Summary of Results
S&T Affordability
Transition Conference
Held: 6-8 April 1999

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Deputy Assistant Secretary
(Science, Technology and Engineering)
Department of the Air Force

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S&T Affordability
Transition Conference
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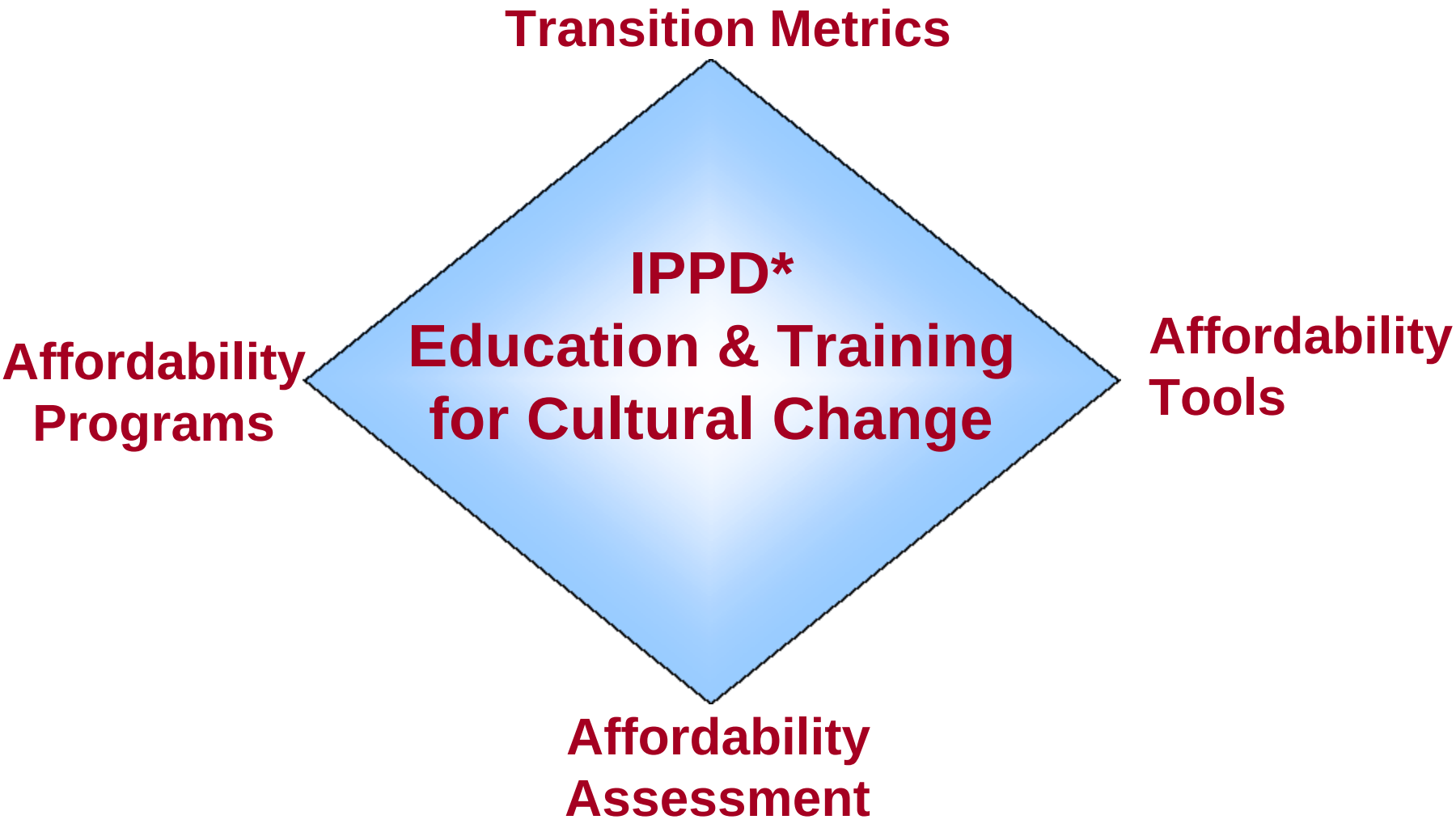
Mr. Timothy L. Dues
Executive Director (Acting)
Air Force Research Laboratory
WPAFB, OH

Briefing Outline

- Background
- What we set out to accomplish
- How we did it
- How we measured results
- Improvements for the future

AFRL Approach to Affordability



*IPPD - Integrated Product and Process Development

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Why Have A Conference?

