



**Parametrics & IPTs
Lessons Learned**

ISPA-1997





Integrated Product Teams (IPTs)

- Integrated Product Teams (IPTs)
- Integrated Product Development Teams (IPDTs)
- Product Development Teams (PDTs)



Advantages to IPTs

- **Improved Customer Satisfaction**
- **Reduced Development Times**
- **Increased Employee Ownership**
- ***REDUCED COST***
- **Fewer Changes**



Disadvantages to IPTs

- **Time Consuming--*Lots of Meetings***
- **Junior Personnel Issues-No OJT**
- **Dedicated Resources**

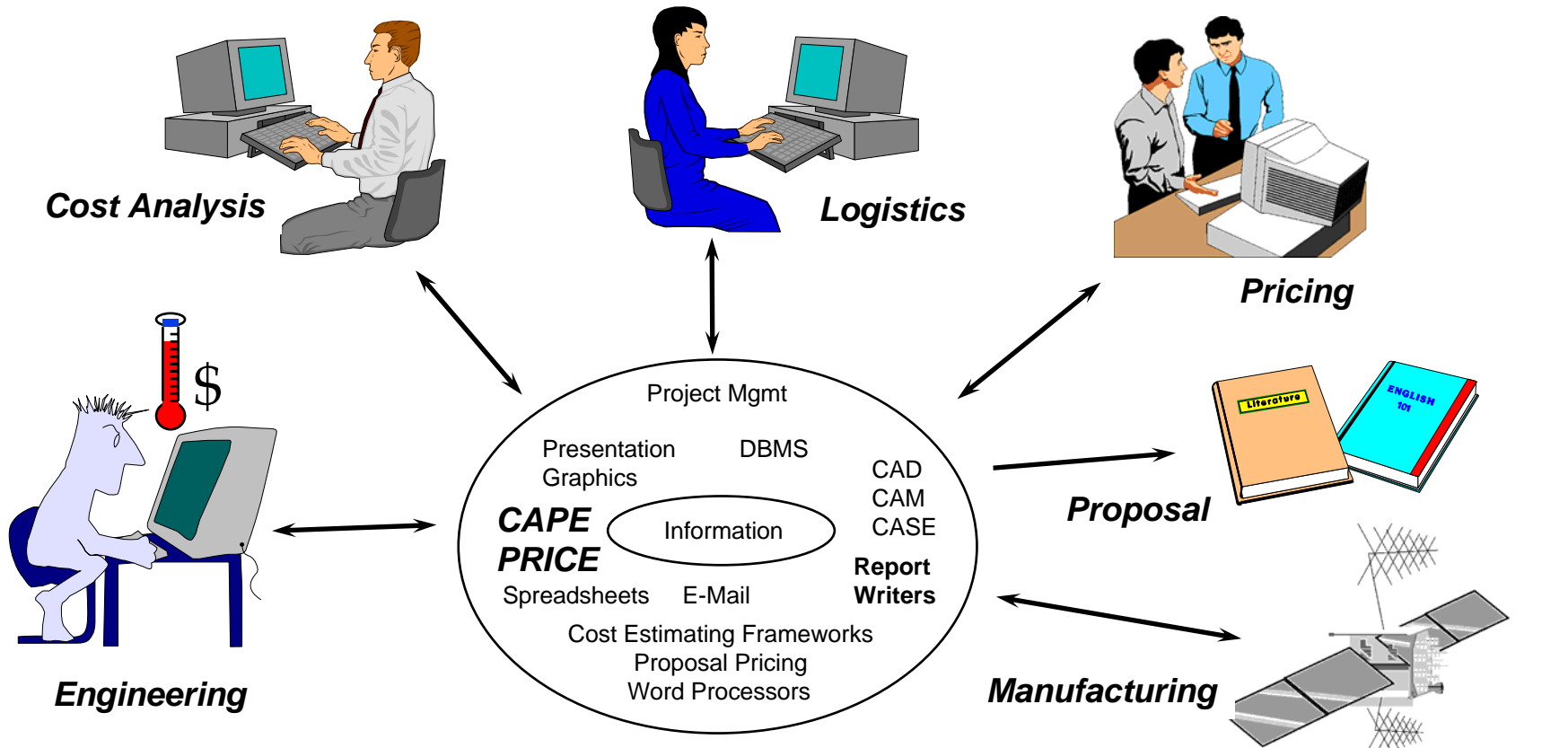
PRICE Systems

LOCKHEED MARTIN



CAPE's Future

An Integrated Solution to Cost Analysis



Concept

Design

Prototype

Production

Operation & Support



U.S. Air Force F22 Program

Excerpt from a USAF Request for Proposal:

