Technology Transition

22 April 09

Wendell Banks

Director, Plans and Programs

Air Force Research Laboratory
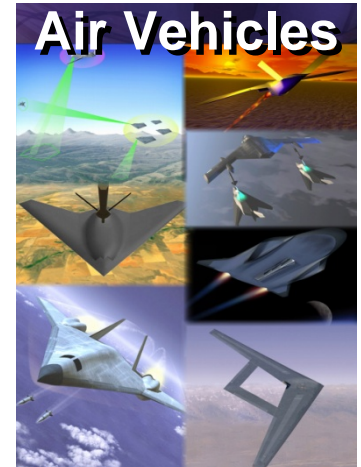
Air Force Materiel Command
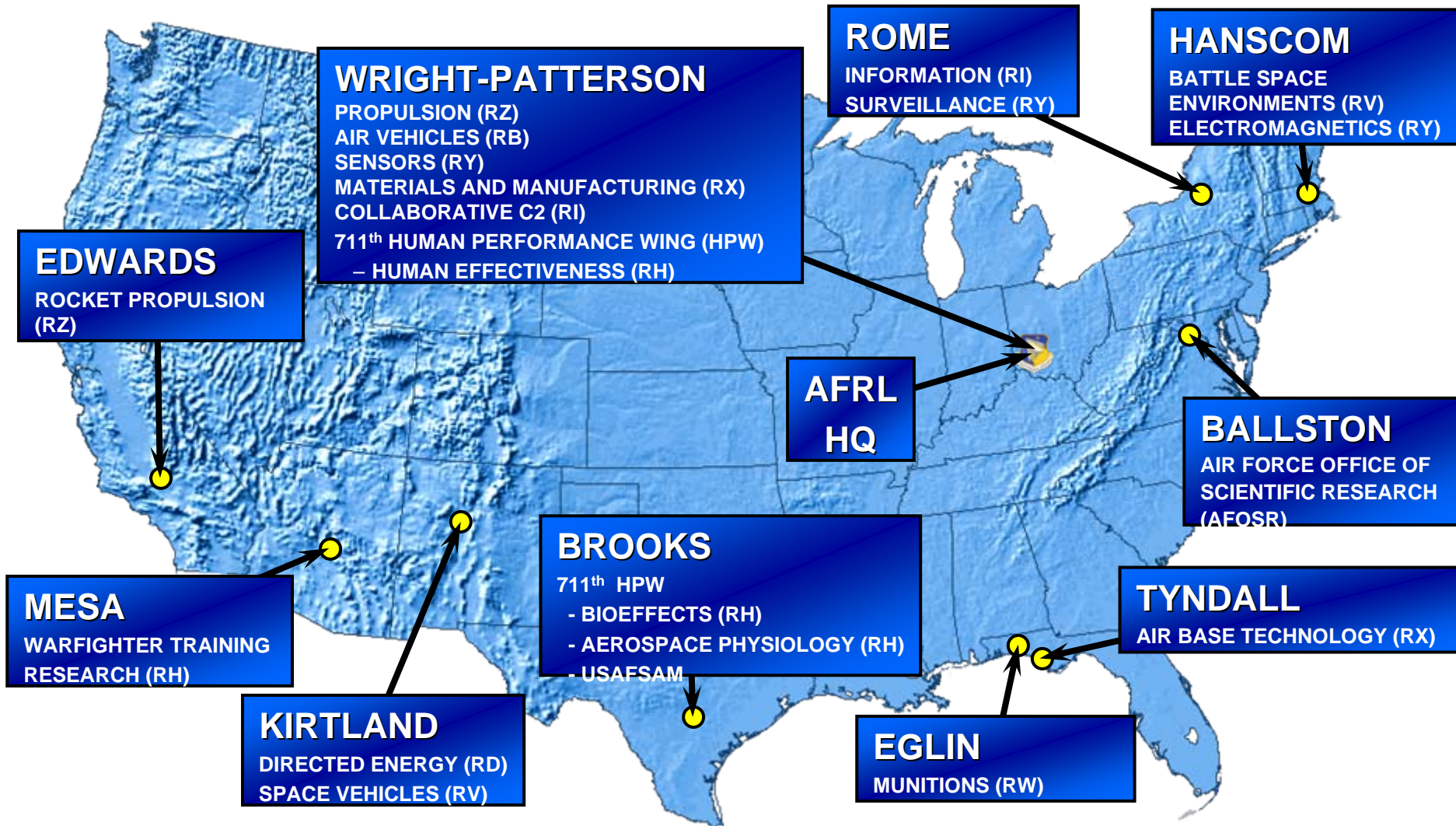

