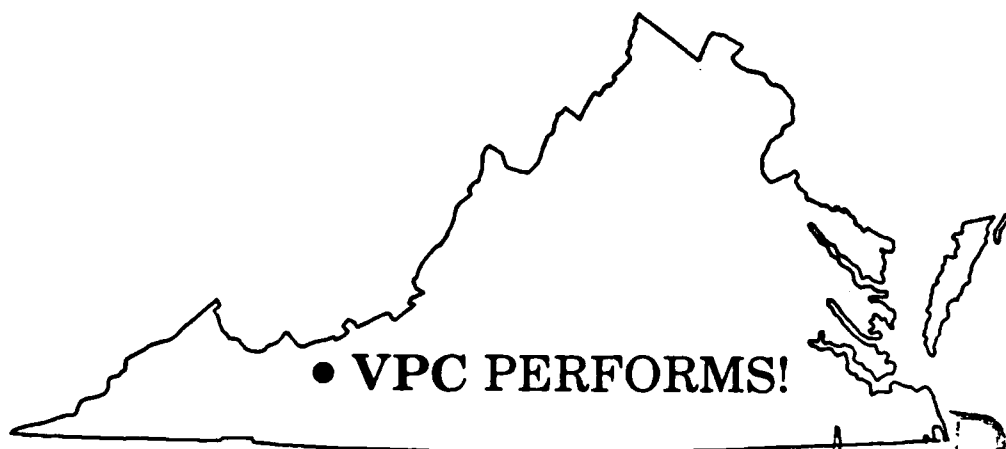


AD-A178 398

DIC FILE COPY

# VIRGINIA PRODUCTIVITY CENTER

The Study of  
Productivity Measurement  
and Incentive Methodology  
(Phase III - Paper Test)  
Volume III



Virginia Polytechnic Institute  
and State University

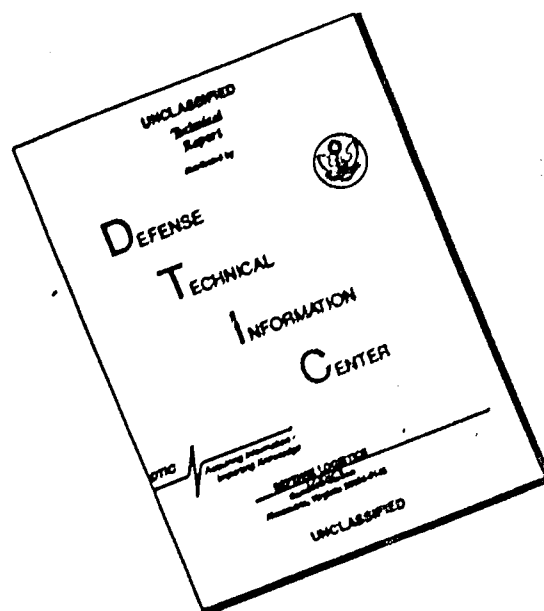
Blacksburg, Virginia 24061

This document has been approved  
for public release and sale; its  
distribution is unlimited.

DTIC  
SELECTE  
MAR 25 1987  
E

87 3 20 033

# DISCLAIMER NOTICE



THIS DOCUMENT IS BEST QUALITY AVAILABLE. THE COPY FURNISHED TO DTIC CONTAINED A SIGNIFICANT NUMBER OF PAGES WHICH DO NOT REPRODUCE LEGIBLY.

1

The Study of  
Productivity Measurement  
and Incentive Methodology  
(Phase III - Paper Test)  
Volume III

FINAL REPORT

March, 1986

Defense Supply Service - Washington

Contract MDA 903-85-C-0237

VIRGINIA PRODUCTIVITY CENTER

VPI & STATE UNIVERSITY

Blacksburg, VA 24061

DTIC  
SELECTE  
MAR 25 1987  
E

This document is prepared  
for the use of the  
contracting agency only

## **DISCLAIMER NOTICE**

**THIS DOCUMENT IS BEST QUALITY  
PRACTICABLE. THE COPY FURNISHED  
TO DTIC CONTAINED A SIGNIFICANT  
NUMBER OF PAGES WHICH DO NOT  
REPRODUCE LEGIBLY.**

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE

ADA178398

## REPORT DOCUMENTATION PAGE

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |       |                                          |                                                                                                                                                                                                                            |                                                                                                                            |                                         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| 1a. REPORT SECURITY CLASSIFICATION<br><b>UNCLASSIFIED</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |       |                                          | 1b. RESTRICTIVE MARKINGS<br><b>NONE</b>                                                                                                                                                                                    |                                                                                                                            |                                         |
| 2a. SECURITY CLASSIFICATION AUTHORITY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       |                                          | 2. DISTRIBUTION/AVAILABILITY OF REPORT<br><b>APPROVED FOR PUBLIC RELEASE<br/>DISTRIBUTION UNLIMITED</b>                                                                                                                    |                                                                                                                            |                                         |
| 2b. DECLASSIFICATION/DOWNGRADING SCHEDULE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |       |                                          |                                                                                                                                                                                                                            |                                                                                                                            |                                         |
| 4. PERFORMING ORGANIZATION REPORT NUMBER(S)<br><b>CONTRACT NO. N00039-84-C-0346<br/>VPI AND STATE UNIVERSITY</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |       |                                          | 5. MONITORING ORGANIZATION REPORT NUMBER(S)                                                                                                                                                                                |                                                                                                                            |                                         |
| 5a. NAME OF PERFORMING ORGANIZATION<br><b>VIRGINIA PRODUCTIVITY CENTER<br/>VPI AND STATE UNIVERSITY</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       | 5b. OFFICE SYMBOL<br>(If applicable)     |                                                                                                                                                                                                                            | 7a. NAME OF MONITORING ORGANIZATION<br><b>DEFENSE SYSTEMS MANAGEMENT<br/>COLLEGE</b>                                       |                                         |
| 7. ADDRESS (City, State and ZIP Code)<br><b>BLACKSBURG, VA 24061</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |       |                                          | 7b. ADDRESS (City, State and ZIP Code)<br><b>RESEARCH DIRECTORATE<br/>FORT BELVOIR, VA 22060-5426</b>                                                                                                                      |                                                                                                                            |                                         |
| 5a. NAME OF FUNDING/SPONSORING ORGANIZATION<br><b>DEFENSE SYSTEMS MANAGEMENT COLLEGE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |       | 5b. OFFICE SYMBOL<br>(If applicable)     |                                                                                                                                                                                                                            | 9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER<br><b>DEFENSE SUPPLY SERVICE- WASHINGTON, CONTR.<br/>MDA 903-85-C-0237</b> |                                         |
| 5c. ADDRESS (City, State and ZIP Code)<br><b>RESEARCH DIRECTORATE<br/>FORT BELVOIR, VA 22060-5426</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       |                                          | 10. SOURCE OF FUNDING NOS.                                                                                                                                                                                                 |                                                                                                                            |                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |       |                                          | PROGRAM<br>ELEMENT NO.                                                                                                                                                                                                     | PROJECT<br>NO.                                                                                                             | TASK<br>NO.                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |       |                                          |                                                                                                                                                                                                                            |                                                                                                                            | WORK UNIT<br>NO.                        |
| 11. TITLE (Include Security Classification)<br><b>THE STUDY OF PRODUCTIVITY MEASUREMENT<br/>AND INCENTIVE METHODOLOGY (PHASE III)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       |                                          |                                                                                                                                                                                                                            |                                                                                                                            |                                         |
| 12. PERSONAL AUTHOR(S)<br><b>D. SCOTT SINK AND MARVIN H. AGEE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |                                          |                                                                                                                                                                                                                            |                                                                                                                            |                                         |
| 13a. TYPE OF REPORT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |       | 13b. TIME COVERED<br>FROM _____ TO _____ |                                                                                                                                                                                                                            | 14. DATE OF REPORT (Yr., Mo., Day)<br><b>1986 MARCH</b>                                                                    |                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |       |                                          |                                                                                                                                                                                                                            | 15. PAGE COUNT<br><b>815</b>                                                                                               |                                         |
| 16. SUPPLEMENTARY NOTATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |       |                                          |                                                                                                                                                                                                                            |                                                                                                                            |                                         |
| 17. COSATI CODES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |       |                                          | 18. SUBJECT TERMS (Continue on reverse if necessary; and identify by block number)                                                                                                                                         |                                                                                                                            |                                         |
| FIELD                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | GROUP | SUB. GR.                                 | PRODUCTIVITY MEASUREMENT; PRODUCTIVITY EVALUATION; PRODUCTIVITY;<br>MULTI-FACTOR PRODUCTIVITY MEASUREMENT; AUTOMATED COST<br>BASELINE GENERATOR; DISCOUNTED CASH FLOW/SHARED SAVINGS<br>MODEL; COST DEFINITION METHODOLOGY |                                                                                                                            |                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |       |                                          |                                                                                                                                                                                                                            |                                                                                                                            |                                         |
| 19. ABSTRACT (Continue on reverse if necessary and identify by block number)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |       |                                          |                                                                                                                                                                                                                            |                                                                                                                            |                                         |
| <p>THE OVERALL GOAL OF THE FIVE-PHASE STUDY WAS TO IDENTIFY AND DEVELOP "PRODUCTIVITY" MEASUREMENT AND METHODOLOGIES AND MODELS THAT WILL EFFECTIVELY INTEGRATE WITH GOVERNMENT TO CONTRACTOR INCENTIVE METHODOLOGIES. THE PHASE III REPORT CONSISTS OF THREE VOLUMES. VOLUME I CONSISTS OF A DETAILED SUMMARY OF THE PHASE III STUDY; VOLUME II, A DETAILED ANALYSIS OF THE MODELS TESTED; VOLUME III, FINAL REPORT BRIEFING AT DSMC.</p> <p>IN PHASE III, THREE PRODUCTIVITY MEASUREMENT/EVALUATION MODELS WERE "PAPER" TESTED AGAINST A GENERIC SET OF CRITERIA TO DEPICT THE RELATIVE STRENGTHS AND WEAKNESSES OF EACH MODEL AS DIRECTLY RELATED TO THE INTENDED APPLICATION.</p> <p>THE PAPER TEST REVEALED THE CRITICAL NEED TO DEVELOP A PRODUCTIVITY MEASUREMENT METHODOLOGY FOR DEFENSE CONTRACTORS THAT REPRESENTS A GRAND STRATEGY, WHICH CAN BE TAILORED TO SUIT SPECIFIC SITUATIONS AND CIRCUMSTANCES.</p> |       |                                          |                                                                                                                                                                                                                            |                                                                                                                            |                                         |
| 20. DISTRIBUTION/AVAILABILITY OF ABSTRACT<br>UNCLASSIFIED/UNLIMITED <input checked="" type="checkbox"/> SAME AS RPT. <input type="checkbox"/> DTIC USERS <input type="checkbox"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |                                          | 21. ABSTRACT SECURITY CLASSIFICATION<br><b>UNCLASSIFIED</b>                                                                                                                                                                |                                                                                                                            |                                         |
| 22a. NAME OF RESPONSIBLE INDIVIDUAL<br><b>DAVID D. ACKER</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |       |                                          | 22b. TELEPHONE NUMBER<br>(Include Area Code)<br><b>(703) 664-4795</b>                                                                                                                                                      |                                                                                                                            | 22c. OFFICE SYMBOL<br><b>DSMC-DR1-R</b> |

THE STUDY OF  
PRODUCTIVITY MEASUREMENT  
AND  
INCENTIVE METHODOLOGY  
(Phase III - Paper Test)

FINAL REPORT

14 March 1986

Contract MDA 903-85-C-0237  
Defense Supply Service - Washington

Contract No. N00039-84-C-0346  
VPI and State University

Principal Investigator:  
Virginia Productivity Center, VPI  
D. Scott Sink, Ph.D., P.E. (Director)  
Marvin H. Agee, Ph.D. (Co-Director)  
Chell A. Roberts (Research Associate)  
Marty Simpson (Administrative Assistant)

Subcontractors:

**LTV Aerospace and Defense**  
Vought Aero Products Division  
Shoni Dhir, Manager Productivity Requirements  
Ray Thornton, Productivity Measurement Staff  
Len Thorpe, Manager Productivity Measurement

**Price Waterhouse**  
William T. Muir, Principal  
Eugene J. Klein, Manager  
Betty B. Thayer, Senior Consultant

**Westinghouse Electric Corporation**  
Defense Group, Manufacturing Systems and  
Technology Center  
Richard L. Engwall, Manager Systems Planning  
Analysis, and Assurance

**Maryland Center for Productivity and  
Quality of Working Life**  
University of Maryland  
Thomas C. Tuttle, Director

|               |    |
|---------------|----|
| Accession For |    |
| NTIS          | XX |
| DTIC TAB      |    |
| Unannounced   |    |
| Justification |    |
| By            |    |
| Distribution  |    |
| Availability  |    |
| Dist          |    |
| A-1           | 23 |



VOLUME III

TABLE OF CONTENTS

|                                                          | <u>Page</u> |
|----------------------------------------------------------|-------------|
| VIII. Final Report Briefing Presentations                |             |
| A. Final Report Draft Presentations - . . . . .          | 698         |
| January 17, 1986, Ft. Belvoir, VA                        |             |
| 1. Introductory Comments/Executive Summary (VPC)         |             |
| 2. LTV/VAPD Integrated Approach                          |             |
| a. LTV Presentation                                      |             |
| b. VPC Paper Test                                        |             |
| 3. CDEF                                                  |             |
| a. Price Waterhouse Presentation                         |             |
| b. LTV Paper Test                                        |             |
| 4. MFPMM                                                 |             |
| a. VPC Presentation                                      |             |
| b. LTV Paper Test                                        |             |
| 5. DCF/SSA                                               |             |
| a. Westinghouse Presentation                             |             |
| b. LTV Paper Test                                        |             |
| 6. Summary Remarks/Conclusions and Recommendations (VPC) |             |
| a. Summary Remarks                                       |             |
| b. Conclusions & Recommendations                         |             |
| B. Final Report Briefing Presentation - . . . . .        | 813         |
| February 18, 1986, Pentagon, Washington, D.C.            |             |
| Appendix A. Distribution List . . . . .                  | 814         |