“ . . . shall be modeled for FSD and production costs via the Martin Marietta PRICE Models (PRICE M, Electronic Module and Microcircuit Model, PRICE H, Hardware Model, and PRICE S, Software Model). This section of Chapter 4 shall include vendor, subvendor, and prime “team” contractor and subcontractor input files and output files for WBS elements 1410 through 1490 and summary WBS element 1400. The data files shall be transferred electronically via the Martin Marietta PRICE Time-Sharing System.”



Integration of Parametrics

- **Implementation Plan**
 - **Include IPT Members in Development**
- ***TRAINING***
 - **All IPT Members**
 - **Ongoing Update Training on Special Topics**
 - **Lessons Learned**



Integration of Parametrics (cont)

- **Data Collection/Repository**
- **Brief/Present Results to All Members**



Lessons Learned

- **Wright Laboratory Environment**
 - **Concept Development Phase**
 - **Minimal Information**
- **FICOP Process**
 - **Over 105 Estimates Completed in 3 Month Period**
 - **80% Accomplished via Parametric Estimating**
 - **Total Life Cycle Cost Estimates Required**



FICOP Process

- **Avionics Subsystem**
 - **Fully Automated Process/Involving Total IPT**
 - **Parametric Estimate**
 - **Project**
 - **Program Schedule**
 - **Program Baseline**



FICOP Process (cont)

- **Aircraft Prime Contractor**
 - **All Electronic**
 - **Completion of Input Forms**
 - **Internal Review**
 - **Internal Approval**
 - **Release to Customer/SPO**



FICOP Process (cont)

- **Special Program**
 - **Parametric Estimate**
 - **SPO Primary Estimate (Financial Mgmt)**
 - **Basis of Govt Negotiations (Contracts)**
 - **Used in Technical Evaluations (Engineering)**
 - **Integrated into Microsoft Project (Prog. Mgmt)**
 - **Basis for SPO Detailed Schedule**
- ***TREMENDOUS TIME/COST SAVINGS***



FICOP Process (cont)

- **OFP Estimating**
 - **Multiple Suites 3/4/5/6**
 - **Large Number of Upgrades/Modifications**
 - **Developed Model/Framework for Estimating/Tracking**
 - **70 Estimates/what-ifs Accomplished in 8 Weeks**
 - **Excellent Results**



Microsoft Excel - Htemp

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Arial 10 B I U \$ % , +.0 .00 +.0

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	1. NAME OF UNIT			2. NAME OF CONTRACTOR			3. WORK BREAKDOWN STRUCTURE ELEMENT NO. (NOS)						
2													
3	4a. CONTRACT LINE ITEM NO.				5. QTY OF THIS UNIT USED IN AND NAME OF NEXT HIGHER ASSY								
4													
5	4b. REFERENCE TECH VOL.				6. NAME OF SYSTEM OR SUBSYSTEM								
6													
7	7. MILITARY SPECIFICATIONS REQUIRED				8. SPECIAL ENVIRONMENTAL REQUIREMENTS								
8	<input type="checkbox"/> YES. SPECIFICATION NO. _____				<input type="checkbox"/> RADIATION HARDENING								
9	<input type="checkbox"/> NO. (Explain in remarks)				<input type="checkbox"/> TEMPEST								
10	<input type="checkbox"/> UNKNOWN				<input type="checkbox"/> OTHER (EXPLAIN IN REMARKS)								
11	9a. SOURCE OF UNIT				9b. IF PURCHASED OR GFE, ENTER % MODIFICATION REQUIRED								
12	<input type="checkbox"/> MANUFACTURED (In House)				PERCENT OF TOTAL ELECTRONIC								
13	<input type="checkbox"/> PURCHASED (SEE NO. 10)												
14	<input type="checkbox"/> OFF THE SHELF				PERCENT OF TOTAL MECHANICAL (EXPLAIN MODIFICATION IN REMARKS)								
15	<input type="checkbox"/> CUSTOM MADE												
16	<input type="checkbox"/> GFE												
17	10. IF PURCHASED												
18	10b. PROTOS UNIT COST \$			FIXED		<input type="checkbox"/>		10c. PROD. UNIT COST \$			YEAR \$		
19				TO BE ESCALATED		<input type="checkbox"/>							
20	11a. PHYSICAL DESCRIPTION (Reference technical volume: include photographs, or exploded views, or schematics, as appropriate.)												
21													
22													