AFRL   AAC   ESC   ASC   46th TW   AFFTC   704th TG   WR-ALC   OC-ALC   O-ALC

Air Logistics Center

Ten Technical Directorates

Space Vehicles

Directed Energy

AFOSR

Materials

Human Effectiveness

Munitions

Sensors

Propulsion

Information

Air Vehicles

Major AFRL Sites

ROME
INFORMATION (RI)
SURVEILLANCE (RY)

HANSCOM
BATTLE SPACE
ENVIRONMENTS (RV)
ELECTROMAGNETICS (RY)

WRIGHT-PATTERSON
PROPULSION (RZ)
AIR VEHICLES (RB)
SENSORS (RY)
MATERIALS AND MANUFACTURING (RX)
COLLABORATIVE C2 (RI)
711th HUMAN PERFORMANCE WING (HPW)
– HUMAN EFFECTIVENESS (RH)

EDWARDS
ROCKET PROPULSION
(RZ)

AFRL HQ

BALLSTON
AIR FORCE OFFICE OF
SCIENTIFIC RESEARCH
(AFOSR)

MESA
WARFIGHTER TRAINING
RESEARCH (RH)

BROOKS
711th HPW
 - BIOEFFECTS (RH)
 - AEROSPACE PHYSIOLOGY (RH)
 - USAFSAM

TYNDALL
AIR BASE TECHNOLOGY (RX)

KIRTLAND
DIRECTED ENERGY (RD)
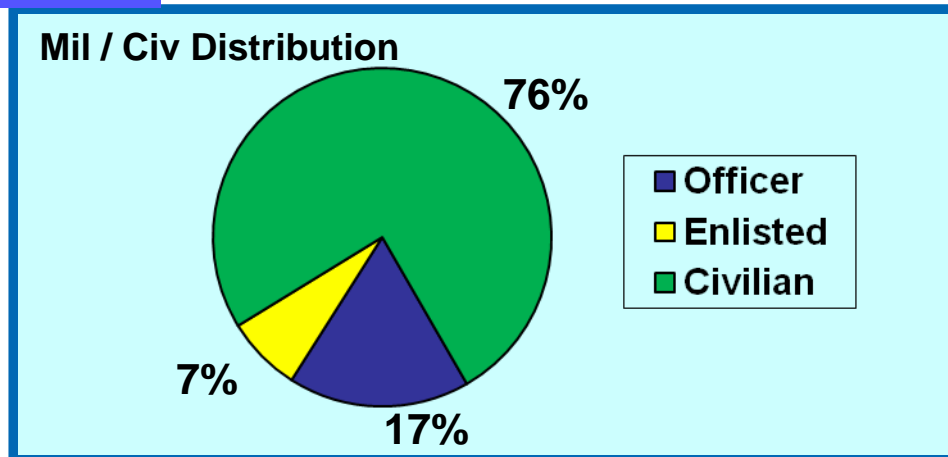SPACE VEHICLES (RV)

EGLIN
MUNITIONS (RW)

40 Sites World-Wide

AFRL Workforce

	Employees	Civilian	Military	Contractor
Total	~10800	~4750	~1450	~4600
S&Es	~ 6750	~2800	~ 850	~3100