VIII.A.1 - Introductory Comments/Executive Summary

# **The Study of Productivity Measurement and Incentive Methodology**

**(Phase III Paper Test)**

**Final Presentation**

**17 January 1986**

**Fort Belvoir, Virginia**

**ITEM 2**  
**FINAL AGENDA**  
**FOR**  
**FINAL PRESENTATION**

**17 January 1985**  
**Fort Belvoir, VA**

|      |                                                              |                                   |
|------|--------------------------------------------------------------|-----------------------------------|
| 0900 | Introduction(s)                                              | Mr. David Acker (TCO)             |
| 0920 | Introduction, Review Agenda,<br>and Executive Summary        | D. Scott Sink (PI)                |
| 1000 | Paper Tests:<br>LTV Integrated Approach<br>VPC Evaluation    | S.Dhir<br>Sink                    |
| 1200 | LUNCH                                                        |                                   |
| 1330 | CDEF:<br>Price Waterhouse<br>LTV/VAPD                        | Thayer/Cline<br>Dhir              |
| 1415 | MFPMM:<br>VPC<br>LTV/VAPD                                    | Sink/Roberts<br>Dhir/Thorpe       |
| 1500 | BREAK                                                        |                                   |
| 1515 | DCF/LMI/Westinghouse<br>Westinghouse<br>LTV/VAPD<br>VPC      | Engvall/<br>Thornton/Dhir<br>Agee |
| 1600 | Summary/Conclusions/<br>Recommendations                      | Sink/Agee                         |
| 1615 | Q&A's, Recommendations<br>from Advisory Board,<br>Next Steps |                                   |
| 1630 | Adjourn                                                      |                                   |

## **PHASE III PROJECT MANAGEMENT OBJECTIVES**

- 010 -- DEVELOP DETAILED PLAN FOR PHASE III  
EXECUTION. HOLD INITIAL PLANNING SESSION.**
- 011 -- SUBMIT SUMMARY REPORT FOR INITIAL PLANNING  
SESSION.**
- 012 -- SUBMIT PROGRESS REPORTS ON A AS SCHEDULED/  
NEEDED BASIS.**
- 013 -- PROVIDE PROGRESS BRIEFINGS AS SCHEDULED/  
REQUESTED.**
- 014 -- EXECUTE PAPER TEST.**
- 015 -- PROVIDE A DRAFT REPORT SUMMARIZING THE  
PAPER TEST 18 WEEKS AFTER CONTRACT APPROVAL.**
- 016 -- PREPARE AND SUBMIT FINAL REPORT ON OR  
BEFORE 26TH WEEK AFTER CONTRACT APPROVAL.  
(NOTE: ONE MONTH EXTENTION HAS BEEN REQUESTED)**

### PHASE III

#### REPORTS AND PROJECT DELIVERABLES

- INITIAL PLANNING MEETING AND REPORT
  - JULY 26, 1985
  - MID AUGUST REPORT
- PLANS FOR PAPER TESTS
  - LTV PLANNING SESSION
  - LATE AUGUST
- PROGRESS REPORTS AND PRESENTATIONS
  - FIVE SCHEDULED
  - SCHEDULE TO BE DETERMINED
- DRAFT REPORT OF PAPER TESTS
  - LATE NOVEMBER
- FINAL REPORT OF PAPER TESTS
  - JANUARY 1986

**VOLUME I  
TABLE OF CONTENTS**

|                                                                                                                   | <u>Page</u> |
|-------------------------------------------------------------------------------------------------------------------|-------------|
| I. Executive Summary . . . . .                                                                                    | 1           |
| II. Background                                                                                                    |             |
| A. Overall Project Goals . . . . .                                                                                | 12          |
| B. Phases I & II Results . . . . .                                                                                | 16          |
| C. Phase III Goals . . . . .                                                                                      | 28          |
| D. Phases IV & V Goals . . . . .                                                                                  | 30          |
| III. Introduction Phase III Results . . . . .                                                                     | 36          |
| IV. Field Site Description (Objective 7)                                                                          |             |
| A. LTV/Vought Aero Products Division . . . . .                                                                    | 43          |
| B. Typical Aerospace and Defense<br>Contractor/Subcontractor . . . . .                                            | 46          |
| C. Westinghouse Site Description . . . . .                                                                        | 53          |
| V. Approach and Results                                                                                           |             |
| A. General Approach . . . . .                                                                                     | 64          |
| B. Description of Each Model . . . . .                                                                            | 66          |
| 1. CDEF                                                                                                           |             |
| 2. DCF/SSA                                                                                                        |             |
| 3. MPPMM                                                                                                          |             |
| 4. LTV Integrated Approach                                                                                        |             |
| C. Applications of Each Model (Objective 5) . . . . .                                                             | 254         |
| 1. CDEF                                                                                                           |             |
| 2. DCF/SSA                                                                                                        |             |
| 3. MPPMM                                                                                                          |             |
| D. Comparison and Evaluation Methodology<br>(Objectives 3 & 6)<br>(Generic and Model Specific Criteria) . . . . . | 273         |
| 1. Generic Criteria                                                                                               |             |
| 2. Specific Criteria                                                                                              |             |
| E. Evaluation of Each Model as a Productivity<br>Measurement and Incentives Methodology<br>Model . . . . .        | 282         |
| F. Evaluation of Combined Models Approach . . . . .                                                               | 293         |
| VI. Recommendations and Conclusions<br>(Objectives 1, 8, 9) . . . . .                                             | 295         |

**VOLUME II  
TABLE OF CONTENTS**

|                                                                    |            |
|--------------------------------------------------------------------|------------|
| <b>VII. Detailed Analysis of Each Model (Objectives 2 &amp; 4)</b> |            |
| <b>(Paper Test) . . . . .</b>                                      | <b>308</b> |
| A. CDEF                                                            |            |
| B. DCF/SSA                                                         |            |
| C. MPPMM                                                           |            |
| D. LTV Paper Test of Three Models                                  |            |
| <b>(Each Detailed Analysis Contains the</b>                        |            |
| <b>Following Elements)</b>                                         |            |
| 1. Purpose of the Model                                            |            |
| 2. Applications — how the model is                                 |            |
| intended/has been applied.                                         |            |
| 3. Unit of Analysis for Model                                      |            |
| 4. Input Data Requirements                                         |            |
| 5. Output Data                                                     |            |
| 6. Operating Scenario — how it                                     |            |
| functions, paper test                                              |            |
| methodology                                                        |            |
| 7. Resource Requirements — person                                  |            |
| hours, equipment, software,                                        |            |
| expertise                                                          |            |
| 8. Analysis of Model for Test Site                                 |            |
| 9. Recommendations                                                 |            |
| <b>E. Responses to Questions Raised in Paper Tests . . .</b>       | <b>670</b> |

## **Major Findings**

- **None of the three models tested will accomplish all of the objectives desired by the Government or contractors.**
- **A methodology which integrates the use of these and perhaps other models is needed.**
- **Each of the three models has certain "soft spots" but all have excellent potential.**
- **The issue of translation, transfer, and effective implementation at other sites needs to be studied further.**



**FIGURE III-1**  
**Generic Productivity Management Methodology**  
**as Related to Defense Industry**

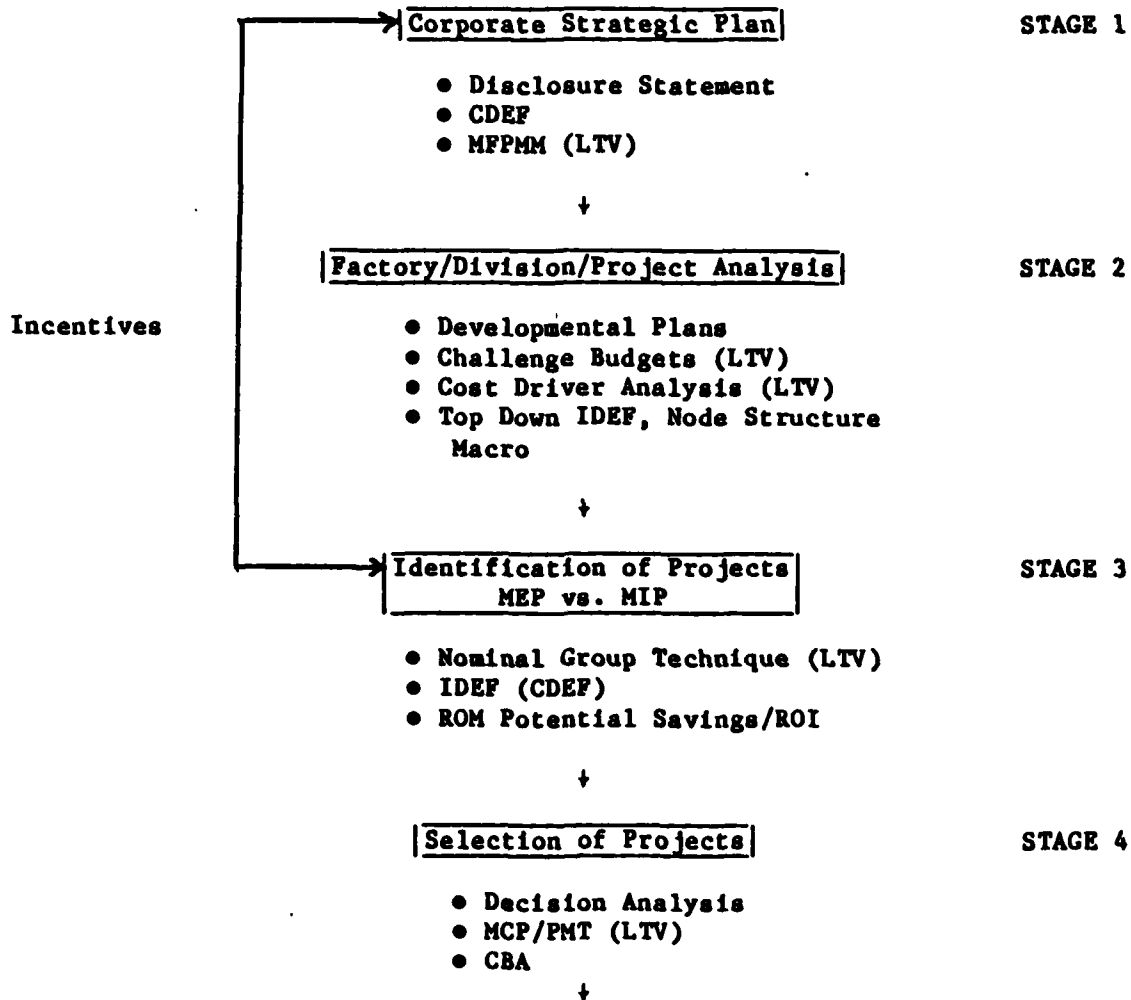
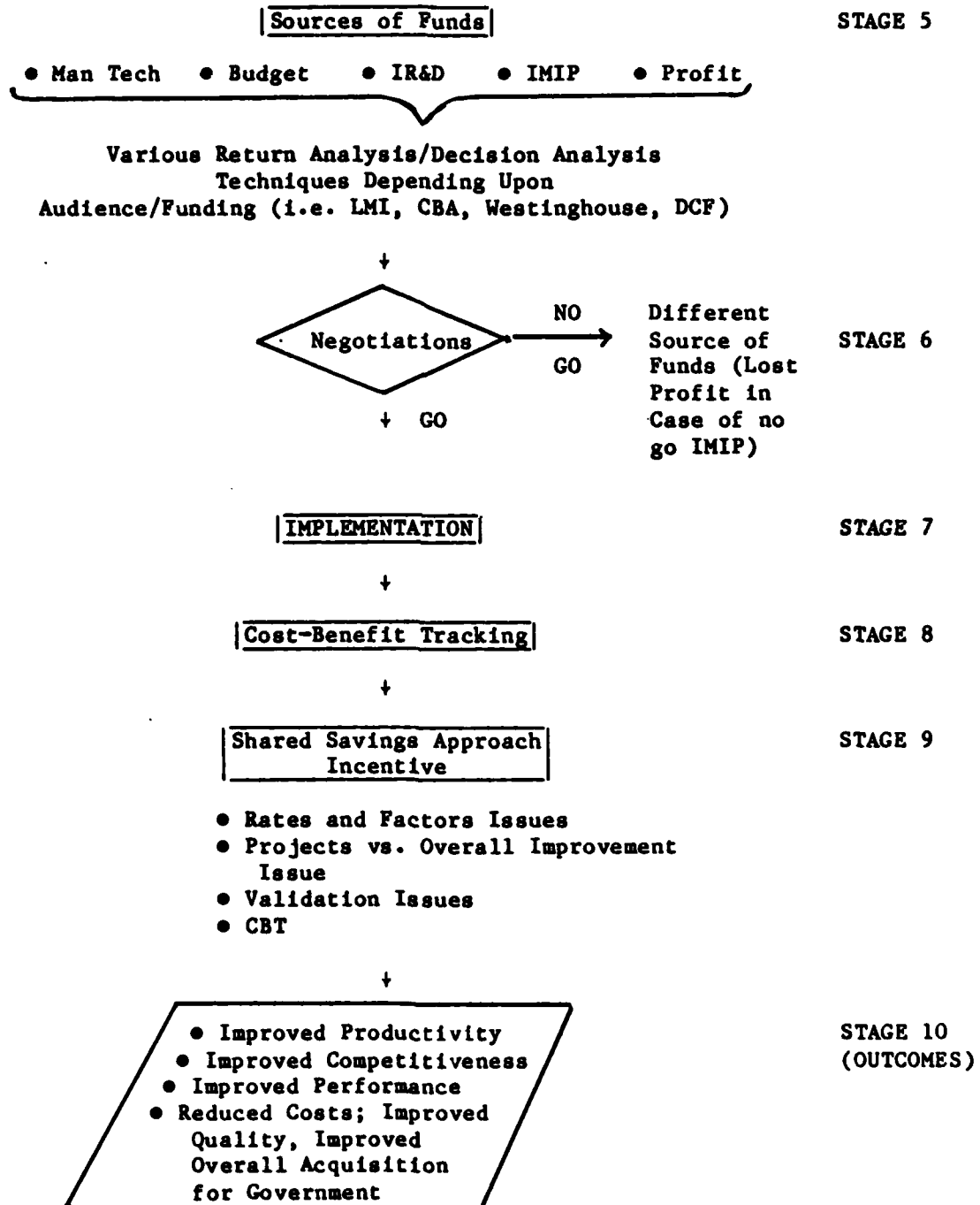