- Showcase significant progress
  - 11 Affordability programs
  - Two IPPD courses - tailored for S&T
- Broaden the dialog on S&T Affordability
  - All aspects of AF 6.3 programs
  - Interested 6.2 program participants
  - Researchers, Industry, Customers
- Increase the focus on Technology Transition
  - What works and what doesn’t work

Objectives of Conference

- Accelerate cultural change
  - Affordability mind set
  - Adoption of Integrated Product and Process Development (IPPD)
- Disseminate lessons learned
  - Researchers, industry, customers
- Improve technology transition
  - AFRL programs to AF weapon systems

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Affordability Transition Conference

- 6-8 April, Orlando, FL
- Agenda:
  - Tutorials
  - Keynote speeches
  - Lessons learned from affordability programs
  - Breakout Sessions
  - Feedback and Group Discussion

Tutorials

- S&T IPPD Process

- Tools for Implementing Affordability

Executive Keynotes

Affordability
Across DoD S&T

Air Force S&T
Affordability
Strategy

Air Force S&T
Affordability
Vision

Industry IPPD
Lessons Learned

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Lessons Learned - Team Work
Composites Affordability Initiative

- Cross Functional & Cross Company
  - Time needed for team building
    - Leadership Integ. Product Team took 1 year to build trust
    - As technical teams formed the process had to be repeated (6 month delay)
  - Team continuity critical
    - Turnover interrupts the progress of the program
  - Data used to justify technical directions
    - Needed to overcome “personal preferences”
  - Vision to be carried down to lowest level
    - Cross company cooperation was not the norm

BOEING LOCKHEED MARTIN NORTHROP GRUMMAN

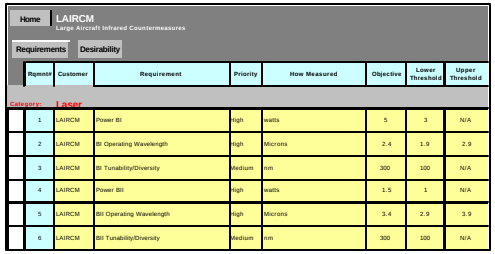
Lessons Learned
Securing Customer Commitment

- Technology Transition Plan
  - Signed by Lab, SPOs, Centers, Commands
- Clear Transition Metrics, e.g.
  - Protection, Quality, Durability, Supportability, Cost
- Tech. Demos at MAJCOMS
- Secure Customer Funding Commitment
  - Product Centers
  - War Fighters

Lessons Learned - Next Gen. Transparency IPPD - Canopy Attachment

IPT

- Customer Requirements

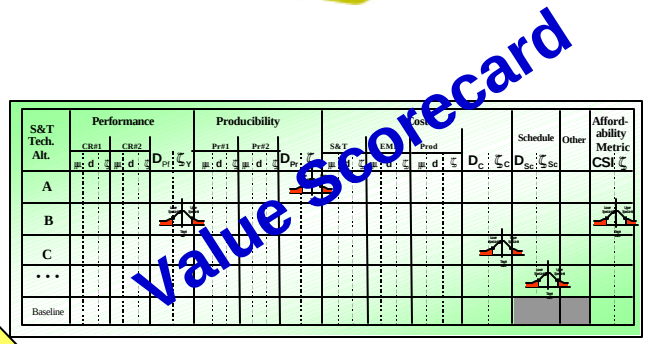


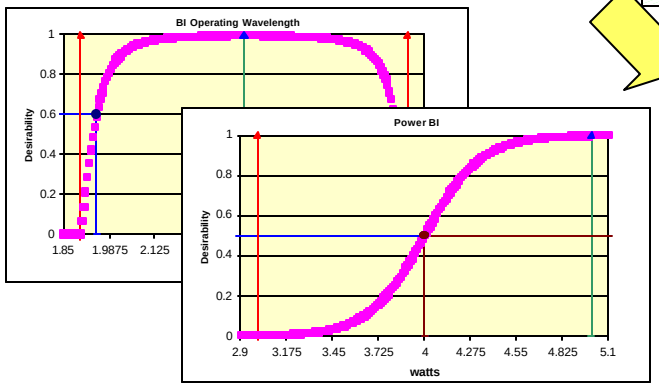
Home | LAIRCM
Large Aircraft Infrared Countermeasures

Requirements | Desirability

	Rqmnt#	Customer	Requirement	Priority	How Measured	Objective	Lower Threshold	Upper Threshold
Category:		Laser						
	1	LAIRCM	Power BI	High	watts	5	3	N/A
	2	LAIRCM	BI Operating Wavelength	High	Microns	2.4	1.9	2.9
	3	LAIRCM	BI Tunability/Diversity	Medium	nm	300	100	N/A
	4	LAIRCM	Power BII	High	watts	1.5	1	N/A
	5	LAIRCM	BII Operating Wavelength	High	Microns	3.4	2.9	3.9
	6	LAIRCM	BII Tunability/Diversity	Medium	nm	300	100	N/A