Civilian S&E Education

29%
43%
28%

- B.S
- M.S
- PhD

Education Level by Grade

people: 0, 200, 400, 600, 800, 1000

DR level 1, 2, 3, 4

- PhD
- M.S
- B.S

Mil / Civ Distribution

76%
7%
17%

- Officer
- Enlisted
- Civilian
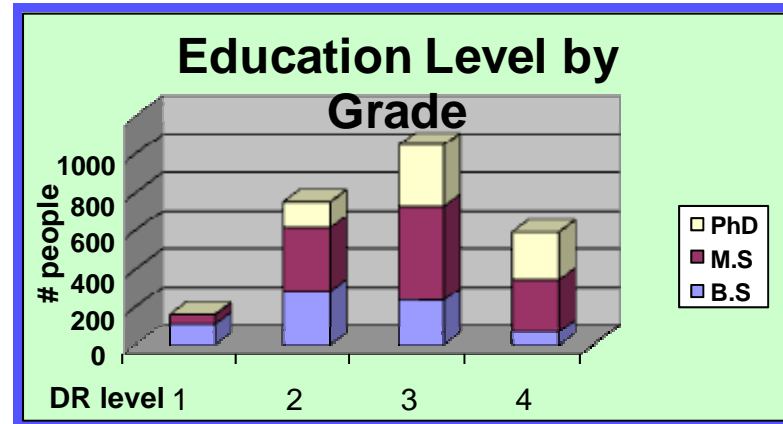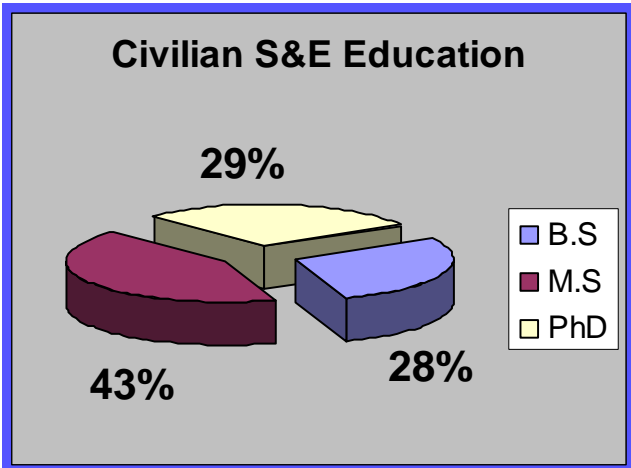
AF Budget Investment
By Budget Activity

6.1
$290M
14%

6.3
$662M
32%

6.2
$1,122M
54%
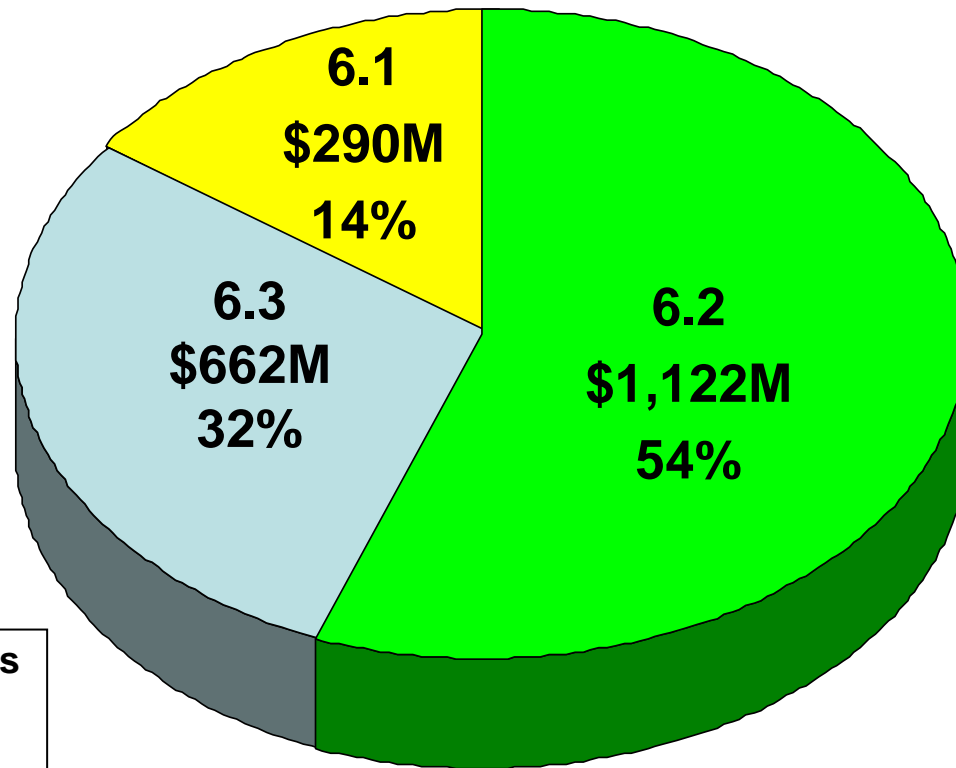
6.1 Basic Research Funds