**Figure III-1 (cont.)  
Generic Productivity Management Methodology  
As Related to Defense Industry**



VIII.A.2 - LTV/VAPD Integrated Approach

a. LTV Presentation

**LDV** Aerospace and Defense  
Vought Aero Products Division

*where we're headed*



094-1120-10

# PRODUCTIVITY IMPROVEMENT THEME BUILT INTO

STRATEGIC PLAN

DEVELOPMENT PLAN

BUDGETS

OPERATIONS

PROFITS

PROPOSALS

IV Aerospace and Defense  
Vought Aero Products Division

# STRATEGIC PLAN

CP-6-3746-1

$$\frac{\text{RESOURCE PRICE}}{\text{PRODUCT PRICE}}$$

$$\frac{\text{RESOURCE PRICE}}{\text{PRODUCT PRICE}}$$

X

X

$$\frac{\text{RESOURCE QUANTITY}}{\text{PRODUCT QUANTITY}}$$

$$\text{PRODUCTIVITY}$$

=

=

$$\frac{\text{COST}}{\text{SALES}}$$

$$\text{PROFITABILITY}$$

$$\frac{\Delta \text{ RESOURCE PRICE}}{\Delta \text{ PRODUCT PRICE}}$$

X

$$\Delta \text{ PRODUCTIVITY}$$

=

$$\Delta \text{ PROFITABILITY}$$

$$\frac{\Delta \text{ RESOURCE PRICE}}{\Delta \text{ PROFITABILITY}}$$

X

$$\Delta \text{ PRODUCTIVITY}$$

=

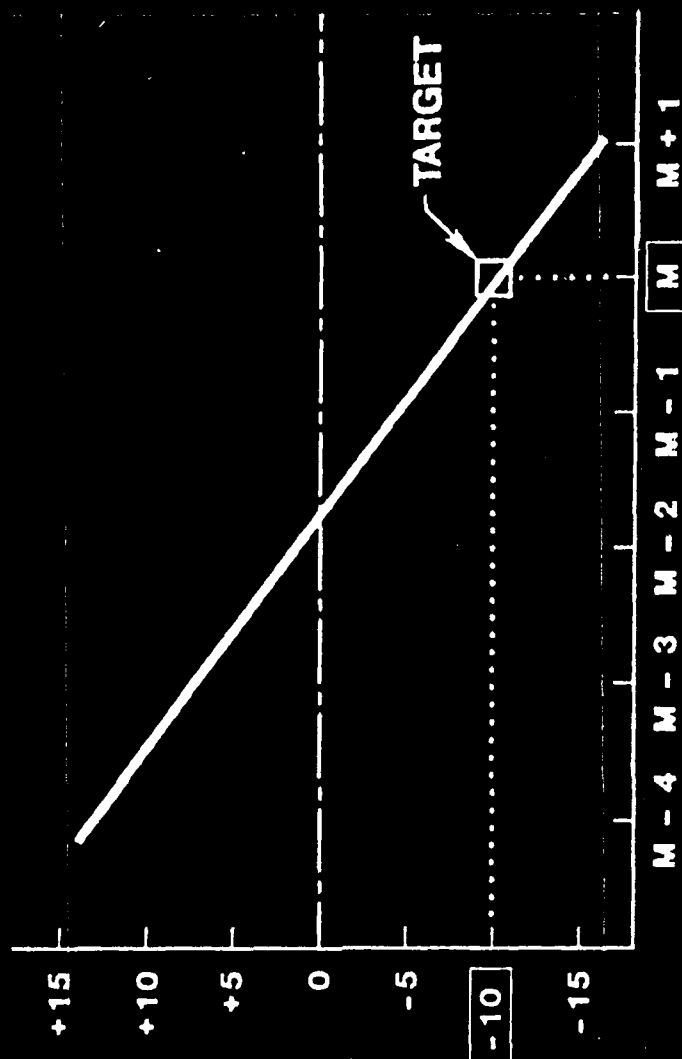
$$\Delta \text{ PRODUCT PRICE}$$

FORECASTED

RELATED

DAV-111-4

# STRATEGIC PRICING



**Δ PRODUCT PRICE**

OVER (+)/UNDER (-)  
INDUSTRY AVERAGE

**Δ PRODUCTIVITY**

ANNUAL IMPROVEMENT

DV Aerospace/and Defense  
Vought Aero Products Division

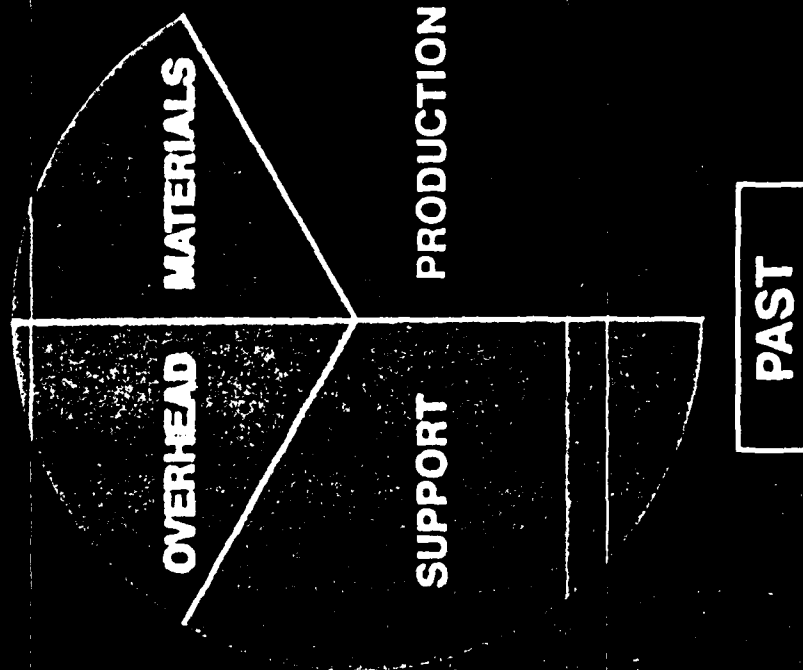
# DEVELOPMENT PLAN

OPG-5745-8

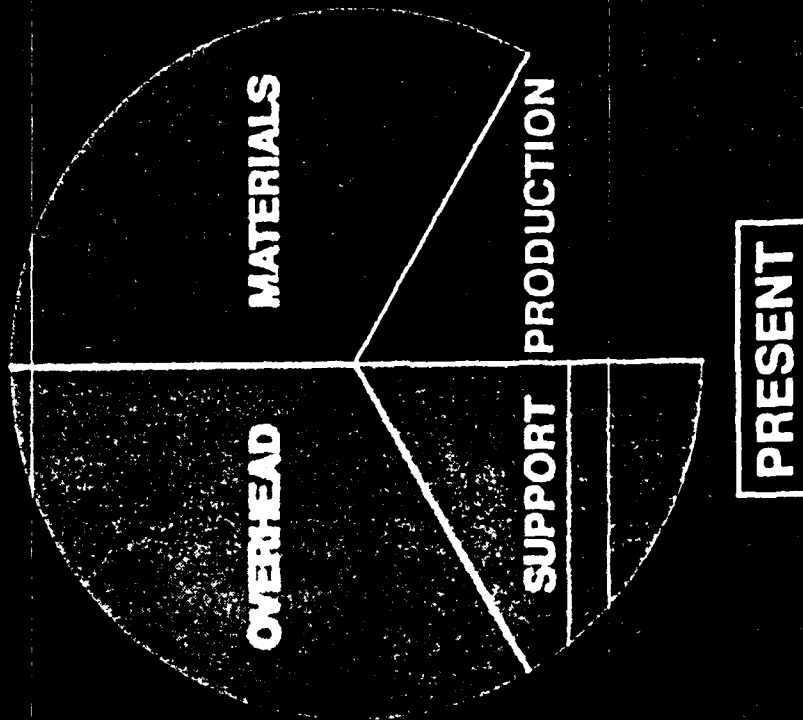
|||||

IV Aerospace and Defense  
Vought Aero Products Division

# CHANGE IN COST DRIVERS



PAST



PRESENT

CPE-111-9

# PROJECT SELECTION AND ANALYSIS

IV Aerospace and Defense  
Vought Aero Products Division

## HUMAN RESOURCES (HR) EXAMPLE OF EMPLOYEE PARTICIPATION (NGT) RESULTS FOR ONE PROJECT

| RANKING     |            | PROJECT                                                                                                                                                                                       | VOTES | SCORE |
|-------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------|
| EMPLOYEE    | MANAGEMENT |                                                                                                                                                                                               |       |       |
| 11          | 2          | <div>EMPLOYEE BADGE BASED AUTOMATION:</div> <ul style="list-style-type: none"><li>• CLOSED CIRCUIT TV CHECK AT ENTRY AND EXIT</li><li>• AUTOMATED ATTENDANCE - ELIMINATE TIME CARDS</li></ul> | 7     | 31    |
| ASSIGNED TO |            |                                                                                                                                                                                               |       |       |
| IMOD        |            |                                                                                                                                                                                               |       |       |

## COST ANALYSIS FOR PROJECT: EMPLOYEE BADGE BASED AUTOMATION

| FOCUS       | AS-IS BASELINE |              | EXPECTED IMPROVEMENT |              | IMPLEMENTATION \$M |       |
|-------------|----------------|--------------|----------------------|--------------|--------------------|-------|
|             | HEADCOUNT      | % OF HR COST | % OF BASELINE        | % OF HR COST | CAPITAL            | OTHER |
| • SECURITY  | 96             | 36           | 16.0                 | 5.7          |                    |       |
| • MAIL ROOM | 18             | 7            | 6.0                  | 0.7          | 4.2                | 2.0   |
| • GENERAL   | 4000           | 1400         | 0.5                  | 11.2         |                    |       |
| • INTEREST  | -              | 210          | 10.0                 | 21.0         |                    |       |
|             |                |              |                      | <u>38.6</u>  |                    |       |
|             |                |              |                      | \$ 4.8M      |                    |       |

CRP-414-7

# PRODUCTIVITY PROJECTS (PARTIAL LIST)

| PROGRAM                                                           | FOCUS                   |
|-------------------------------------------------------------------|-------------------------|
| • FLEXIBLE MANUFACTURING                                          | PRODUCTION              |
| • COMPUTER-AIDED DESIGN                                           | ENGINEERING             |
| • COMPUTER-AIDED MANUFACTURING                                    | SUPPORT                 |
| • INVENTORY REDUCTION/JUST-IN-TIME                                | OVERHEAD                |
| • AUTOMATED PROCUREMENT                                           | MATERIALS               |
| • OFFICE OF THE FUTURE                                            | WHITE COLLAR            |
| • EMPLOYEE BADGE BASED AUTOMATION<br>(ENTRY, ATTENDANCE, PAYROLL) | SECURITY AND<br>FINANCE |
| • ENERGY MANAGEMENT SYSTEMS                                       | ENERGY                  |
| • ARTIFICIAL INTELLIGENCE BASED BIDS<br>AND PROPOSALS             | SALES                   |
| • AUTOMATED WAREHOUSING SYSTEMS                                   | WAREHOUSING             |
| • EMPLOYEE MOTIVATION AND<br>GAINSHARING                          | GENERAL                 |

IV Aerospace and Defense  
Vought Aero Products Division

# BUDGETS

CVS-5745-10

**COST**  
—  
**SALES**

=

**RESOURCE QUANTITY**  
—  
**PRODUCT QUANTITY**

X

**RESOURCE PRICE**  
—  
**PRODUCT PRICE**

**PROFITABILITY**

=

**PRODUCTIVITY**

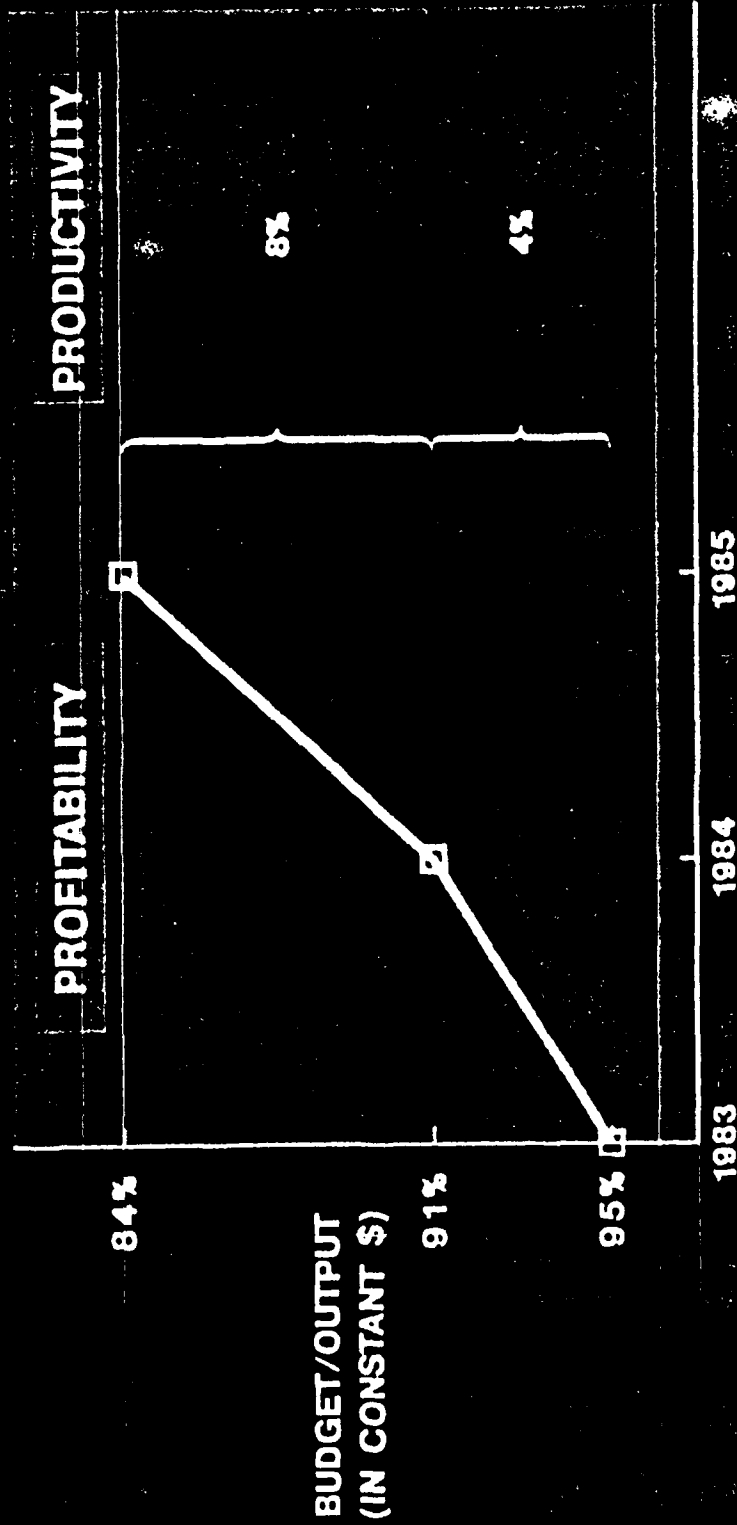
X

**PRICE RECOVERY**

**RELATED**

**FORECASTED**

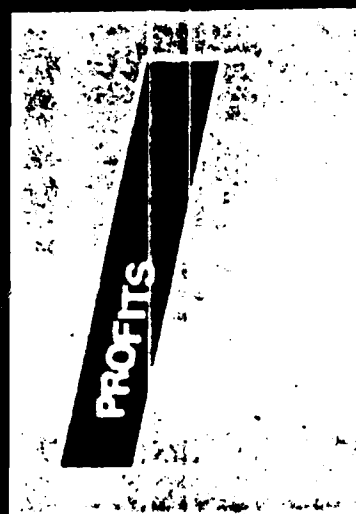
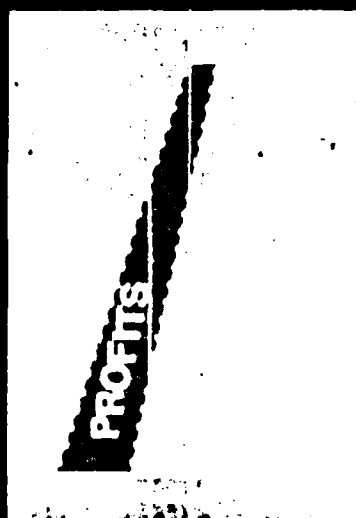
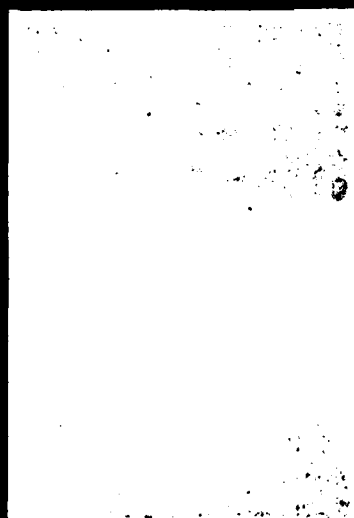
# BUDGET CONTROL