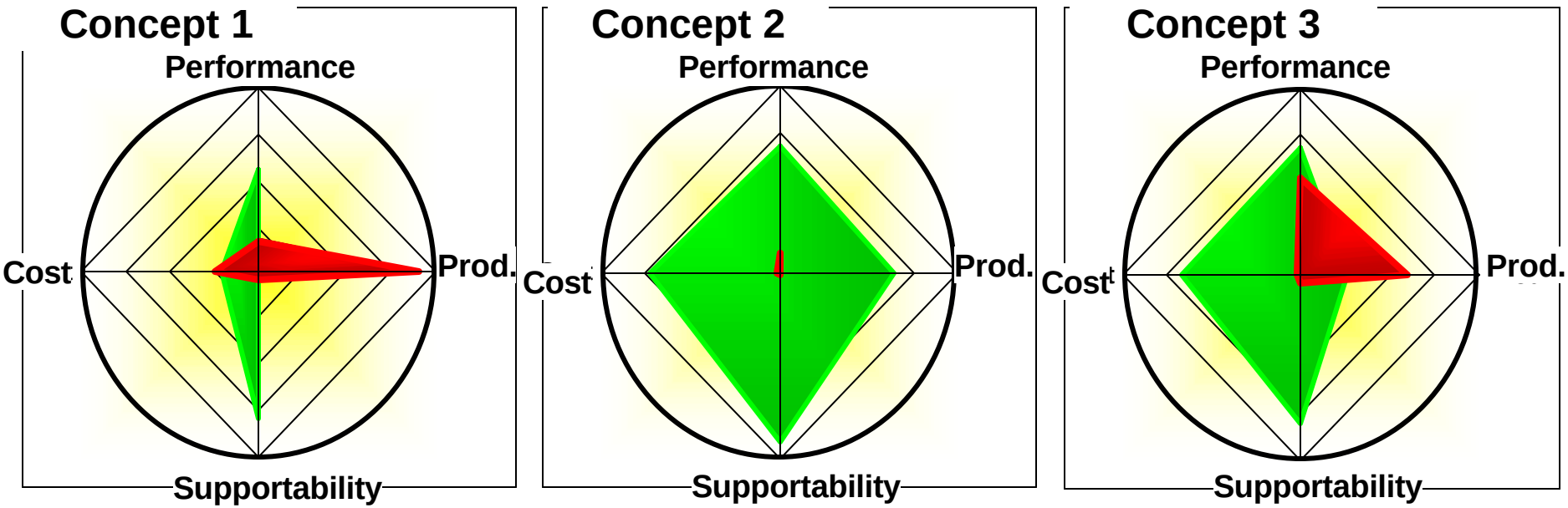
- Measures
- Objectives & Thresholds
- Desirability Curves





- Technology Alternatives
- Risk and Cost Drivers
- Best Value

NGT Value Analysis Results



- Charts are indicators of Value Scorecard Information
  - Customer Satisfaction (green), Risk (red)

IPPD Process Gets Team to Solid Consensus

Example Key Points
Affordability Program Briefings

- IPPD methods are integral to managing a pilot, not an additional task.
- It takes time and energy to build the customer requirements data base but it pays off when you justify best value
- Researchers are not used to being measured on projected costs and risks of technology targeted for transition - a real culture change.
- Real customer support is gained by making the customer a key part of the team.

Improvements for the Future

- Use IPPD as a part of every technology project
- Invest in tools to estimate costs
  - Goal is a common cost modeling tool set across AFRL
- Develop a Return on Investment for every 6.3 project
  - Consider best value assessments.
- Secure customer funding to ensure transition of Advanced Technology Development projects

Supporting Information

Current AFRL Affordability Programs

Affordability Program Name	Team Leader	Dir	$M (Total)
Next Generation Transparency (NGT)	Mr Robert McCarty	VA	3.8 (6.0)
Infrared Countermeasures (IRCM)*	Mr Bill Taylor	SN	23.9
Multirole Aircraft Support System (MASS)	Mr Matt Tracy	HE	6.9
Improved Space Computer Program (ISCP)	Mr Ken Hunt	VS	4.0
Advanced Laser Eye Protection (ALEP)	Ms Pam Schaefer	ML	3.0
Composites Affordability Initiative (CAI)	Mr Dennis Hager	ML	44.2 (94.9)
'99			
Unmanned Combat Air Vehicle (UCAV)	Lt Col Mike Lysaght	VA	120
Enh Recog. and Sensing Ladar (ERASER)	Mr Robert Zumrick	SN	5.5
Thin Film Solar Cells	Dr Kitt Reinhardt	VS	3.0
High Efficiency Solar Cells	Dr Kitt Reinhardt	VS	4.5 (4.5)
Joint Exp Tur. Engine Concepts (JETEC)	Mr Lance Chrisinger	PR	10.0

New Affordability Programs

Program Name	Team Leader	Dir	$M (Total)
Small Munitions Dispenser	Mr. Jerry Provenza	MN	2.8
MMC Guided Flight Test Demo*	Mr. Ken Lockwood	MN	23.4
Metals Affordability Initiative	Dr. Dan Evans	ML	100
Afford. Space Systems Intell. Syn. Tech.	Mr. George Orzel	ML	4
Integ. Night Vision - Laser Eye Protection	Mr. Randell Brown	HE	10
High Heat Sink Fuels	Dr. Tim Edwards	PR	10.5
Joint Turbine Advanced Gas Generator	Mr. Marty Huffman	PR	15.3
Affordable Threat Alert System*	Mr. Aaron Lynn	SN	14.8