6.2 Applied Research Funds

6.3 Advanced Technology Development Funds

FY08 S&T Appropriation

FY08 Core TOA

TOTAL: $2.075 Billion
TOTAL: $1.722 Billion

AFRL FY08 Funding

S&T

- Directed Energy $175M (8%)
- Human Eff $129M (6%)
- Munition $78M (4%)
- Space Vehicles $231M (11%)
- Information $155M (7%)
- Materials & Mfg $236M (11%)
- Air Vehicles $208M (10%)
- Sensors $212M (10%)
- Basic Research $290M (14%)
- Propulsion $362M (18%)
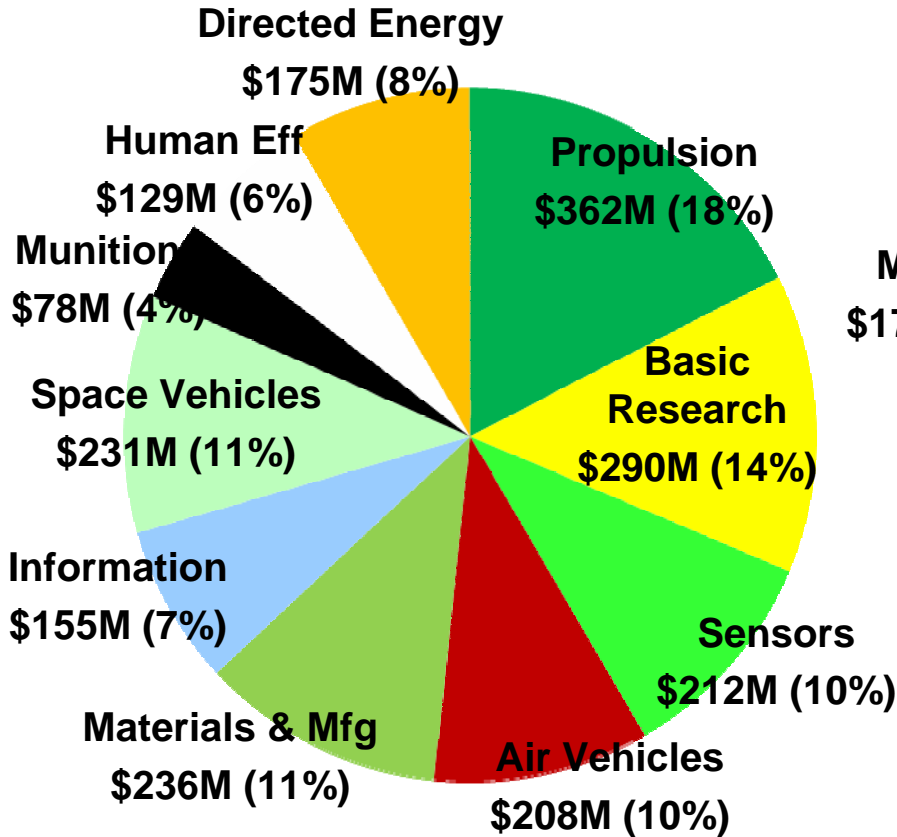
S&T Total: $2.075B
(PB plus Cong Adds)