**COST  $\equiv$  BUDGET**  
**SALES  $\equiv$  OUTPUT (SALES  $\pm$   $\Delta$  INVENTORY)**

# PROFITABILITY INCENTIVE

INCENTIVE ABSENT



PRODUCTIVITY —→

PRODUCTIVITY —→

← % ALLOWED PROFIT MARGIN

← \$

# PROFITABILITY INCENTIVE

SIMPLE

UNIVERSAL

MACRO

MEASURABLE

AUDITABLE

DTV Aerospace and Defense  
Vought Aero Products Division

# OPERATIONS - PERFORMANCE

CV-5765-13

# PERFORMANCE CRITERIA\*

PRODUCTIVITY

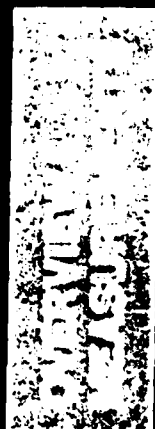
QUALITY

INNOVATION

EFFECTIVENESS

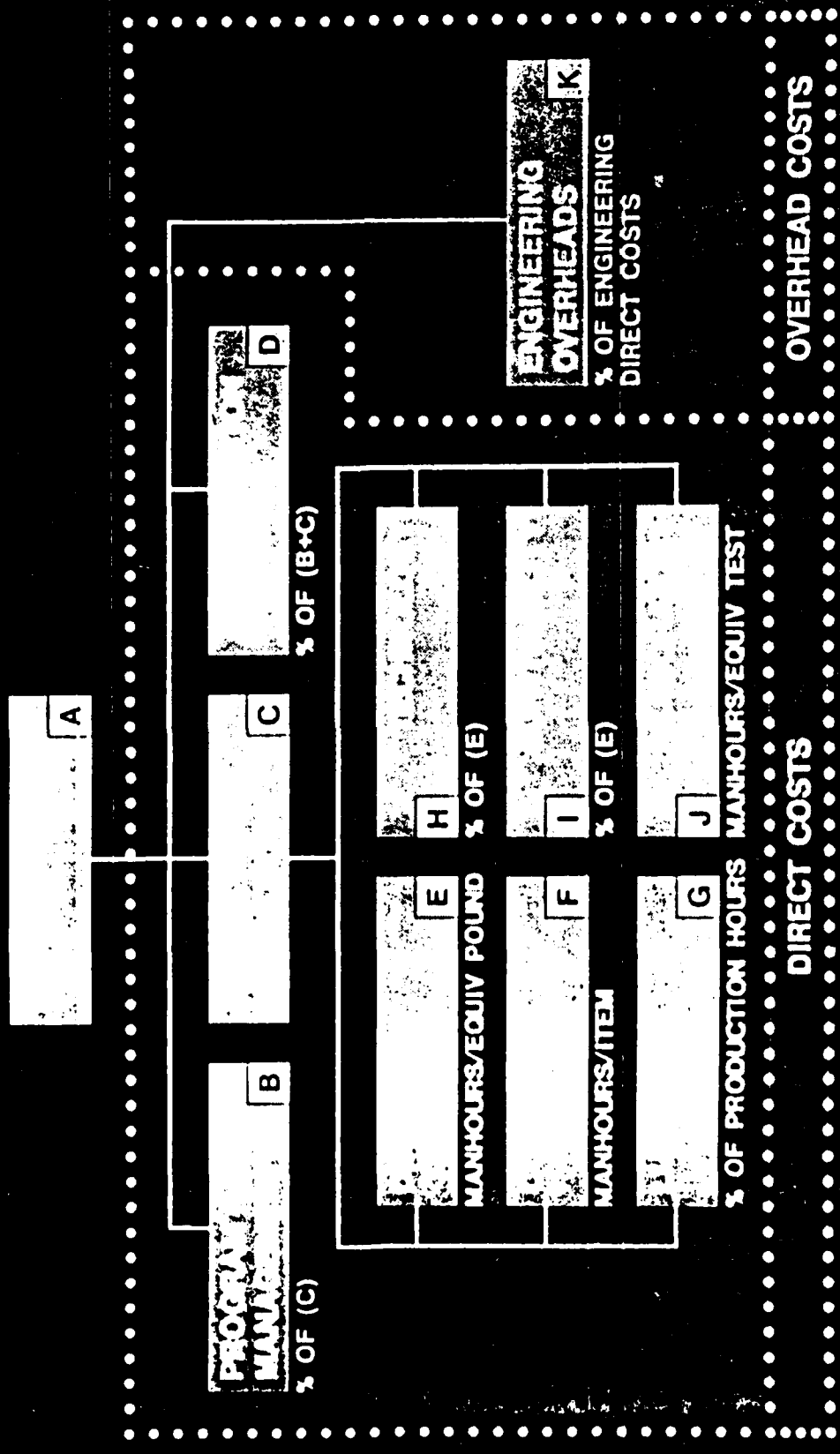
QUALITY OF WORK LIFE

PROFITABILITY



\* Book on "Productivity Management" by Dr. D. Scott Sink

# DEPARTMENTAL MEASUREMENTS



OP-111-B

# OVERVIEW MEASUREMENTS

SALES FROM INHOUSE DEVELOPED PRODUCTS

R&D COSTS

R&D COSTS

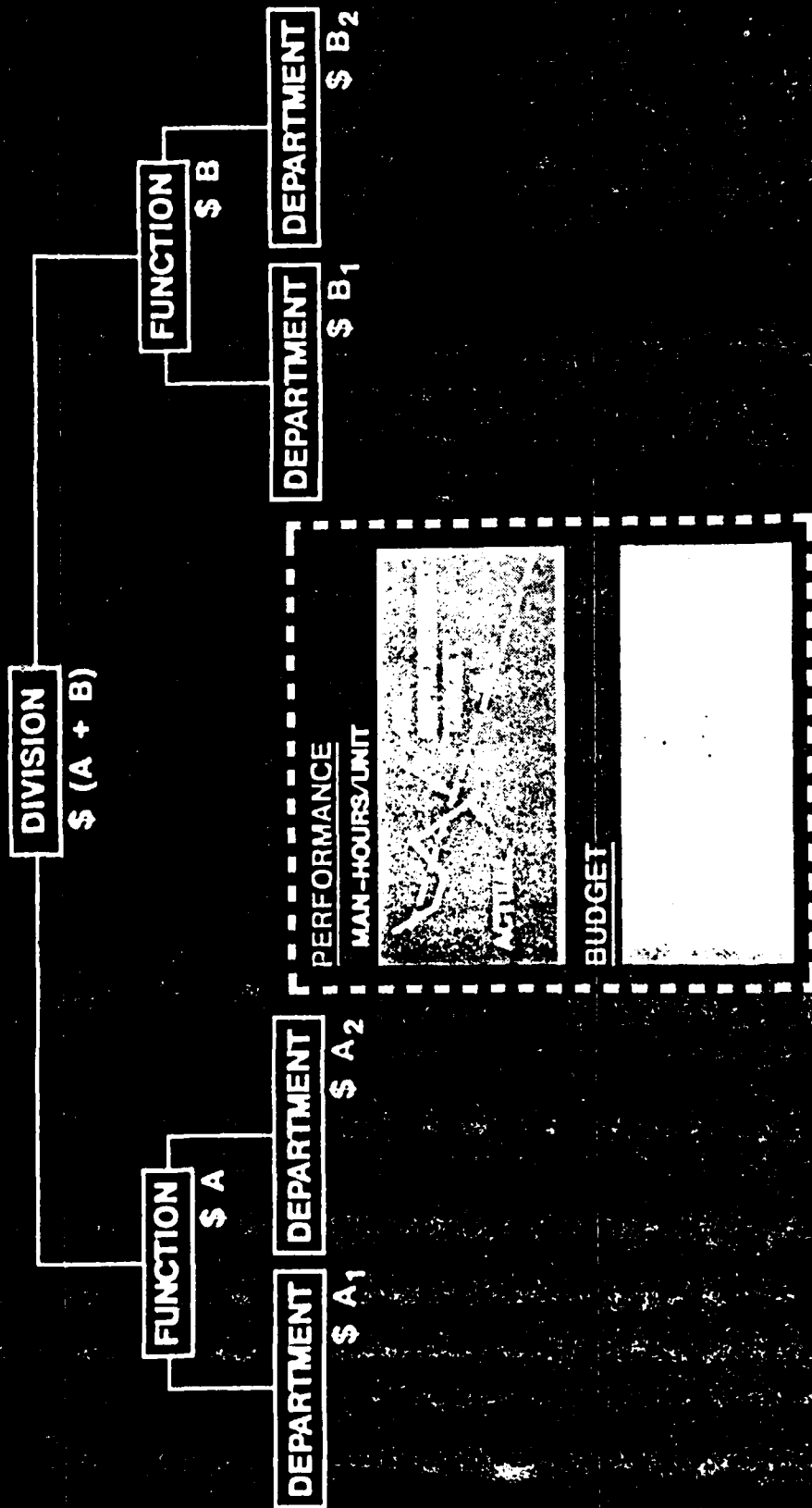
TOTAL ENGINEERING COSTS

LABOR TURNOVER

TRAINING AND EDUCATION COSTS

ENGINEERING SALARY AND WAGES

ENGINEERING CHANGE TRAFFIC PER PART



**DEPARTMENTAL MEASUREMENTS ARE  
DIRECTLY RELATED TO BUDGETS**

# DEPARTMENTAL CONTRIBUTIONS ARE SUBJECT TO MEETING OVERVIEW PERFORMANCE

陳永發

DV Aerospace and Defense  
Vought Aero Products Division

CONVING

800-444-8

## TWO TYPES OF IMIP PROJECTS

### MODERNIZATION INVESTMENT

(MIP)

- CAPITAL INTENSIVE
- EQUIPMENT & FACILITIES
- RETURN-ON-INVESTMENT

FOCUS: **MANUFACTURING**

### MODERNIZATION EFFICIENCY

(MEP)