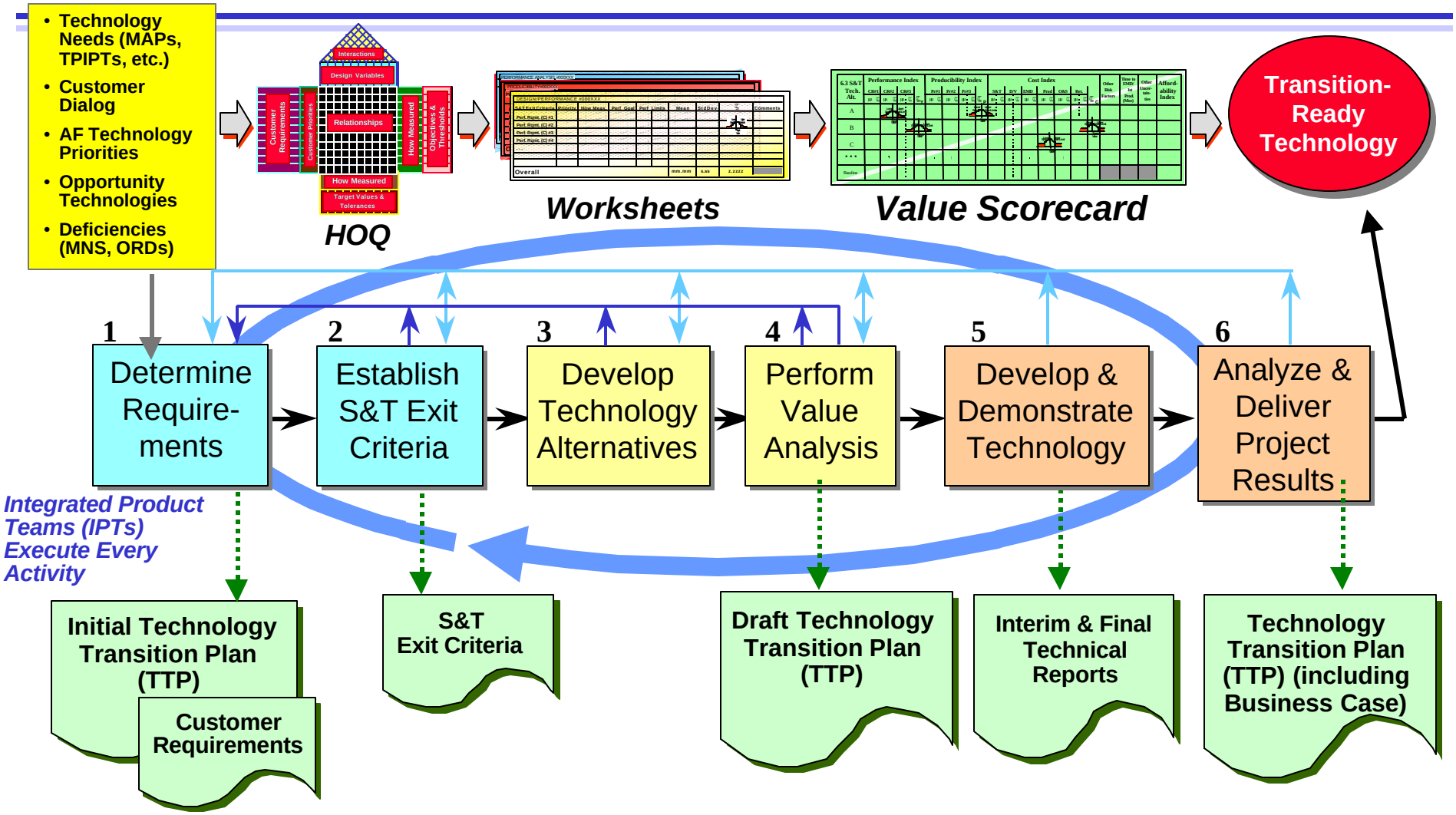
* FY 01 start

New Affordability Programs (cont)

Program Name	Team Leader	Dir	$M (Total)
Com/Nav Outage Forecasting System	Dr. Theodore Beach	VS	64.7
Missile Launch Detection Through Clouds**	Dr. Frank Clark	VS	??
Corrosion Fatigue Structural Demo	Mr. Mike Falugi	VA	8.1
Structurally Integrated Compact Inlet Demo	Mr. Skip Gridley	VA	10.2
More Electric A/C Tech. Validation	Mr. Dave Homan	VA	7.1
Self Adaptive Flight Experiment	Dr. David Doman	VA	5.45
Joint Defensive Planner	Mr. James Tremlett	IF	3

