOINT
UC2
AF-DCGS Phoenix
OA-DCGS
DMO DIB
Weather Data Analysis
Cheyenne Mountain CIC2S
Legacy SPADOC SPEARR
Cobra Dane ADPE Re-host
Integrated Broadcast Service

F-35 ALIS “Mad Hatter”
Growing revolution

- BESPIN, PEO/BES, Montgomery
- Level Up, PEO/C3I&N, San Antonio
- Space Camp, SMC Colorado Springs
- Kobyashi Maru (Surf Camp), SMC West Coast
- Rogue Blue, PEO/Digital, Offutt
- Software Engrg Groups, Hill, Robins, and Tinker

We have successfully implemented agile devops with:

- Organically-led PMO coding teams
- Government as integrator—industry coding teams
- Traditional contract relationships with industry
- Organic SEGs at Robins, Hill, & Tinker
**Strategic best practices**

- The program office must enable agile—get “hands on!”
- Requires PEO engagement with senior stakeholders
- Platform operations, pipeline tools, and security require significant attention and effort
- SAFE ART is a trap if not achieving continuous integration and test
- Employ small wins strategies
- Scaling up is a major challenge
The Department is catching up on software ...

Revised DoD 5000.02 software acquisition pathway (draft)

DoD Enterprise DevSecOps Reference Design, 12 August 2019
Within the AF, everything is changing ...

• Outside influences—DIB, DDS, DIU, AFWERX, AFWIC, and others

• Unprecedented delegation of authority

• Changing strategies—agile devops, rapid prototyping, design agent, the concept of an MVP and incremental fielding

• Working with accelerators and start-ups, AF Pitch Days

• Technology—automation, emulation, commercial tools, ML/AI, etc

• New partnerships—Northeastern University/KRI, MassChallenge, NSIN

• DoD 5000.02 is being re-written—DAU revising training

• AF leadership demanding speed, innovation, and technology

  VCSAF: “Status quo is not acceptable”

  Dr. Roper: “Be radical! Make me nervous!”
What are we learning for accelerators and start-ups?

AF Pitch Day #1 NYC, 6-7 March

AF Pitch Day #2 KRI, 24 July

AF Pitch Day #3 Kessel Run, 26 July

AF Space Pitch Day, 5-6 November
Most of our systems do not leverage modern technologies

- Automation
- Optimization
- Full instrumentation and analytics
- Data science
- Digital engineering
- Realistic M&S
- Attended and unattended BOTS
- ML/AI
- Blockchain
- Gaming technology
- Augmented and virtual reality
- 4G/5G technology
- Unintended emissions detection
- Zero trust cybersecurity

We’re learning we’re still at the starting point ...
Realization

We can no longer simply deliver and sustain capability in response to requirements or problems ... we need to be an S&T organization

How do we think through what our systems could be and make that a reality?

We can get more help from commercial small businesses, start ups, and research labs—how do we best engage them to work with us?

How do we become more like a tech company?
Much work remains

- Business systems, C2, ISR PED, and other software efforts are transforming contracting, RMF, and test processes

- Aircraft, weapons, and other embedded software introduce additional challenges

- Dev * ops
  * Program protection
  * Safety
  * Airworthiness
  * Seek Eagle
  * Nuclear Certification

- Much more process automation required to achieve CI/CD

- Beginning to explore what agile means for major HW/SW systems
To sum it all up ...

• The NDS challenge is serious—we had fallen behind in technology and practices

• Unprecedented rapidly changing environment provides flexibility and opportunities for speed, innovation, and technology adoption

• The AF recognizes the need to become more like a technology company—adapting agile approaches to embedded systems and hardware

• Agile software development was a starting point—innovation must be more than a software pathway