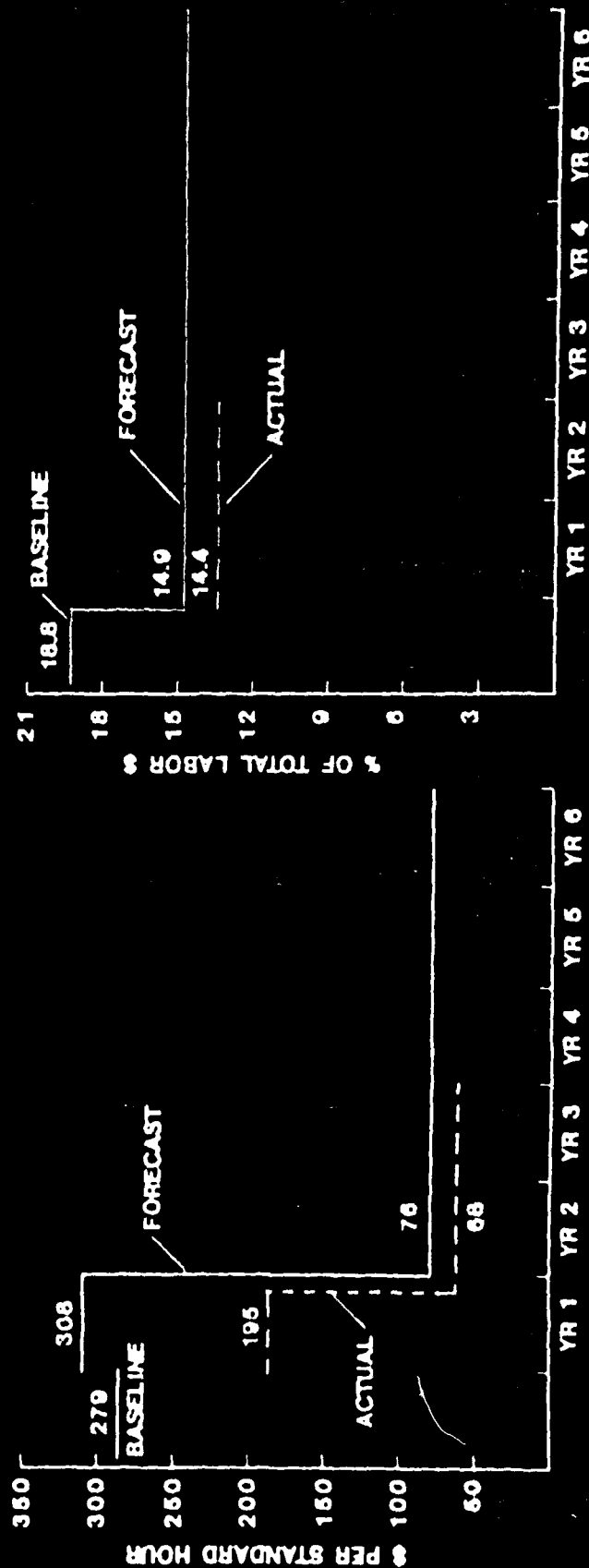
- NO SIGNIFICANT CAPITAL
- MANAGEMENT & SYSTEMS
- NEGOTIATED REWARDS

FOCUS: **OVERHEAD**

DV Aerospace and Defense  
 Weight And Products Division

# TRACKING ACTUAL RESULTS

## MEP PROJECT-FRIDGE COST

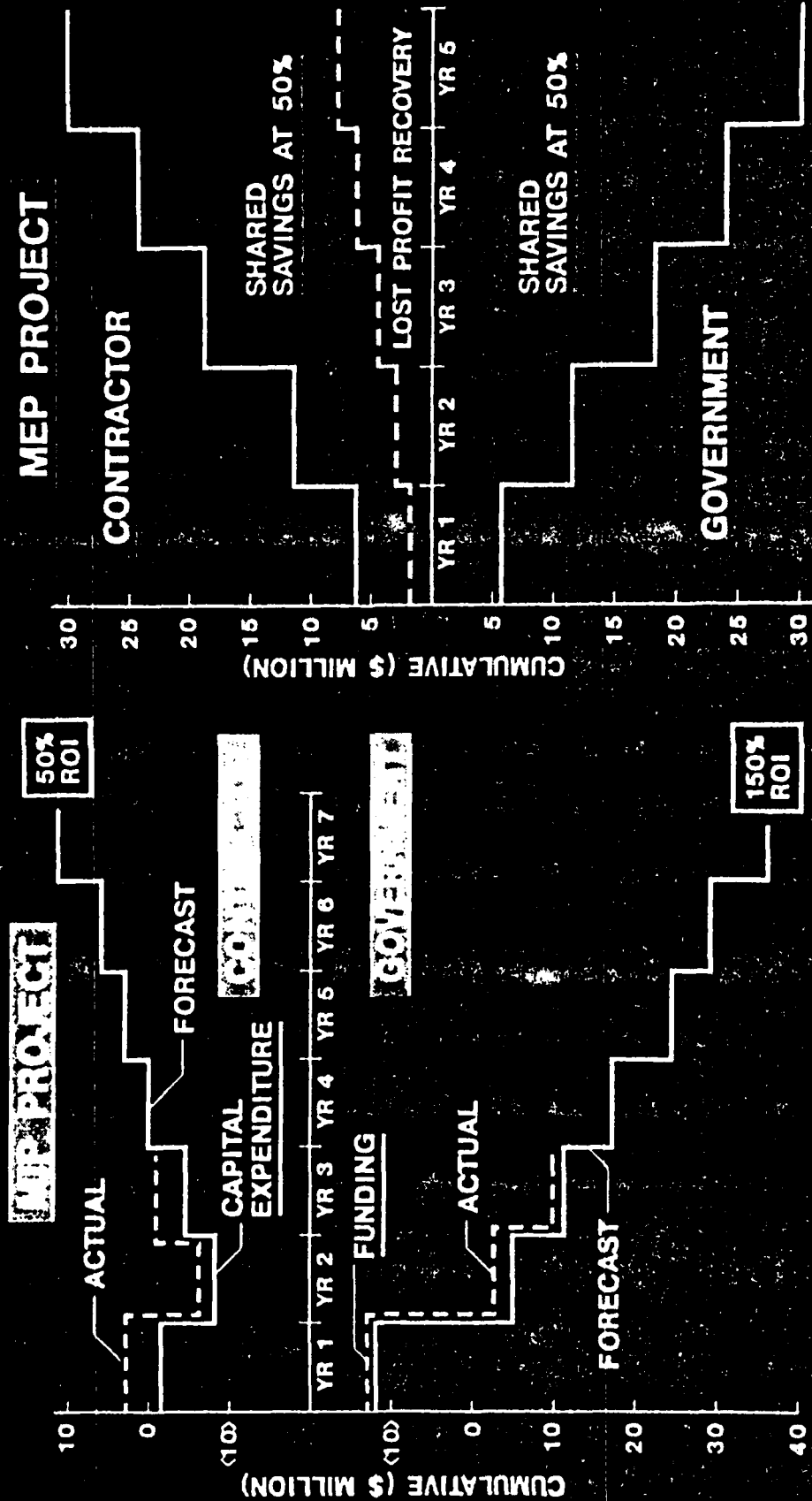


GPO-114-11

# SHARED SAVINGS

| FLEXIBLE MACHINING                                |  |  | MEP PROJECT                       |  |
|---------------------------------------------------|--|--|-----------------------------------|--|
| \$ COST OF AFFECTED PARTS<br>AS-IS STANDARD HOURS |  |  | FRINGE COST                       |  |
| \$ 279 PER STD. HOUR                              |  |  | FRINGE BENEFIT \$                 |  |
| \$ 195 PER STD. HOUR                              |  |  | LABOR \$                          |  |
| 30%                                               |  |  | 18.8%                             |  |
| \$ 35,000                                         |  |  | 14.4%                             |  |
| 30 X \$35,000 = \$1,050,000                       |  |  | 4.4%                              |  |
| 0.50 X \$1,050,000 = \$525,000                    |  |  | \$2,700,000                       |  |
| STANDARD HOURS                                    |  |  | 4.4 X \$2,700,000 = \$12,000,000  |  |
| PROGRAM X Y Z                                     |  |  | 0.50 X \$12,000,000 = \$6,000,000 |  |
| STD. HRS. (000)                                   |  |  | LABOR COST                        |  |
| % ALLOCATION                                      |  |  | % ALLOCATION                      |  |
| \$ (000) SAVINGS                                  |  |  | \$ (000) SAVINGS                  |  |
|                                                   |  |  | PROGRAM A B C D                   |  |
|                                                   |  |  | 3000 14000 25000 77000            |  |
|                                                   |  |  | 2.5 11.8 21 84.7                  |  |
|                                                   |  |  | 150 710 1260 3880                 |  |

# CASH FLOW



| YEAR:   | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 |
|---------|------|------|------|------|------|------|------|------|------|------|
| PERIOD: | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 10   |

|      | 1. EQUIPMENT | 2. BUILDING | 3. OTHER | 4. CAPITAL INVESTMENT SUBTOTAL | 5. EXPENSES | 6. TOTAL INVESTMENT |
|------|--------------|-------------|----------|--------------------------------|-------------|---------------------|
| 1960 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1961 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1962 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1963 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1964 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1965 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1966 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1967 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1968 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1969 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1970 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1971 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1972 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1973 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1974 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1975 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1976 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1977 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1978 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1979 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1980 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1981 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1982 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1983 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1984 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1985 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1986 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1987 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1988 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1989 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1990 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1991 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1992 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1993 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1994 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1995 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1996 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1997 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1998 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 1999 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 2000 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 2001 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 2002 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 2003 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 2004 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 2005 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 2006 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 2007 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 2008 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 2009 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 2010 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 2011 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 2012 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 2013 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 2014 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 2015 | 100          | 100         | 100      | 300                            | 100         | 400                 |
| 2016 | 100          | 100</       |          |                                |             |                     |

7. PRODUCTIVITY SAVINGS RELIARD
8. RETAINED PROGRAM SAVINGS
9. COMMERCIAL PROGRAM SAVINGS
10. TOTAL CONTRACTOR SAVINGS
11. COST OF MONEY RECOVERY
12. CDS 449 DEPRECIATION
13. EUPROSE RECOVERY
14. LOST PROFIT EFFECT
15. DEPRECIATION PROFIT
16. SALVAGE VALUE
17. BEFORE TAX CASH FLOW

18. ACES DEPRECIATION  
19. VARIABLE INCOME  
20. INCOME TAX  
21. INVESTMENT TAX CREDIT  
22. EXPENSE TAX ADJUSTMENT  
23. AFTER TAX CASH FLOW

24. DID PROGRAM BENEFIT (W/O INCENTIVE)  
QUALITATIVE TOTAL

25. DID PROGRAM BENEFITS (WITH INCENTIVE)  
QUALITATIVE TOTAL

|                            | 26.             | 27.                | 28.                       | 29.                        |
|----------------------------|-----------------|--------------------|---------------------------|----------------------------|
|                            | 200 DDD FUNDING | 2000 NET CASH FLOW | 2000 CUMULATIVE CASH FLOW | 2000 PAYOFF PERIOD (YEARS) |
| CUMULATIVE TOTAL           |                 |                    |                           |                            |
| 2000 NET CASH FLOW         |                 |                    |                           |                            |
| 2000 CUMULATIVE CASH FLOW  |                 |                    |                           |                            |
| 2000 PAYOFF PERIOD (YEARS) |                 |                    |                           |                            |

| 32. | CUMULATIVE CASH FLOW NET PRESENT VALUE |
|-----|----------------------------------------|
| 33. | RATE OF RETURN W/O INCENTIVE           |
| 34. | RATE OF RETURN WITH INCENTIVE          |
| 35. | PAYBACK PERIOD (YEARS)                 |
| 36. | INVESTMENT COST TO SAVINGS RATIO       |



**GP8-414-24**

# PROJECT CASH FLOW AND KEY INDICATORS

## SECTION IV - DOD BENEFIT SUMMARY

- 24. DOD Program Benefit (without Incentive)  
Cumulative Total
- 25. DOD Program Benefits (with Incentive)  
Cumulative Total
- 26. DOD Funding  
Cumulative Total
- 27. DOD Net Cash Flow
- 28. DOD Cumulative Cash Flow Net Present Value

- 31. Cash Flow Ratio  
(DOD to contractor, cumulative)

## SECTION V - CONTRACTOR BENEFIT SUMMARY

- 32. Cumulative Cash Flow Net Present Value
- 36. Investment Cost to Savings Ratio

MEP  
PROJECTS

MEP  
PROJECTS

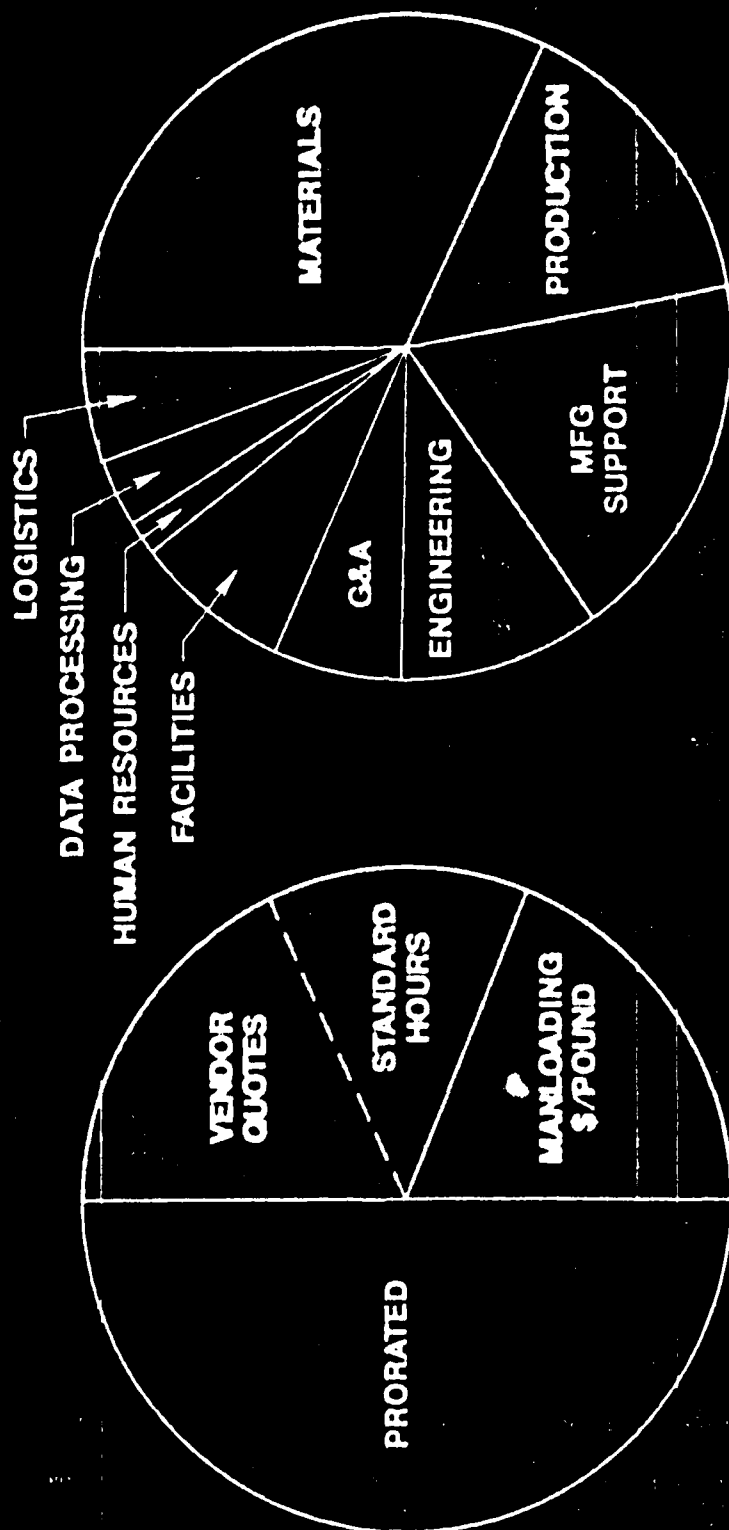
DV Aerospace and Defense  
Wright Aero Products Division