** FY O2 Start

S&T Integrated Product & Process Development (IPPD) Approach

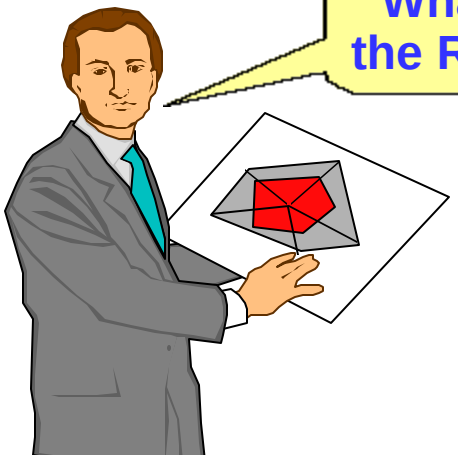


Affordability Metrics

*How shall we **measure** affordability?*

Will it satisfy the requirements?

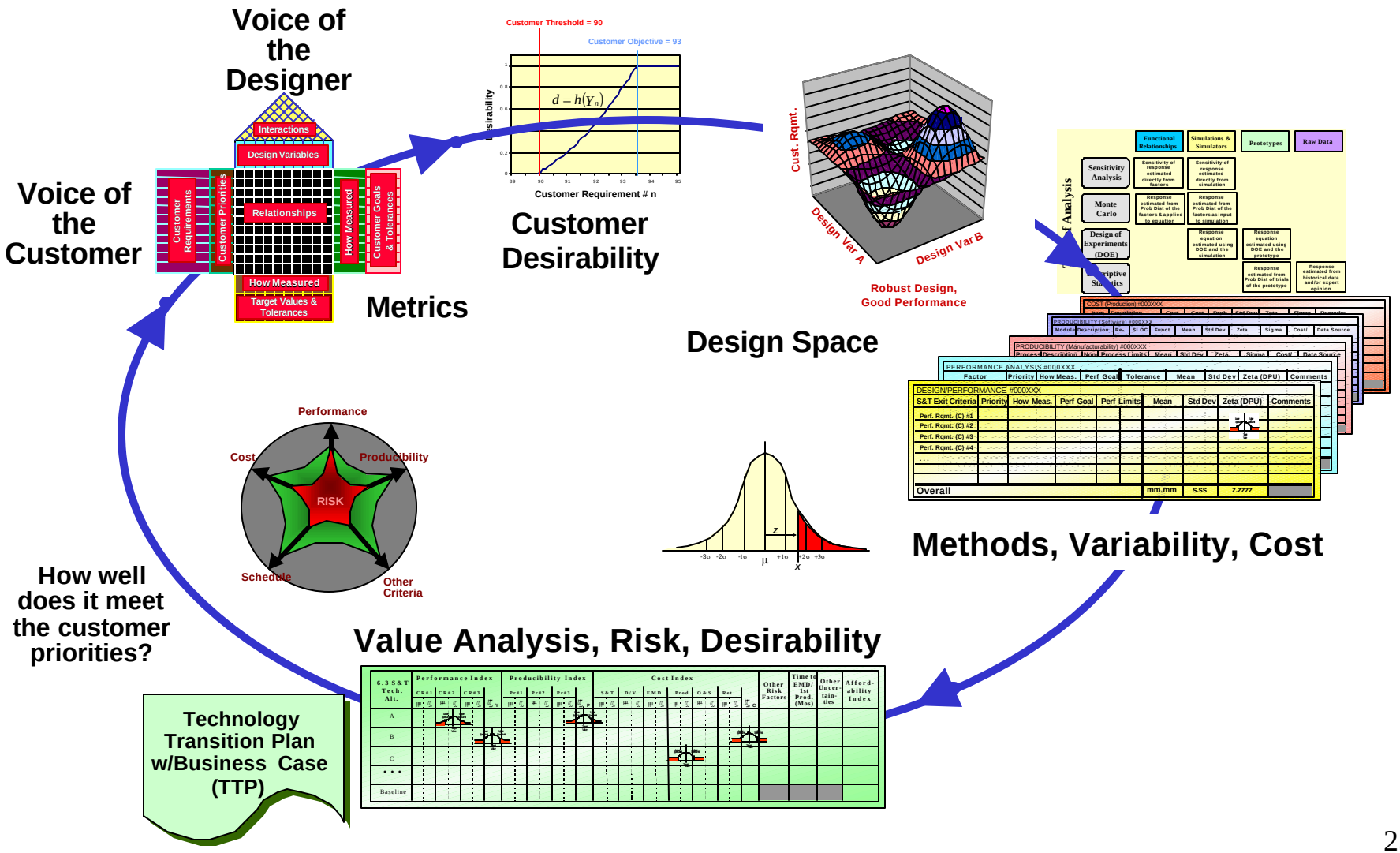
*Customer Satisfaction or **Desirability***