H FORM INSTRUCTIONS Sheet3 Sheet4 Sheet5 Sheet6 Sheet

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Microsoft Excel - Htemp

File Edit View Insert Format Tools Data Window Help

Arial 10 B I U \$ % , +.00 +.00

D1

	A	B	C	D	E	F	G	H	I	J	K	L	M
23	11b. FUNCTIONAL DESCRIPTION <i>{Describe fully. Include where and how used and check category in 19 which most closely fits- indicate type of display or readout.}</i>												
24													
25													
26	12a. ENCLOSURE CONSTRUCTION			12b. DISCRETE STRUCTURAL/MECHANICAL MODULES (eg. GYROS, MOTORS, FANS, TRANSFORMERS, ENCLOSURE, BATTERIES, ANTENNAS, CASING, TWT, ETC)									
27	ENCLOSURE MATERIAL AND THICKNESS <i>{Inches}</i>			NAME OF MODULE	VOLUME (FT)	WEIGHT (LBS)	QTY/ ASSY	SOURCE					
28								MADE	% NEW DESIGN	PURCH	COST (\$)	YEAR	
29	SPECIAL PROCESSES <i>{Check any that apply}</i>												
30	<input type="checkbox"/>	MACHINING	<input type="checkbox"/>	POLISHING									
31	<input type="checkbox"/>	MODERATE	<input type="checkbox"/>	SHOCK MOUNTING									
32	<input type="checkbox"/>	CONSIDERABLE	<input type="checkbox"/>	WELDING									
33	<input type="checkbox"/>	MILLING	<input type="checkbox"/>	CASTINGS									
34	<input type="checkbox"/>	BRAZING	<input type="checkbox"/>	X-RAY INSPECTION									
35	13a. NAMES OF OTHER UNITS INTERFACING WITH THIS UNIT				13b. CHECK THE APPROPRIATE BOXES BELOW TO INDICATE INTEGRATION REQ								
36					MECHANICAL INTEGRATION				ELECTRONIC INTEGRATION				
37					<input type="checkbox"/>	ONE SURFACE MOUNTING, NO MACHINING			<input type="checkbox"/>	POWER FURNISHED TO ASSEMBLY			
38					<input type="checkbox"/>	TWO SURFACE MOUNTING, NO MACHINING			<input type="checkbox"/>	POWER FURNISHED: CABLED OUTPUT			
39					<input type="checkbox"/>	MODERATE MACHINING: SHIMMING.			<input type="checkbox"/>	AS ABOVE, PLUS CALIBRATION, ADJUSTMENT, TUNING			
40					<input type="checkbox"/>	CONSIDERABLE MACHINING			<input type="checkbox"/>	AS ABOVE, PLUS PARTS &/OR SUB-ASSY REPLACEMENT			
41	14. UNIT GEOMETRY AND WEIGHT			15. METHOD OF COOLING		16. TOTAL STRUCTURAL/MECHANICAL WT (LBS) (Include weight of all but active electron)			17. ESTIMATED TOTAL % NEW DESIGN OF ALL STRUCTURAL/MECHANICAL COMPONENTS				
42	TOTAL UNIT WEIGHT (LBS)					(eg. blowers, heat sinks, piping)							
43	UNIT VOLUME (FT)					INCLUDE WT. IN 12b AND 16							
44	OR												
45													

H FORM INSTRUCTIONS Sheet3 Sheet4 Sheet5 Sheet6 Sheet

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Microsoft Access - [PRICE H]

File Edit View Insert Format Records Tools Window Help

PRICE H

ID:	1	Title:	Sample Input Box	PLTFM:	1.8
Quantity:	252			Protos:	0
Production Start:	198	Unit Weight:	2.4	Development Start:	0
INTEGS:	1	Volume:	0.0359	INTEGE:	1
WS:	0.5	ECMPLX:	0	WE:	1.9
NEWST:	0			NEWEL:	0
Design Repeat for Structure:	0	Design Repeat for Electronics:	0		
MCPLXS:	6.761	MCPLXE:	9.56		

Structural Items:

The MCPLXS value was derived using the concept generator (contractor). Inputs used were Machined, precision parts, less than 5 lbs, material aluminum.