00-11-1

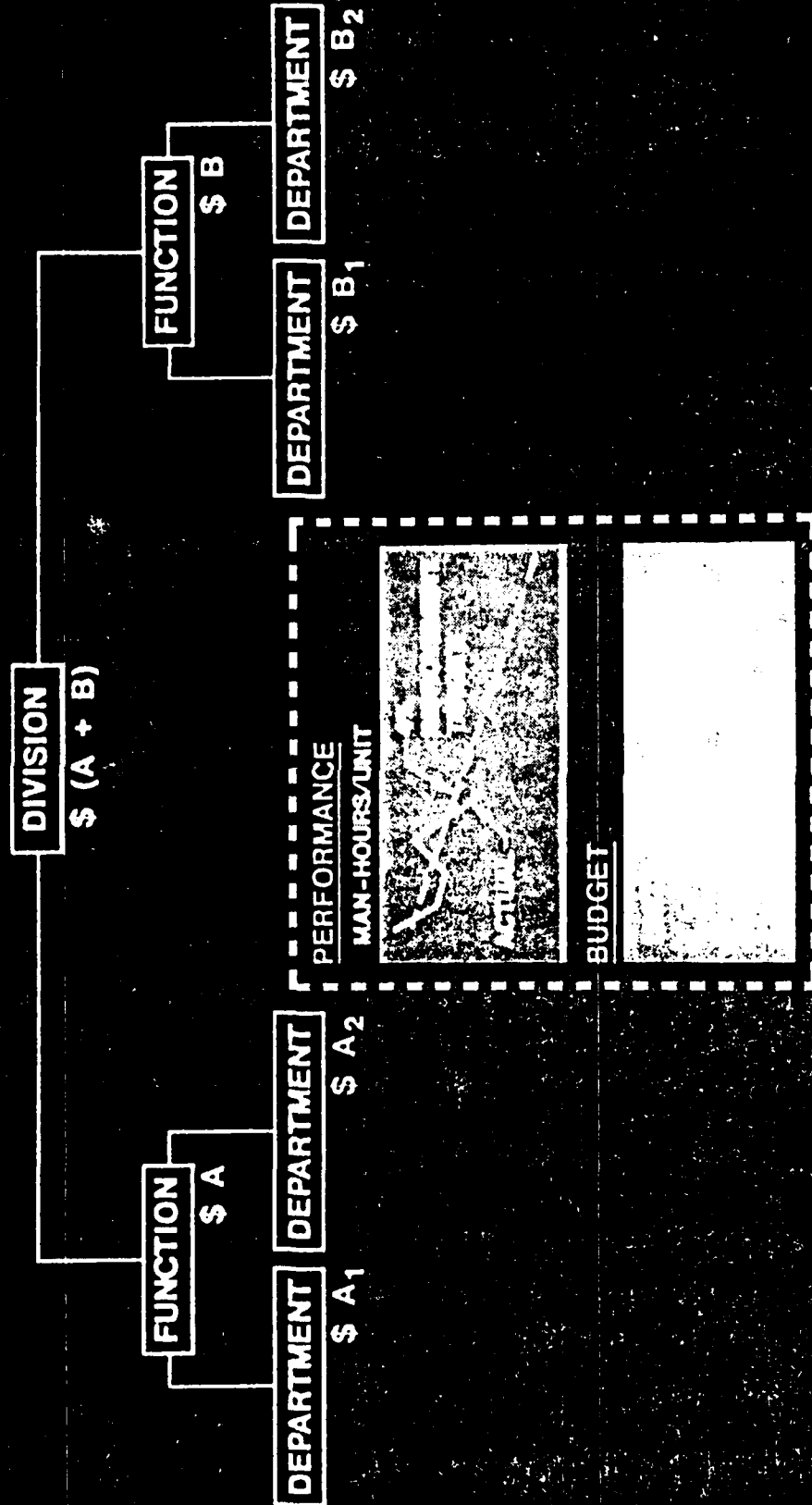
# STRUCTURE OF PROPOSAL ESTIMATES

DTIC Aerospace and Defense  
Vought Aero Products Division



☐ RIGOROUS ESTIMATES
 ☐ SUBJECTIVE ESTIMATES
 ☐ PRORATIONS

CPA-114-17

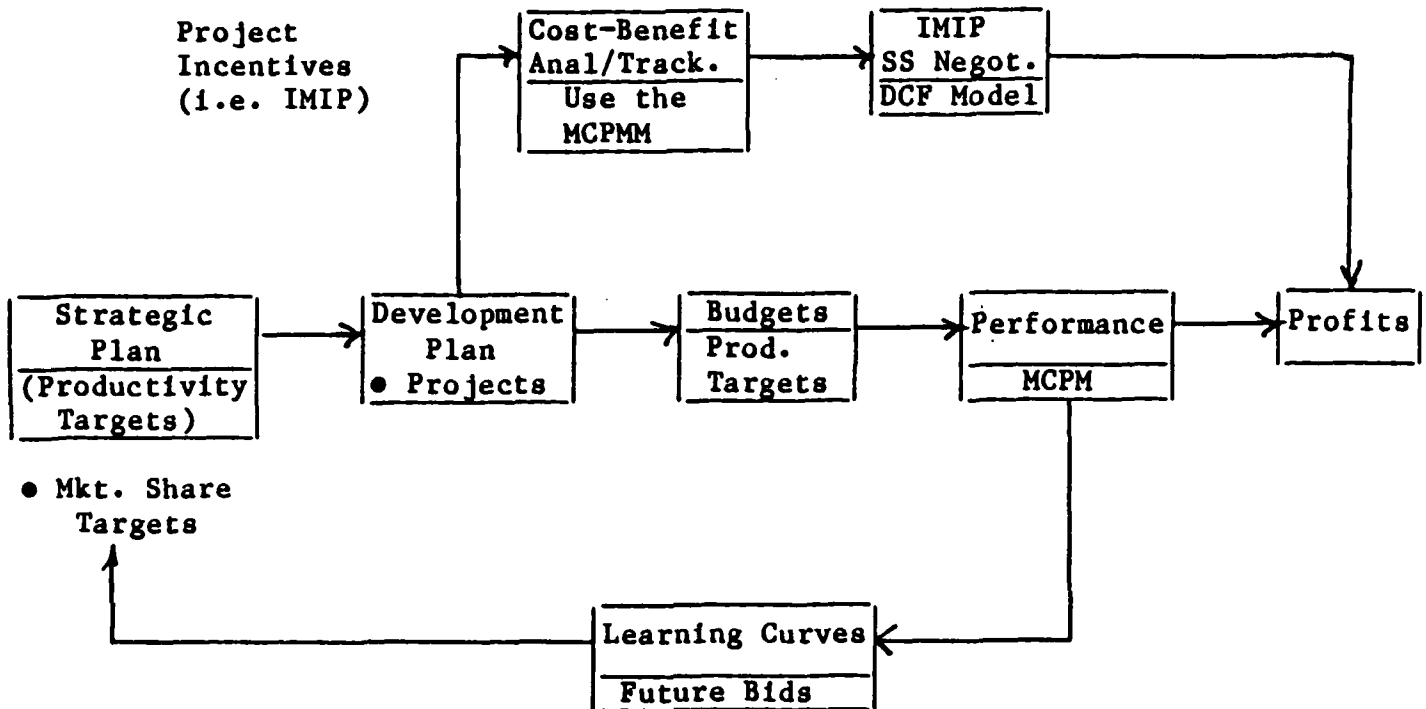


**MORE IMPORTANT THAN PROGRAM  
STRUCTURE IS THE DEGREE  
TO WHICH PRODUCTIVITY TOOLS  
ARE INHERENT IN COMPANY  
OPERATIONS**

VIII.A.2 - LTV/VAPD Integrated Approach

b. VPC Paper Test

**FIGURE III-2**  
**Depiction of LTV/VAPD's Basic Approach**  
**to Productivity Management**



- Comments:**
- Process should be self-motivated
  - IMIP utilized to minimize lost profit impact
  - If there were overall total productivity improvement incentives the company would likely do what Government is after anyway and with less difficulty than by way of project focussed incentives.

Table v-f-1

## LTV/VAPC Methodology

## Models:

| Criteria:                            | NGT | TPM | Cost-Driver Analysis | MCPM | DCF | Challenge Budgets | Overall System General Comments |
|--------------------------------------|-----|-----|----------------------|------|-----|-------------------|---------------------------------|
|                                      |     |     |                      |      |     |                   |                                 |
| 1. 2-5 Plan Process                  |     | ✓   |                      |      |     | ✓                 | Not Sure                        |
| 2. Plan Process Involvement of KDM's |     |     |                      |      |     |                   | Yes                             |
| 3. Champion                          |     |     |                      |      |     |                   | Yes-Council                     |
| 4. Managing Change                   |     |     |                      |      |     |                   | Not Clear-Needs Improve.        |
| 5. Productivity Basics               |     |     |                      |      |     |                   | Not Clear                       |
| 6. Productivity Restraints dealt w/  |     |     |                      |      |     |                   | Not Clear                       |
| 7. Stages of Evolution               |     |     |                      |      |     |                   | Good-Productivity Council       |
| 8. Top Mgmt. Support                 |     |     |                      |      |     |                   | Very Good                       |
| 9. Integration into Mgmt. Sys.       |     |     |                      |      |     |                   | Very Good                       |
| 10. Integration of Planning Sys.     |     |     |                      |      |     |                   | Needs Improvement               |
| 11. Participative Mgmt.              |     |     |                      | ✓    |     | ✓                 | Very Good                       |
| 12. Link Planning to Implem.         |     |     |                      | ✓    |     | ✓                 | Excellent                       |
| 13. Budget Mgmt.                     |     |     |                      |      |     |                   | Excellent                       |
| 14. Prod. Measurement Sys. Dev.      |     |     |                      |      |     |                   | Not Clear                       |
| 15. Meas. Audits                     |     |     |                      |      |     |                   | Excellent                       |
| 16. Control vs. Tap. Meas. & Eval.   |     |     |                      |      |     |                   | Not Clear                       |
| 17. Meas. A While Hope for B         |     |     |                      |      |     |                   | Excellent                       |
| 18. Meas. & Eval. as Mgmt. Sys.      |     |     |                      |      |     |                   | Needs Development               |
| 19. Personalized Scoreboards         |     |     |                      | ✓    |     |                   |                                 |
| 20. Control & Improve. Sys. Dev.     |     | ✓   | ✓                    |      |     | ✓                 |                                 |
| 21. Audit Cal Sys's                  |     |     |                      |      |     |                   | Not Clear                       |
| 22. Reward A While Hope for B        |     |     |                      |      |     |                   | Not Clear                       |
| 23. Innovation Promoted              |     | ✓   |                      |      |     |                   | Needs Development               |
| 24. Cost-Driver Analysis             |     |     | ✓                    |      |     | ✓                 | Excellent                       |
| 25. MLE → Cal                        |     | ✓   | ✓                    | ✓    |     |                   | Excellent                       |
| 26. Sys. Optimization                |     |     |                      |      |     |                   | Very Good                       |
| 27. Win/Loss Situations Set Up       |     |     |                      |      |     |                   | Not Clear                       |
| 28. Part. Mgmt.                      |     | ✓   | ✓                    | ✓    |     | ✓                 | Needs Improvement               |
| 29. Mgmt. Basics                     |     |     |                      |      |     |                   | Good                            |
| 30. Accountability                   |     |     |                      | ✓    |     | ✓                 | Good                            |
| 31. Maintain Excellence              |     |     |                      |      |     |                   | Shared Savings-Gainsharing      |
| 32. Mgmt. Understanding              |     |     |                      |      |     |                   | Not Clear                       |
| 33. Self Motivating                  |     |     |                      |      |     |                   | Not Clear                       |
| 34. Simplicity                       |     |     |                      |      |     |                   | A Major Weakness                |

VIII.A.3 - CDEF

a. Price Waterhouse Presentation

# *Price Waterhouse*



Manufacturing &  
Cost Management  
Services

# **PAPER TEST**

---

# **COST DEFINITION**

# **(CDEF)**

# **METHODOLOGY**



**Manufacturing &  
Cost Management  
Services**

## CDEF SCOPE

### CDEF Is:

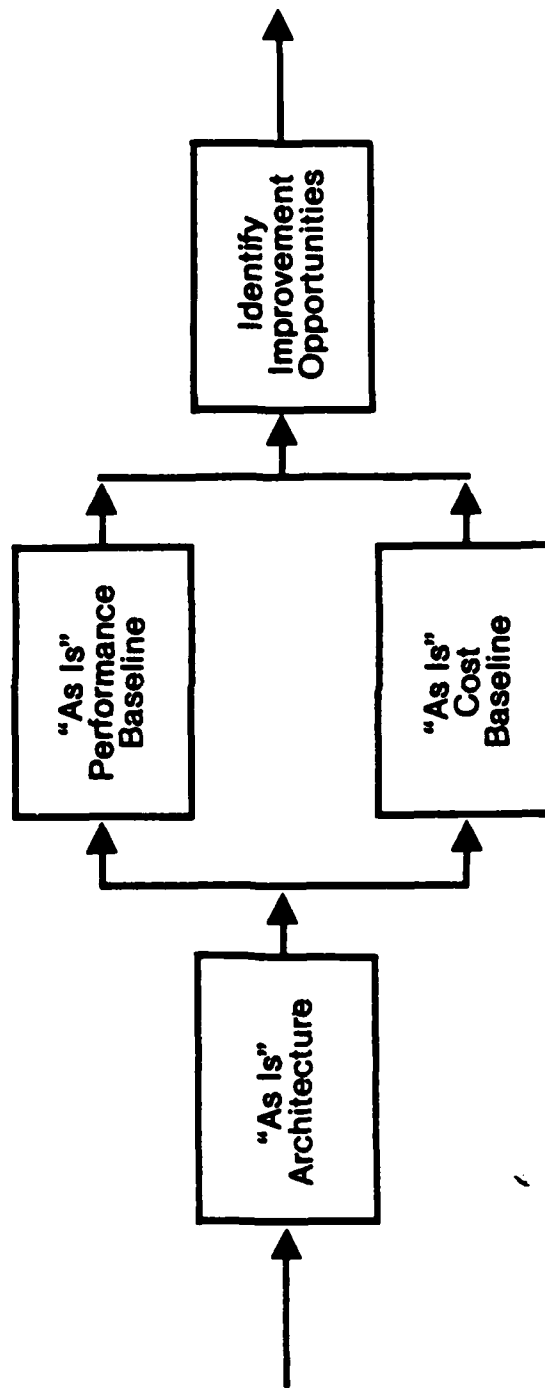
- A technology modernization planning and management methodology
- A cost-benefit analysis process
- A cost-benefit tracking approach
- A performance measurement technique



Manufacturing &  
Cost Management  
Services

# CDEF SCOPE

(Needs Analysis)

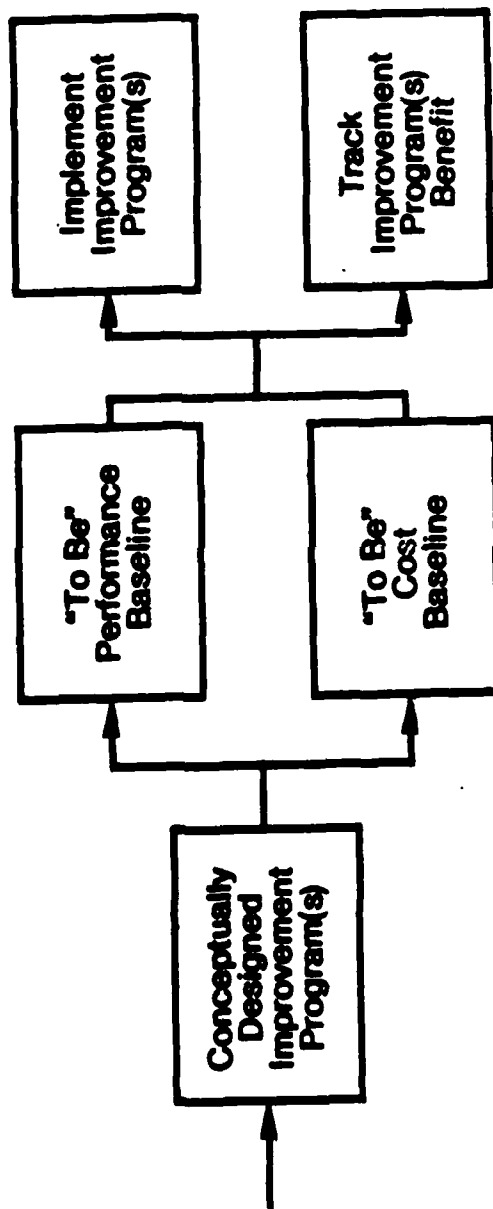


Manufacturing &  
Cost Management  
Services



# CDEF SCOPE

## (Conceptual Designs)



Manufacturing &  
Cost Management  
Services



# CASE EXAMPLE

## Opportunity Matrix

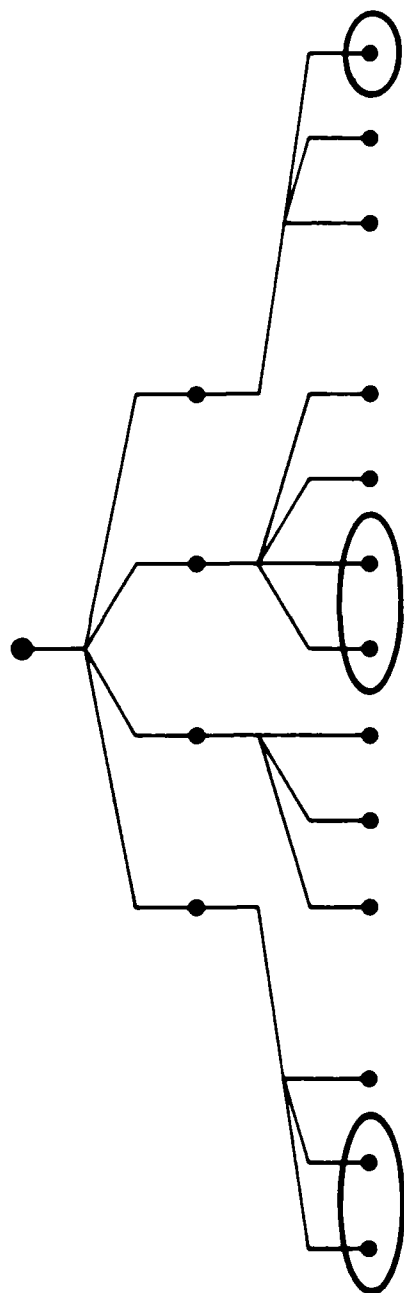
|                                       |      |                     |                       |
|---------------------------------------|------|---------------------|-----------------------|
| Improvement<br>Potential<br>Baselines | High | Good<br>Potential   | Greatest<br>Potential |
|                                       | Low  | Modest<br>Potential | Good<br>Potential     |
|                                       |      | Low                 | High                  |
|                                       |      | Cost Baselines      |                       |