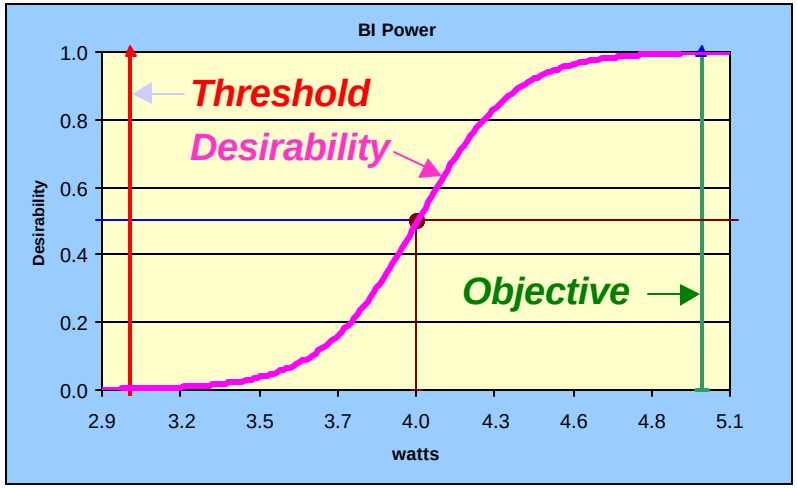
What's the Risk?

*Useful Method to Quantify **Risk***

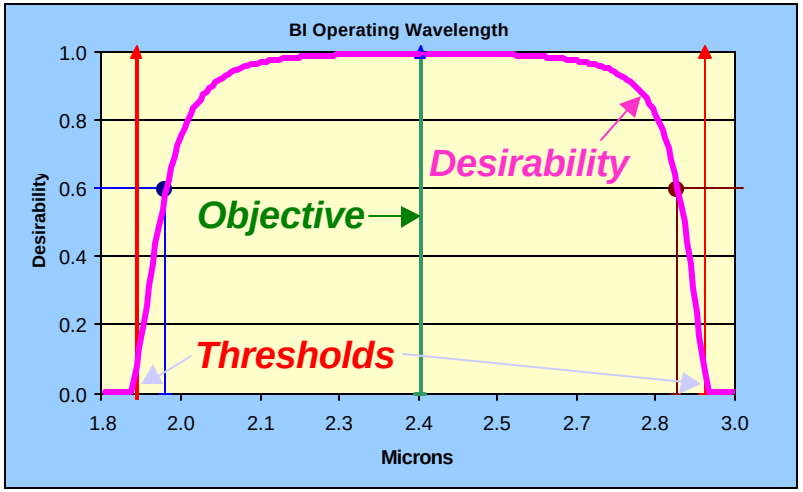
IPPD End-to-End Methods/Tools



Customer Satisfaction: Objectives, Thresholds & Desirabilities



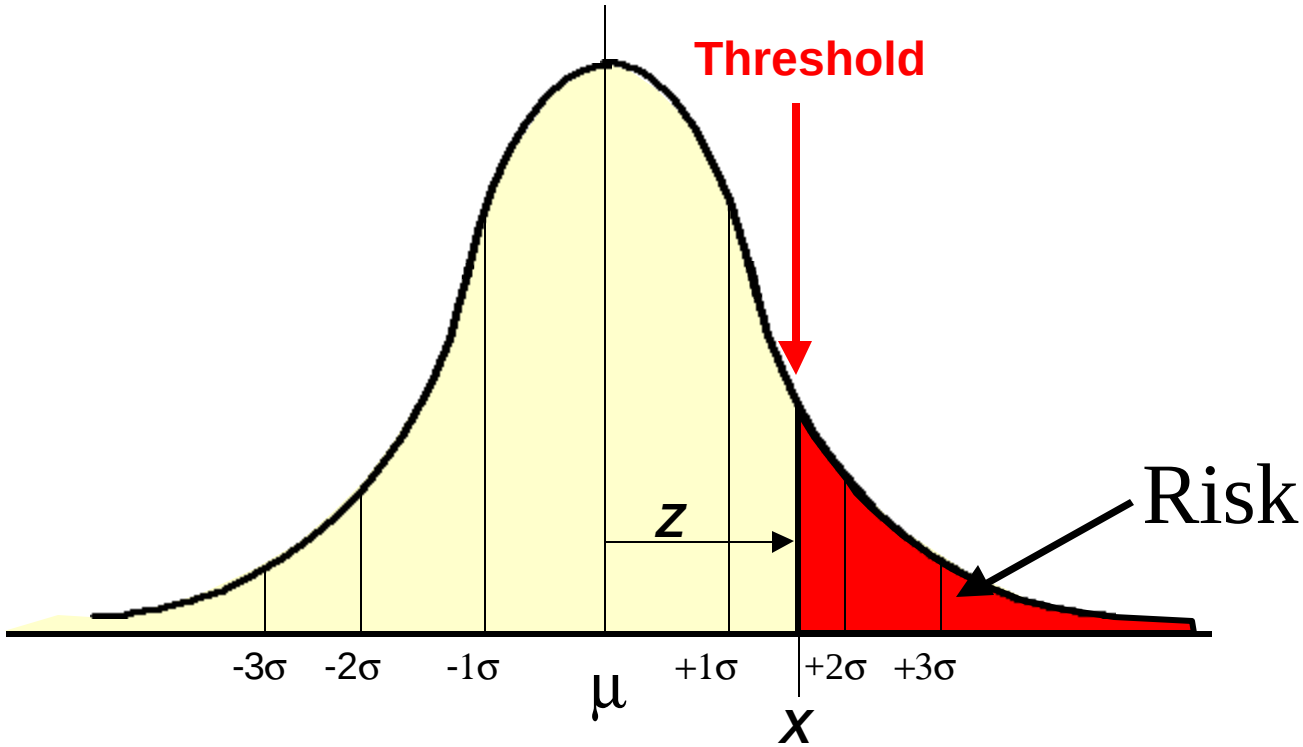
Example Desirability Curve, Power in Band 1, "More is Better". The desirability (d) at 4watts is 0.6 or 60%.