Total

- Directed Energy $361M (9%)
- Human Eff $246M (6%)
- Munitions $172M (4%)
- Space Vehicles $397M (10%)
- Information $675M (16%)
- Materials & Mfg $542M (13%)
- Air Vehicles $227M (5%)
- Sensors $624M (15%)
- Basic Research $453M (11%)
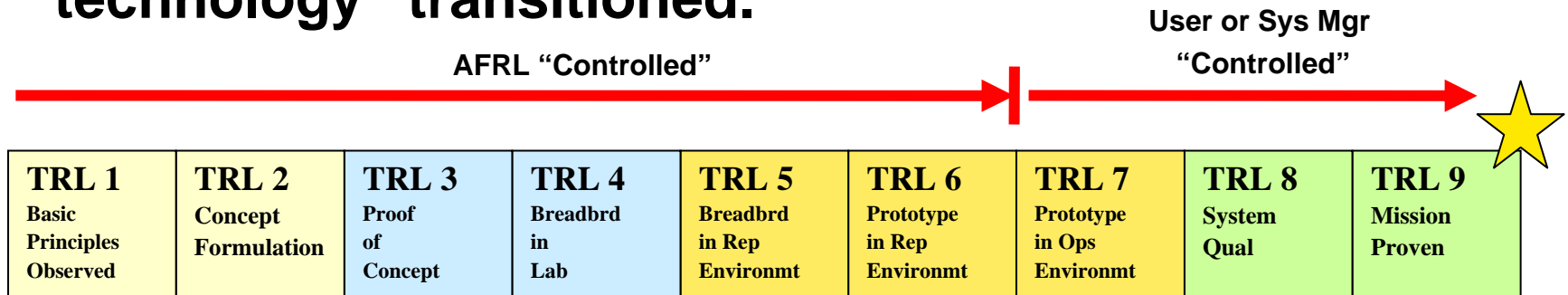- Propulsion $473M (11%)
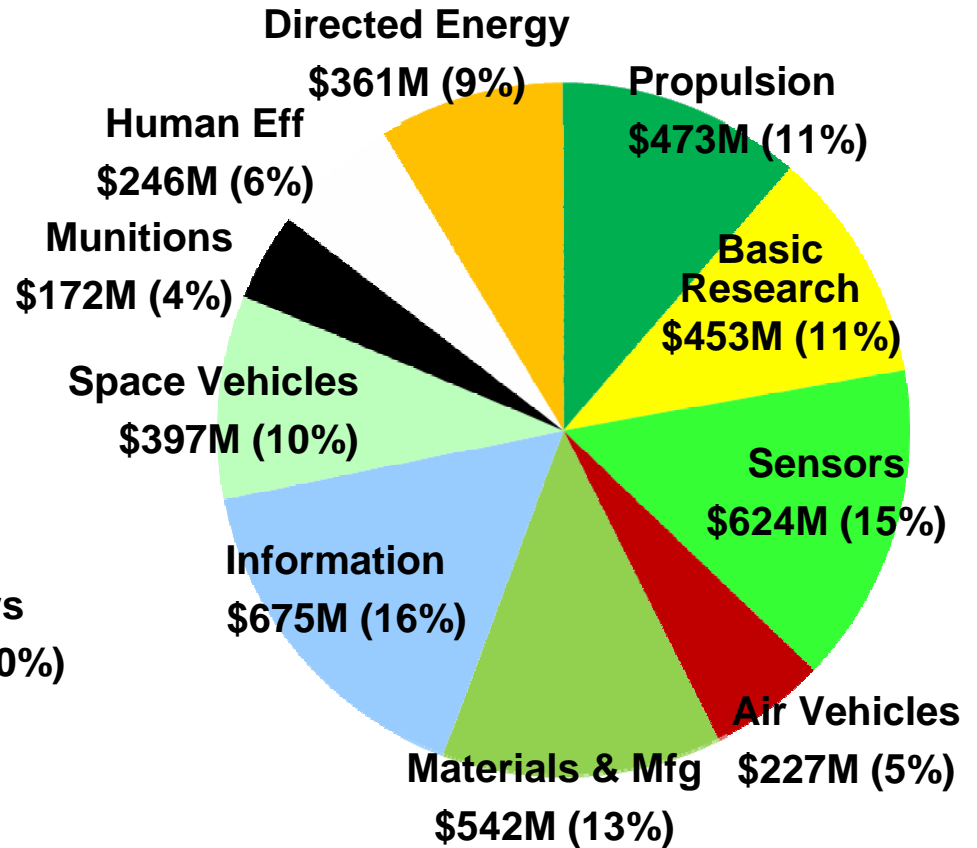
Total: $4.170B

Tech Transition is a Process
…and the "event" doesn't happen until the end.