Manufacturing &  
Cost Management  
Services



# SUCCESS STORY

## "As Is" Architecture



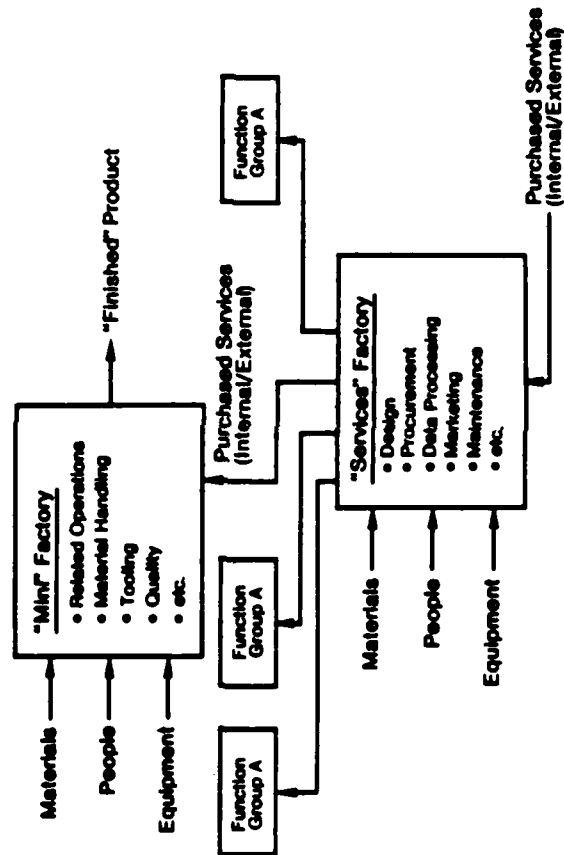
○ Function Group "N"

Manufacturing &  
Cost Management  
Services



# SUCCESS STORY

## Function Group



**Manufacturing &  
Cost Management  
Services**



## SUCCESS STORY

### Performance Measurement Criteria

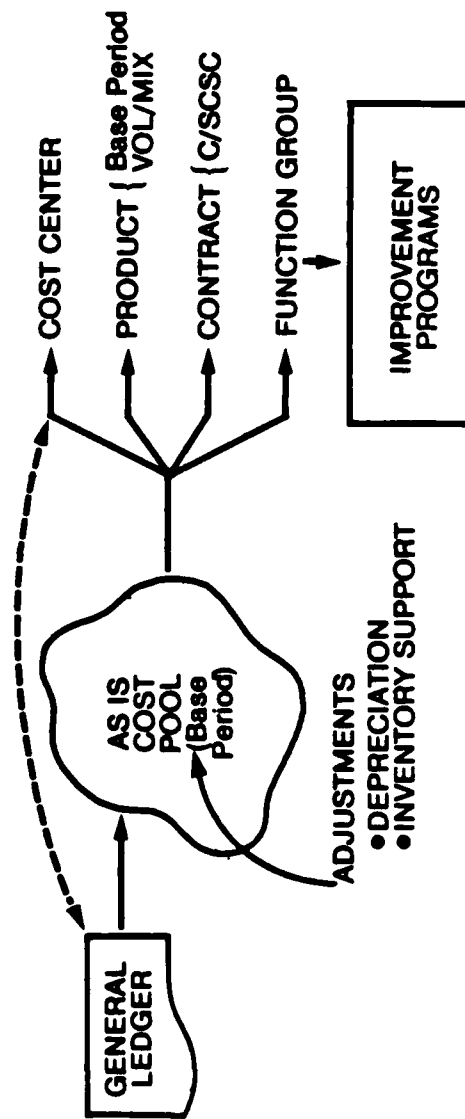
- Direct Labor Hours
- Indirect Labor Hours
- Equipment Availability
- Schedule Adherence
- Equivalent Production Units
- Utility Consumption
- Set Up Hours
- Throughput Time



Manufacturing &  
Cost Management  
Services

# CASE EXAMPLE

## Cost Baseline Logic



Manufacturing &  
Cost Management  
Services



## **TOOLS**

### **AUTOMATIC COST BASELINE GENERATOR** **(ACBG)**

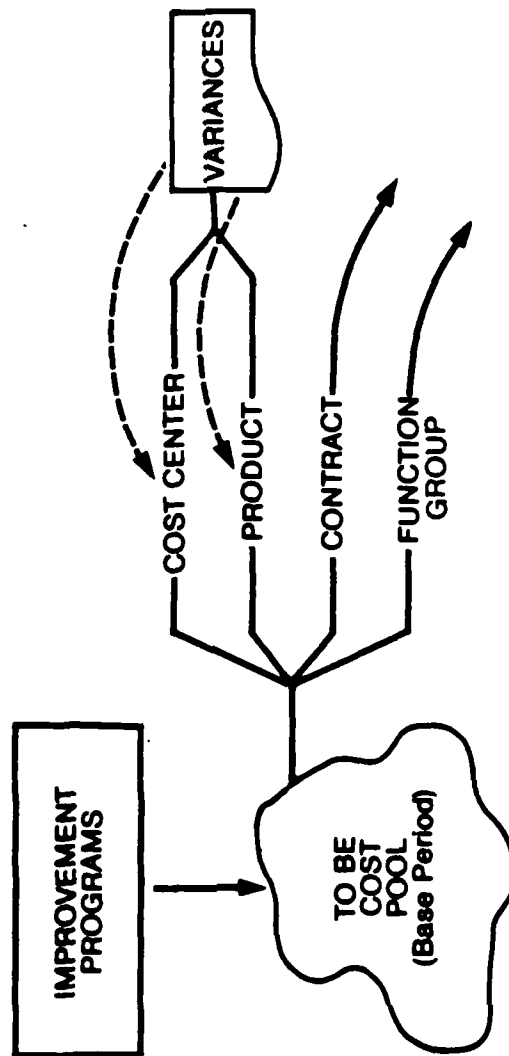
- PROVIDES FOCUSED STRUCTURE
- SIMPLIFIES ALLOCATION CALCULATIONS
- PROVIDES 'WHAT IF' CAPABILITY



**Manufacturing &  
Cost Management  
Services**

# CASE EXAMPLE

## Cost Baseline - Logic (cont.)



Manufacturing &  
Cost Management  
Services



## **EXPERIENCES**

- CLEVELAND PNEUMATIC
- EX-CELL-O / ACE
- EX-CELL-O / ELWOOD
- BOEING MILITARY (ISMC)
- GENERAL DYNAMICS/FORT WORTH (AMS)
- BOEING AEROSPACE
- GOODYEAR AEROSPACE
- McDONNELL DOUGLAS (C17)
- McDONNELL DOUGLAS (ICC)
- ONTARIO FORGE
- DURADYNE
- ALUMINUM FORGE
- HONEYWELL UNDERSEA



**Manufacturing &  
Cost Management  
Services**

# PAPER TEST METHODOLOGY



Manufacturing &  
Cost Management  
Services

## **PAPER TEST**

### **LTV TEST SITE MEETING**

#### **PROJECT TEAM:**

|                     |          |            |
|---------------------|----------|------------|
| <b>RAY THORNTON</b> | <b>-</b> | <b>LTV</b> |
| <b>LEN THORPE</b>   | <b>-</b> | <b>LTV</b> |
| <b>GENE KLEIN</b>   | <b>-</b> | <b>PW</b>  |
| <b>BETTY THAYER</b> | <b>-</b> | <b>PW</b>  |
| <b>MARVIN AGEE</b>  | <b>-</b> | <b>VPI</b> |



**Manufacturing &  
Cost Management  
Services**

## **PAPER TEST**

### **CONCLUSIONS / RECOMMENDATIONS**

- DEVELOP BETTER CDEF DESCRIPTION MANUAL
- DEVELOP CDEF USERS TRAINING
- DEVELOP USER FRIENDLY DOCUMENTATION FOR CDEF AND ACBG
- DEVELOP BETTER EXAMPLE OF COST MODEL AND GENERAL LEDGER ALLOCATION PROCESS



**Manufacturing &  
Cost Management  
Services**

## **PAPER TEST**

### **CONCLUSIONS / RECOMMENDATIONS (CONT.)**

- DOCUMENT INFORMATION FLOW FROM DATA COLLECTION TO SHARED SAVINGS CALCULATION
- FULL SCOPE FIELD TEST OF CDEF AT LTV TOO EXPENSIVE
- DEVELOP / TEST COMPREHENSIVE PRODUCTIVITY GUIDE



**Manufacturing &  
Cost Management  
Services**

VIII.A.3 - CDEF

b. LTV Paper Test

## PAPER TEST RESULT FORMAT

### PRICE WATERHOUSE CDEF COST BENEFIT ANALYSIS MODEL

|                            |       |        |
|----------------------------|-------|--------|
| DATA SOURCE<br>DESCRIPTION |       |        |
|                            |       |        |
| REQUIREMENTS               |       |        |
|                            | INPUT | OUTPUT |
| DIFFICULTY IN USE          |       |        |
|                            |       |        |
| EASE OF USE                |       |        |
|                            |       |        |

000-414-01

## CDEF PAPER TEST

Price Waterhouse's CDEF model is very detailed and probes to the lowest level of contractor's activity

The model offers the opportunity to mimic company cost characteristics

The model relies on activity-based costing that is not always compatible with contractor's organizational structure-based cost data

Resource requirements are extensive and output format is detailed and voluminous

"To-be" cost development is derived from alterations to "as-is" cost case

In some instances, detailed cost data is not available to match the detail found in the node tree structure

## CDEF PAPER TEST

Model could require the creation of a separate cost allocation/tracking infrastructure

Extensive resource requirements will limit field test viability

Utilizing the model on a company-wide field test would entail efforts beyond the scope or timetable available in this contract

Field test will need to be scaled down in scope to match contractual resource constraints

The model can be applied to a functional area of the test site and generate the necessary evaluative data within contractual constraints

VIII.A.4 - MFPMM

a. VPC Presentation

(1) Basic MFPMM eqtn.      Profit = Productivity x Price Recovery

$$(2) \quad \frac{\text{SALES}}{\text{COSTS}} = \frac{\text{OUTPUT}}{\text{INPUT}} \times \frac{\text{OUTPUT PRICE}}{\text{INPUT PRICE}}$$

$$(3) \quad \Delta \text{ Profit} = \Delta \text{ Productivity} \times \Delta \text{ Price Recovery}$$

$$(4) \quad \Delta \text{ Profit} = \Delta \text{ Prod.} \times \underbrace{\frac{\Delta \text{ OUTPUT PRICE}}{\Delta \text{ INPUT PRICE}}}_{\text{Forecasted (i.e. -- we know these from published data or can constrain } \Delta \text{ Output price to gain competitive edge.)}}$$

$$(5) \quad \Delta \text{ Product Price or } = \Delta \text{ Prod.} \times \underbrace{\frac{\Delta \text{ Input Price}}{\Delta \text{ Profit}}}_{\text{forecasted}}$$

from eqtn. (5), we can develop strategic objectives for product pricing and annual productivity improvement that are interrelated.

FIGURE VII-C-1: Basic MFPMM Equation and its Derivation to Show How the Model is Utilized by LTV.

VP1/17C VERSION MP104-2

764

Figure 5

VIII.A.4 - MFPMM

b. LTV Paper Test

## MFPMM PAPER TEST

The model examines contractor effort at the company or macro level

Practical application of the model is found in the total factor productivity model used at LTV's Vought Aero Products Division. The model is driven by unit measures of price and quantity to yield "value"; these unit measures are not always available, but total value for cost categories will be available

The lack of price and quantity data could affect model-generated indices and ratios

Due to long cycle times, product mix changes, customizations and other configuration changes, the product and resources from one period to the next are often not identical

The model's period-to-period comparisons are meaningful, but are restricted at LTV to "program output values"

## **MFPMM PAPER TEST**

The model can be customized to fit the long cycle times and ever-changing product mix in the aerospace environment by defining output at the program level - one entry per program per period