Example Desirability Curve, Operating wavelength in Band 1. It is best to be in a region in the center part of the band.

- The ***desirability* (*d*)** ranges from zero (0) to one (1)
- The ***desirability curve*** is developed in negotiation with the ***customer***
- Desirability curves can be any shape that reflects the customer's view
- Benefits: Insight into customer's view, ability to combine ***d***'s for a satisfaction "index"

Measuring Risk



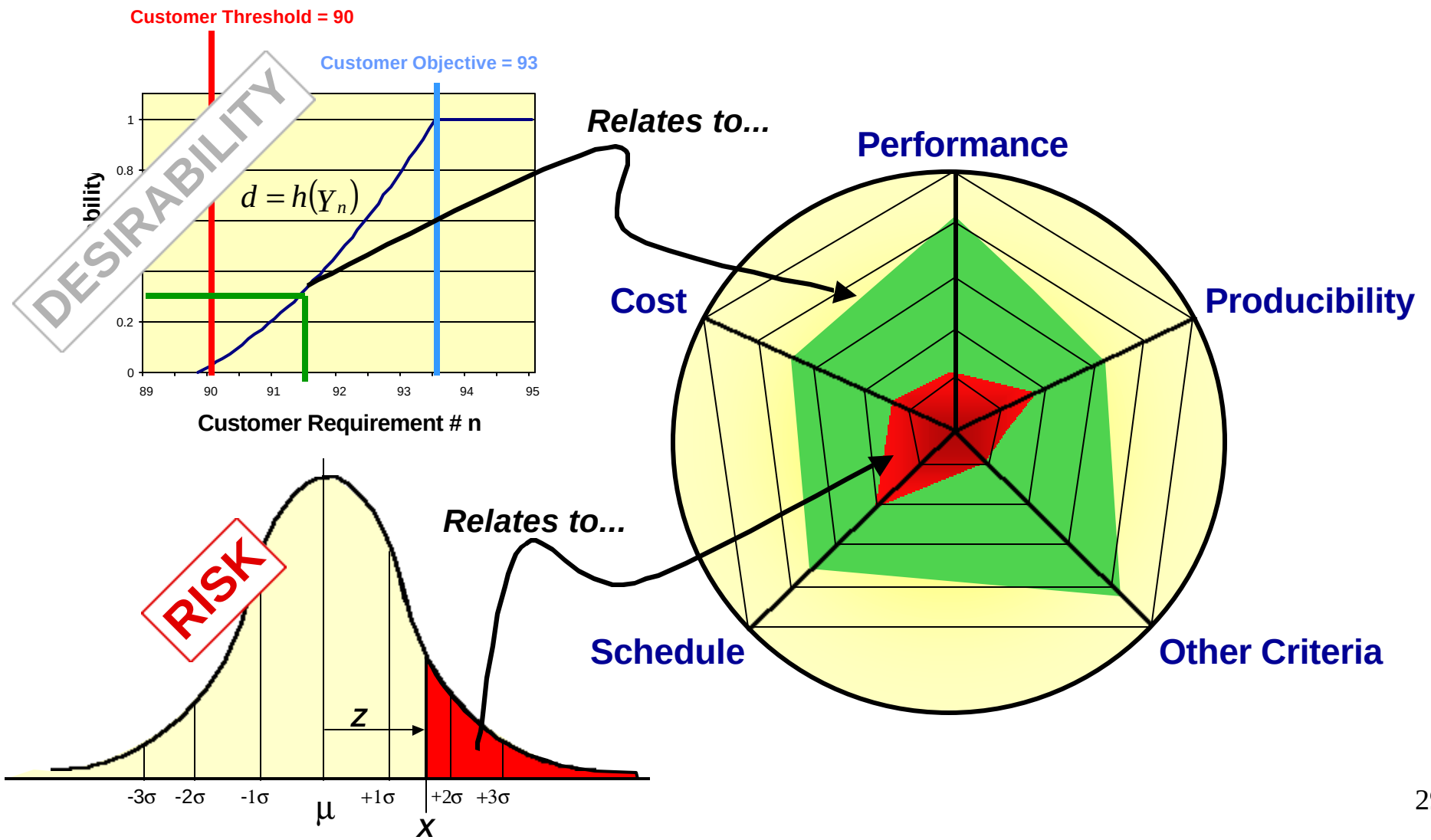
The dark (red) area under the curve that is *outside* the threshold represents the *risk*.