- **Technology transition is a process where technology is developed in strong collaboration with system managers and users of end products* with the intent to insert the matured technology into that end product**

- **The process is complete when the technology is operational (TRL 9) and supportable. Only then has the technology "transitioned."**

AFRL "Controlled"　　　　　　　　　User or Sys Mgr "Controlled"

TRL 1 Basic Principles Observed	TRL 2 Concept Formulation	TRL 3 Proof of Concept	TRL 4 Breadbrd in Lab	TRL 5 Breadbrd in Rep Environmt	TRL 6 Prototype in Rep Environmt	TRL 7 Prototype in Ops Environmt	TRL 8 System Qual	TRL 9 Mission Proven

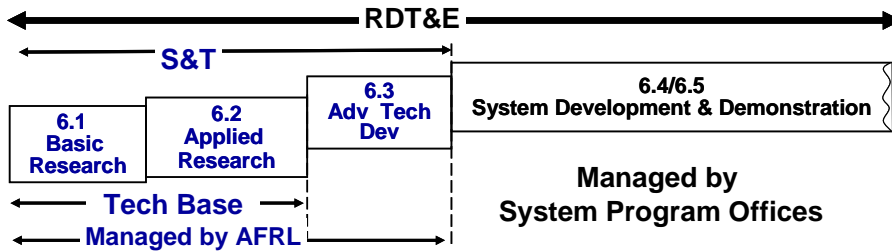*Weapon systems, manufacturing processes, analysis tools, and other systems intended to support the warfighter

Processes & Programs to Facilitate Technology Transition

Overcoming the "Valley of Death"

RDT&E

S&T

| 6.1 Basic Research | 6.2 Applied Research | 6.3 Adv Tech Dev | 6.4/6.5 System Development & Demonstration |

Tech Base
Managed by AFRL

Managed by System Program Offices

Applied Technology Council
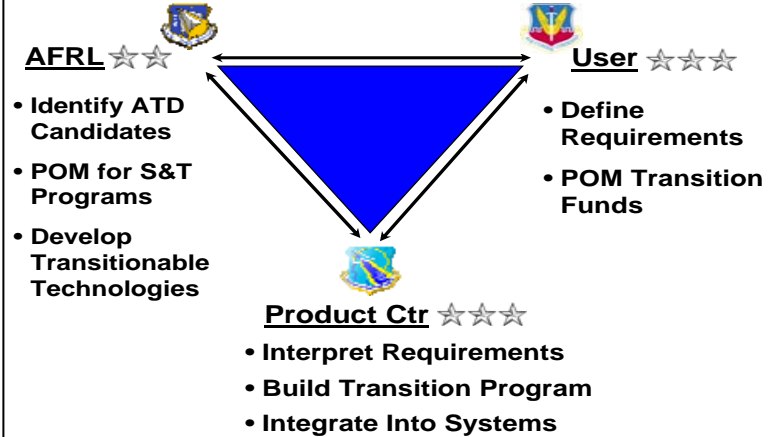
Tech Transition "Chasm"

Means for Tech Transition
Advanced Technology Demo (ATD)
Advanced Concept Tech Demo (ACTD)
Technology Planning IPT
Battle Lab Experiments
Technical Events (JEFX)
SPD Initiative
Industry Initiative
Senior Leader Initiative

Emphasis is Necessary on Technology Transition

- Sustained Senior Leader Emphas
- Continuous Communication
- Integrated Process
- Budget For Production Incorpora

The ATC Triangle

AFRL ☆☆
- Identify ATD Candidates
- POM for S&T Programs
- Develop Transitionable Technologies