Electronic Technology:

This module consisted of Analog Discretes (5%), and Hybrids (95%). MCPLXE was derived using RW complexities. RF components, along with a density adjustment of 80 pounds per cubic foot.

Blue Book:

Parametric Data Forms:

Source: 1995 submission from contractor

Notes: The RFD assembly routes all the input and output RF for the control oscillator. Switches are controlled by the RA Card. Parametric data forms were received July 1995. This assembly is part

Record: 1 of 1

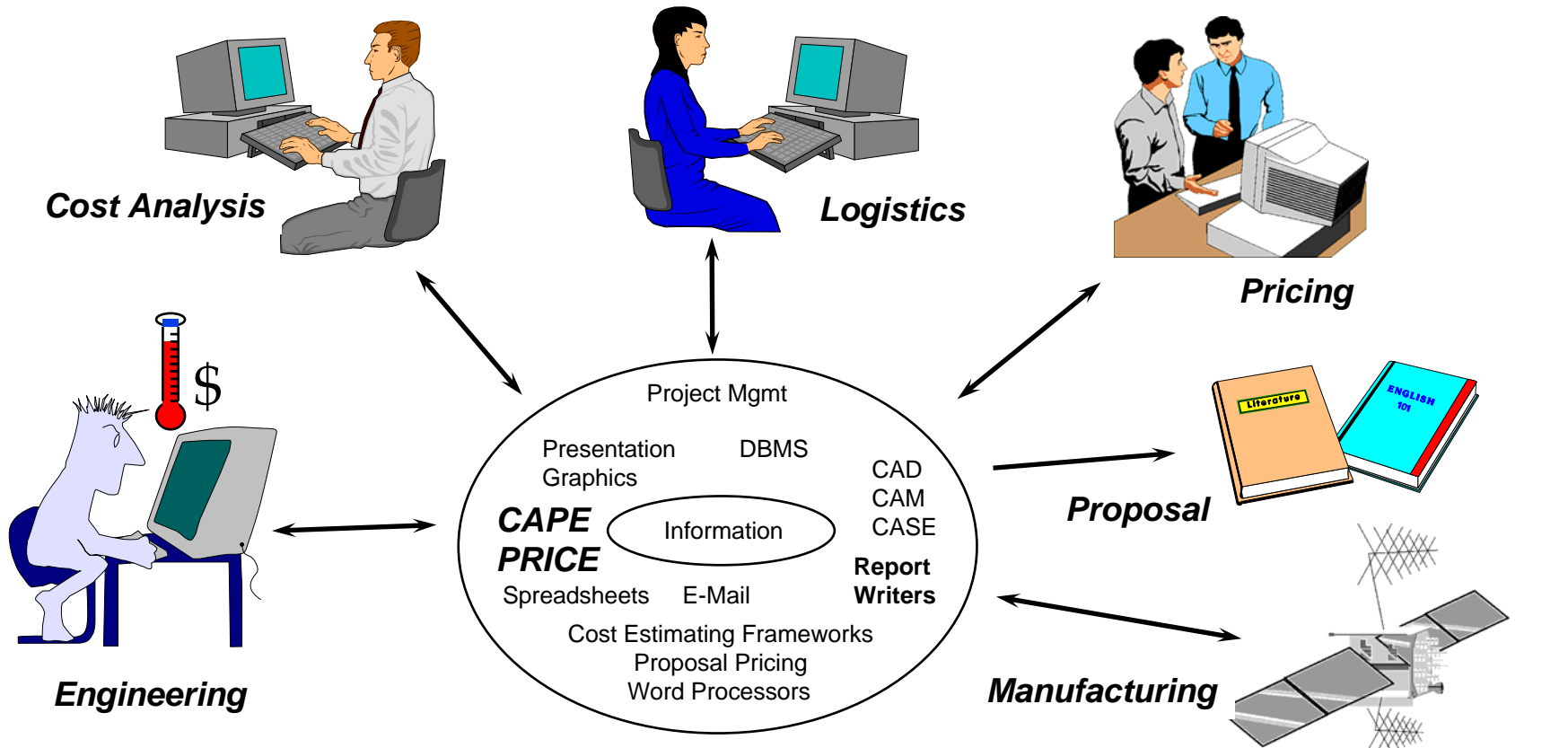
Form View

NUM



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Summary

- ***Real Examples of Programs that are Employing Parametrics in the IPT Environment***
- ***Real Examples of REDUCED COST***
- **Future of Parametrics & IPTs**