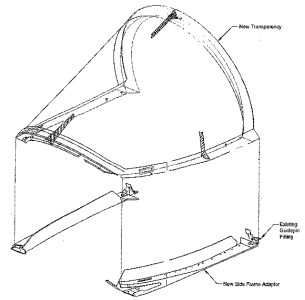
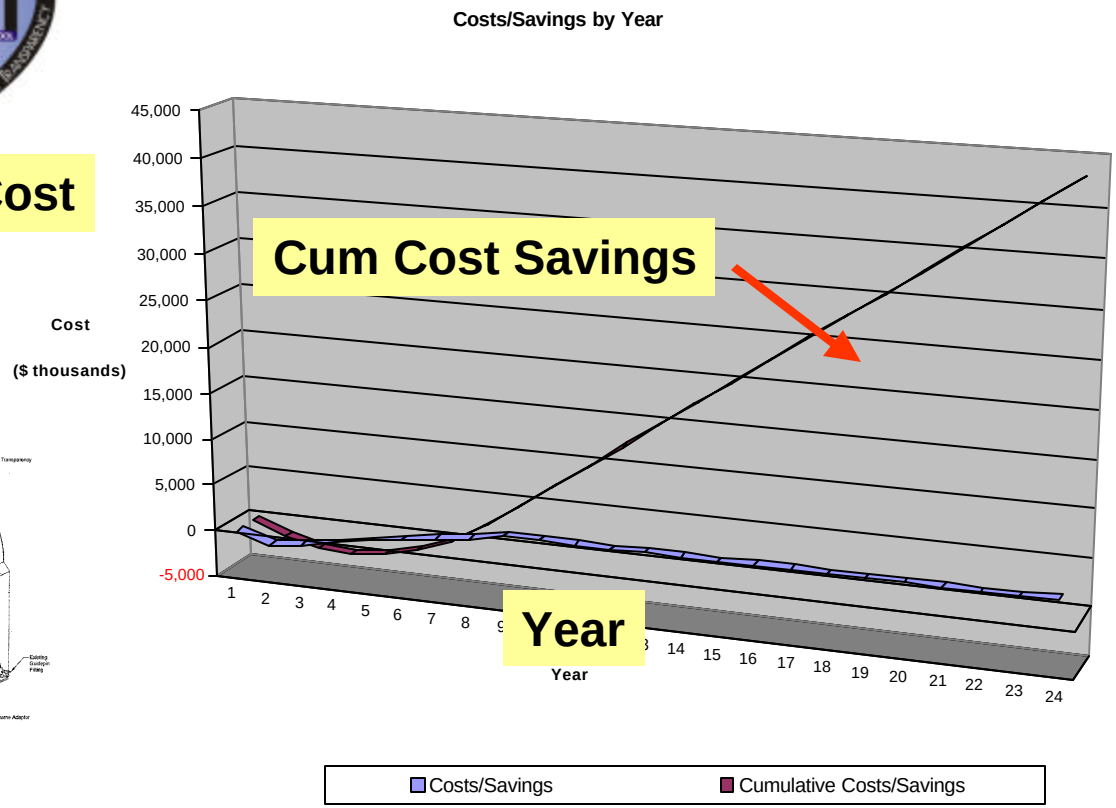
Value Scorecard

S&T Tech. Alt.	Performance								Producibility								Cost												Schedule		Other	Afford-ability Metric	
	CR#1			CR#2					Pr#1			Pr#2					S&T			EMD			Prod										
	μ	d	ζ	μ	d	ζ	D_{Pf}	ζ_Y	μ	d	ζ	μ	d	ζ	D_{Pr}	ζ_P	μ	d	ζ	μ	d	ζ	μ	d	ζ	D_C	ζ_C	D_{Sc}	ζ_{Sc}		CSI	ζ
A																																	
B																																	
C																																	
• • •																																	
Baseline																																	

- Enables balancing desirability with cost and risk
- CSI and ζ provide a balanced affordability metric
- There is no single bottom-line number intentionally!

Goal: Quantify Best Value



NGT Example of ROI in S&T

- Replacement of Windshield on F-15 C, D & E Inventory
- Results are PRELIMINARY