User ☆☆☆
- Define Requirements
- POM Transition Funds

Product Ctr ☆☆☆
- Interpret Requirements
- Build Transition Program
- Integrate Into Systems

AFRL

To User through Acquirer

BATCAM

End User

Direct to the User

WIDE
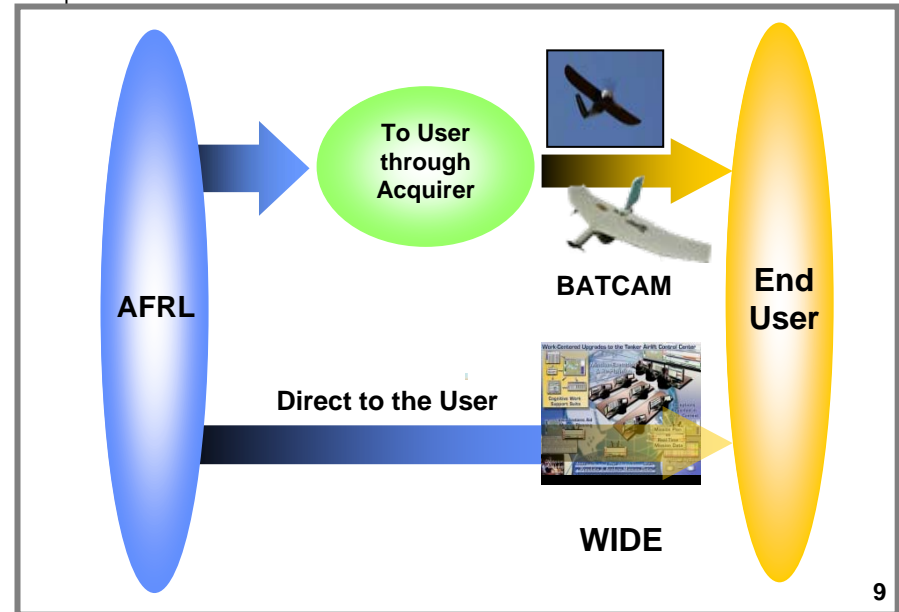
Transition Myths and Realities

- **M: AFRL is responsible for technology transition**
  - R: System managers typically determine what transitions to use on their system
- **M: Technology maturation and transition can be worked independently**
  - R: Must be worked together
- **M: Transition planning starts after TRL 6**
  - R: Must start as early as TRL 3 or 4
- **M: Technology doesn't have to be "operational" (TRL 9) to be "transitioned"**
  - R: If it's not "operational," no benefit to the user
- **M: ATDs and ATCs are the primary way of transitioning**
  - R: Most technology is transitioned through other means

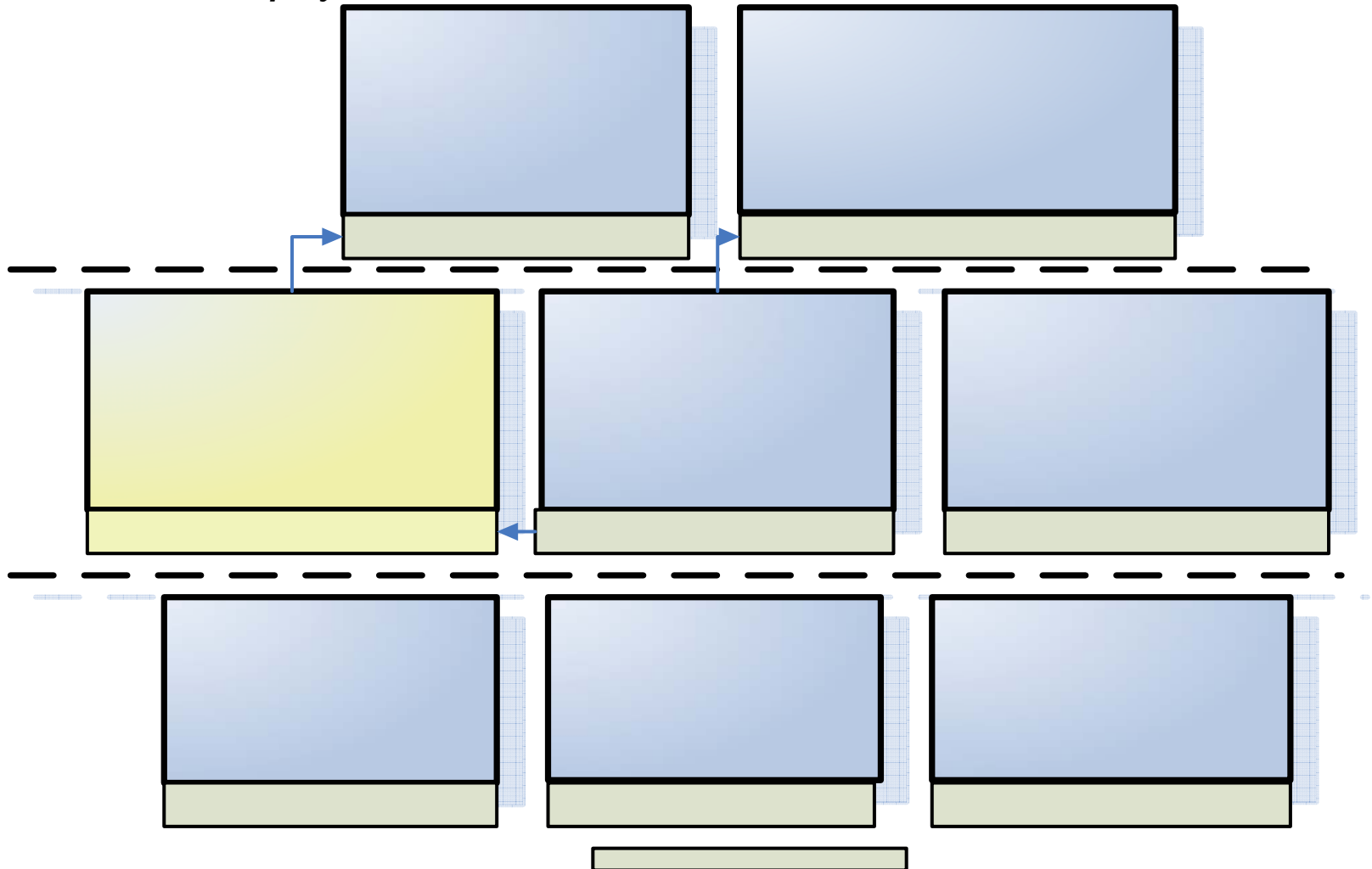| *Process Owner/Co-Lead*	Gen Donald Hoffman / Lt Gen Mark Shackelford / Lt Gen Loren Reno
Chief Process Officer / Deputy	Maj Gen Marshall Sabol / Col John Griggs

Three D&SWS Technology Development Initiatives

3 Initiatives with the goal of <u>institutionalizing</u> one AF level process to manage investments in technologies to ensure they are mature for AF systems

TD 1-12 Improved Tech Maturity Assessments

- **Comprehensive Qualitative Criteria**
    - **Tech Performance**
    - **Manufacturability**
    - **Integrability**
    - **Other 'ilities**
- **Better Assessment of Risk**
- **Improved Tech Forecasting**

TD 1-13 High Confidence Tech Transitions

- **Early & complete lifecycle transition planning**
    - **IPT Approach – maximize coordination**
- **"Stage/gated" transition of technology**
    - **Clearly defined entrance/exit Criteria**

TD 1-14 Identify & Prioritize Tech Needs

- **Enterprise process to gather & prioritize tech needs**
    - **Focus S&T on highest priority needs**
- **Game-changing "Tech Push"influencing capability planning**

Summary

- **Tech Transition is process and a team sport -- Ends when Technology is being used**

- **Successful Transition starts by working on what the customer needs…and can afford**

- **Tech Maturation and Transition must be worked simultaneously by the same team…Earlier is better**

- **More complete measures of Tech Maturity required…TRLs necessary but not sufficient (cost, MRL, "ilities", etc)**

- **D&SWS Tech Development Team and AFRL working this hard**
  - **SAF/AQR, AFMC/A2/5, AFRL, and many others**