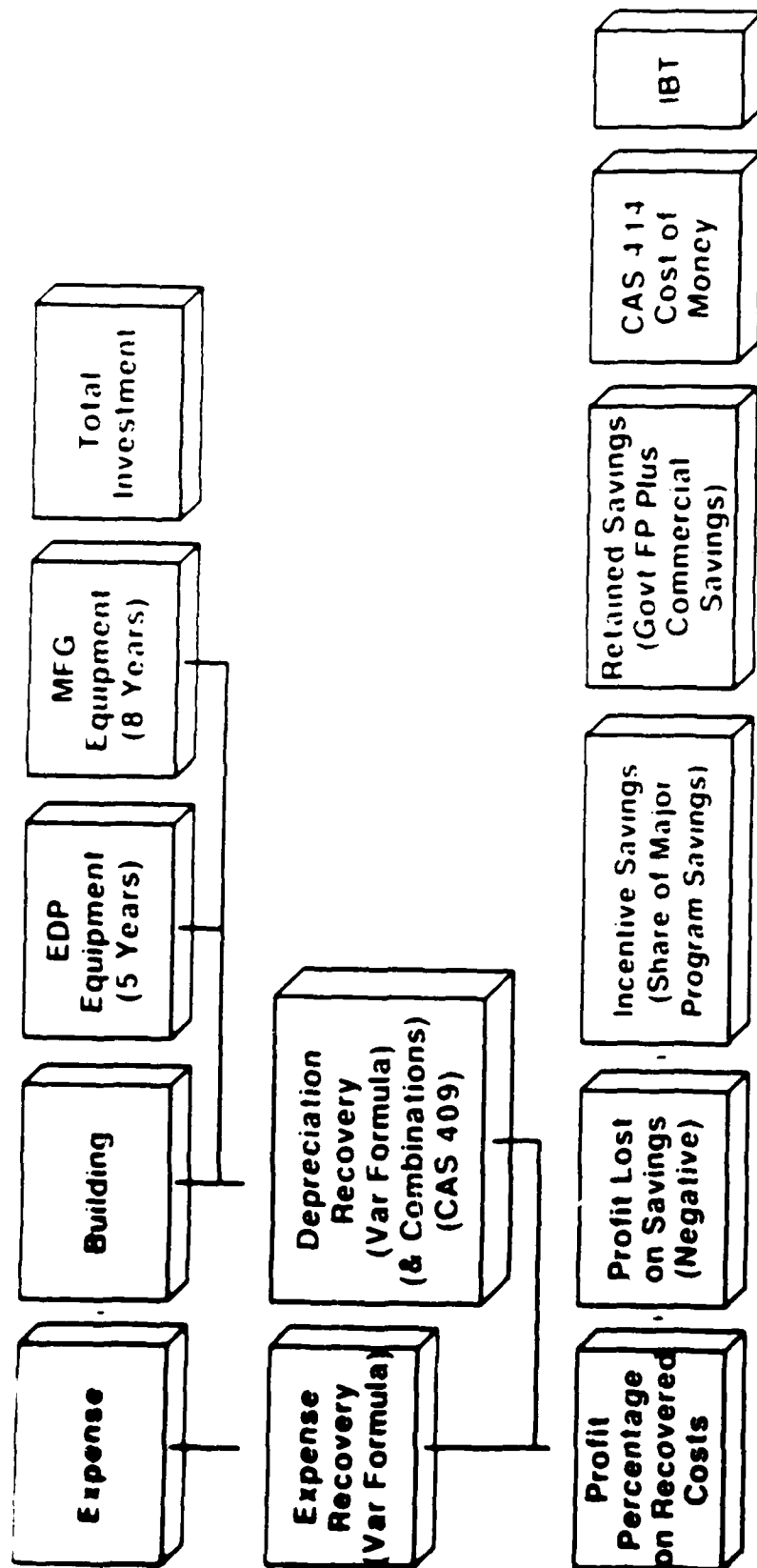
This alternative approach to defining the product would overcome problems due to product mix changes and partial quantitles to allow application of the model to LTV cost data bases

The model can be adapted to a field test

VIII.A.5 - DCF/SSA

a. Westinghouse Presentation

# IMIP DCF / SSA Approach



Note: The IRR Represents the Rate at Which the Sum of the Yearly Returns Are equal to the Sum of the Yearly Investments

# Westinghouse DCF / SSA Model

- Based on Execucom Systems Corporation's Interactive Financial Planning System (IFPS) Software Package

- Inputs

- Project Expense      · Project Capital
- Savings
- Total Government
- Major Program
- Commercial

- Outputs

- Depreciation Recovery (CAS 409)
- Expense Recovery
- Cost of Money (CAS 414)
- Profit on Recoverables
- Loss on Savings
- Retained Savings

Figure 1. Schematic representation of the experimental design. The subjects were divided into two groups: the control group (CG) and the experimental group (EG). The CG was divided into two subgroups: the control group (CG) and the control group (CG). The EG was divided into two subgroups: the experimental group (EG) and the experimental group (EG). The subjects were divided into two groups: the control group (CG) and the experimental group (EG). The CG was divided into two subgroups: the control group (CG) and the control group (CG). The EG was divided into two subgroups: the experimental group (EG) and the experimental group (EG).

### **SAMPLE THE ANALYSIS REPORT!**

[illegible]

# WESTINGHOUSE DCF/SSA MODEL

```

MODEL TM VERSION OF 12/20/85 00:30
10 COLUMNS 1-11
11 EXPENSE = 0
12 BUILDING = 0
13 CUR BLC = L30 + PREVIOUS L33
14 PREV BLC BASE = L33 - L30
15 EQUIPMENT = 0
16 CUR EQUIP = L40 + PREVIOUS L43
17 PREV EQUIP = L43 - L40 - PREVIOUS S L43
18 EQUIPMENT = 0
19 CUR EQUIP = L50 + PREVIOUS L53
20 PREV EQUIP = L53 - L50 - PREVIOUS 0 L53
21 EQUIPMENT = L40 + L50
22 CASH FLOW ADJ = 0
23 CAPITAL = L70 + L60 + L70
24 TOTAL INVESTMENT = L20 + L80
100 STL BLC DEP = (L30/40) * (L34/45)
103 CUR BLC DEP = L100 + PREVIOUS L103
104 BLC IN VALUE = L33 - L103
110 ACC BLC DEP (15.1904 BUILDING ACC BLC DEP)
120 STL BLC DEP = ((L40 + PREVIOUS S L40)/10) * (L46/5)
123 CUR STL BLC DEP = L120 + PREVIOUS L123
124 BLC IN VALUE = L43 - L123
130 STL BLC DEP = ((L50 + PREVIOUS 0 L50)/16) * (L56/8)
133 CUR STL BLC DEP = L130 + PREVIOUS L133
134 BLC IN VALUE = L53 - L133
140 ACC BLC DEP (15.1904 EQUIPMENT ACC BLC DEP)
150 STL BLC DEP = L100 + L120 + L130
160 ACC DEPRECIATION = ACC BLC DEP + ACC ES DEP
170 TOTAL BLC VALUE = L100 + L120 + L130
180 DEP RECOVERY = 94 * ((95 + L150) * (95 + PREVIOUS L150))
190 DEP RECOVERY = 94 * ((95 + L20) * (95 + PREVIOUS L20))
200 CASH FLOW ADJ = 0
210 CASH FLOW ADJ = 0
220 INCENTIVE SAVINGS = 600L220 FOR S. 25 + L220. 000L220
230 RETAINED SAVINGS = (90 + L200) * L210
240 PROFIT IN DEP = 12 * 94 * (L20 + L150)
250 NET PROFIT = 90 * (L250 + PREVIOUS L250)
260 LOSS IN SAVINGS = 12 * L200
270 BLC IN LOSS = 90 * (L270 + PREVIOUS L270)
280 CASH FLOW ADJ = 94 * ((95 + L170) * (95 + PREVIOUS L170))
290 L20 + L200 + L200 + L200 + L200
300 L20 + L200
310 INVESTMENT = 00 + L60
320 ACC BLC DEP = 46 * (L100 - L100)
330 CASH FLOW ADJ = 46 * (L100 - L100)
340 NET CASH FLOW = L100 + L110 + L120 + L130 + L140 + L90
350 DEP INVESTMENT = 0
360 CASH FLOW ADJ = 0
370 DEP = 94 * ((95 + L270) * (95 + PREVIOUS L270))
380 L20 + 94 * ((95 + L20) * (95 + PREVIOUS L20))
400 CASH FLOW ADJ FOR L20 FROM L270 + 94 * ((95 + L20) * (95 + PREVIOUS L20))
410 OF BLC

```

# WESTINGHOUSE DCF/SSA MODEL

## DATAFILE FOR SAMPLE ROI ANALYSIS

RELOAD FILE EDIT. LAST LINE IS 0

|   |                      |     |      |      |      |      |       |       |       |       |       |
|---|----------------------|-----|------|------|------|------|-------|-------|-------|-------|-------|
| 1 | EXPENSE=             | 750 | 3750 | 2500 | 500  | 0    | 0     | 0     | 0     | 0     | 0     |
| 2 | BUILDINGS=           | 0   | 0    | 0    | 0    | 0    | 0     | 0     | 0     | 0     | 0     |
| 3 | EQUIPMENTS=          | 0   | 0    | 0    | 0    | 0    | 0     | 0     | 0     | 0     | 0     |
| 4 | EQUIPMENT P=         | 0   | 2000 | 5000 | 1000 | 1000 | 0     | 0     | 0     | 0     | 0     |
| 5 | CASH FLOW ADV=       | 0   | 0    | 0    | 0    | 0    | 0     | 0     | 0     | 0     | 0     |
| 6 | COST SAVINGS=        | 0   | 250  | 5000 | 5250 | 9500 | 10000 | 10500 | 12000 | 12500 | 15000 |
| 7 | COST SAVINGS=        | 0   | 0    | 50   | 75   | 300  | 600   | 650   | 650   | 700   | 750   |
| 8 | MAJOR PRICE SAVINGS= | 0   | 150  | 4500 | 5000 | 5000 | 7500  | 9000  | 9500  | 10000 | 10500 |

REPORT FILE FOR SAMPLE ROI ANALYSIS

REPORT IN VERSION OF 00/11/75 10:54  
1 FURTHER  
2 COLUMNS 1-11  
3 DATES  
4 CENTER SAMPLE ROI ANALYSIS REPORT  
5  
6 COLUMN TITLES YEAR 1. YEAR 2. YEAR 3. YEAR 4. YEAR 5. YEAR 6.  
7 YEAR 7. YEAR 8. YEAR 9. YEAR 10. TOTAL  
8 UNDERLINE  
9  
10 L20. SPACE. L40. L30. L70. L80. SPACE. L90. SPACE 2  
11 L230. L100. L190. L240. L200. L250. L240. SPACE 2  
12 L300. L310. L320. L330. L340. SPACE 2  
13 L350. SPACE. L360  
14 SPACE 2. L200. L210. L220  
END OF REPORT

# **LMI DISCOUNTED CASH FLOW MODEL**

|                                                               | Year:     | 1984<br>1 | 1985<br>2 | 1986<br>3 | 1987<br>4 |
|---------------------------------------------------------------|-----------|-----------|-----------|-----------|-----------|
| <b>SECTION I. COST DATA</b>                                   |           |           |           |           |           |
| 1 Contractor Investment                                       |           | 0.0       | 0.0       | 0.0       | 0.0       |
| Cumulative Total                                              |           | 0.0       | 0.0       | 0.0       | 0.0       |
| 2 Contractor Expenses                                         |           | 0.0       | 0.0       | 0.0       | 0.0       |
| Cumulative Total                                              |           | 0.0       | 0.0       | 0.0       | 0.0       |
| 3 Sub/Government Funding                                      |           | 0.0       | 0.0       | 0.0       | 0.0       |
| Cumulative Total                                              |           | 0.0       | 0.0       | 0.0       | 0.0       |
| 4 Savings Available to Sub                                    |           | 0.0       | 0.0       | 0.0       | 0.0       |
| Cumulative Total                                              |           | 0.0       | 0.0       | 0.0       | 0.0       |
| <b>SECTION II. INCREMENTAL CASH FLOWS</b>                     |           |           |           |           |           |
| 5 Productivity Savings Score                                  |           | 0.0       | 0.0       | 0.0       | 0.0       |
| Cumulative Total                                              |           | 0.0       | 0.0       | 0.0       | 0.0       |
| 6 Cost of Money (C&M 414)                                     | ans       | 0.0       | 0.0       | 0.0       | 0.0       |
| 7 C&M 409 Depreciation                                        |           | 0.0       | 0.0       | 0.0       | 0.0       |
| 8 Profit Effect                                               |           | 0.0       | 0.0       | 0.0       | 0.0       |
| 9 Subtotal: Sub Cash Flow to Contractor                       |           | 0.0       | 0.0       | 0.0       | 0.0       |
| 10 Savings Value                                              |           | 0.0       | 0.0       | 0.0       | 0.0       |
| 11 Contractor Before-Tax Cash Flow                            |           | 0.0       | 0.0       | 0.0       | 0.0       |
| <b>SECTION III. TAX CALCULATIONS</b>                          |           |           |           |           |           |
| 12 ADD Depreciation                                           |           | 0.0       | 0.0       | 0.0       | 0.0       |
| 13 Contractor Taxable Income                                  |           | 0.0       | 0.0       | 0.0       | 0.0       |
| 14 Contractor Income Tax                                      | 775       | 0.0       | 0.0       | 0.0       | 0.0       |
| 15 Investment Tax Credit                                      | ans       | 0.0       | 0.0       | 0.0       | 0.0       |
| 16 Contractor After-Tax Cash Flow                             |           | 0.0       | 0.0       | 0.0       | 0.0       |
| Cumulative Total                                              |           | 0.0       | 0.0       | 0.0       | 0.0       |
| <b>SECTION IV. SUMMARY</b>                                    |           |           |           |           |           |
| 17 Sub Program Benefits (Without Incentive)                   |           | 0.0       | 0.0       | 0.0       | 0.0       |
| Cumulative Total                                              | ans       | 0.0       | 0.0       | 0.0       | 0.0       |
| 18 Sub Program Benefits (With Incentive)                      |           | 0.0       | 0.0       | 0.0       | 0.0       |
| Cumulative Total                                              | ans       | 0.0       | 0.0       | 0.0       | 0.0       |
| 19 Sub Payback Period                                         | 0.0 years |           |           |           |           |
| 20 Government Benefits                                        |           | 0.0       | 0.0       | 0.0       | 0.0       |
| Cumulative Total                                              |           | 0.0       | 0.0       | 0.0       | 0.0       |
| 21 Government Payback Period                                  | 0.0 years |           |           |           |           |
| 22 Contractor Internal Rate of Return                         |           |           |           |           |           |
| Without Incentive                                             | 0.0%      |           |           |           |           |
| With Incentive                                                | 0.0%      |           |           |           |           |
| 23 Contractor Payback Period                                  | 0.0 years |           |           |           |           |
| <b>MODEL INPUTS:</b>                                          |           |           |           |           |           |
|                                                               | Year      | 1984      | 1985      | 1986      | 1987      |
| Contractor Investment                                         |           |           |           |           |           |
| Contractor Expenses                                           |           |           |           |           |           |
| Sub/Government Funding                                        |           |           |           |           |           |
| Savings Available to Sub                                      |           |           |           |           |           |
| Productivity Savings Score                                    |           |           |           |           |           |
| Profit Effect                                                 |           |           |           |           |           |
| Savings Value                                                 |           |           |           |           |           |
| C&M 414 Rate                                                  | ans       |           |           |           |           |
| C&M 409 Depreciation:                                         |           |           |           |           |           |
| Depreciation Method                                           |           |           |           |           |           |
| (1) Straight Line; 2) Sum-of-Years; 3) Sum-of-Years/Half-Year |           |           |           |           |           |
| 4) 100% Accelerating Schedule; 5) 1986 50% Switch to SL Line  |           |           |           |           |           |
| Asset Service Life (years)                                    |           |           |           |           |           |
| Year Placed into Service                                      |           |           |           |           |           |
| ADD Depreciation:                                             |           |           |           |           |           |
| Depreciation Method                                           |           |           |           |           |           |
| (1) Standard ADD Tables; 2) Straight Line                     |           |           |           |           |           |
| Asset Class (Service Life)                                    |           |           |           |           |           |
| (3) 3-yr; 5-yr; 10-yr; 15-yr                                  |           |           |           |           |           |
| Year Placed into Service                                      |           |           |           |           |           |
| Contractor Tax Rate                                           | 775       |           |           |           |           |
| Investment Tax Credit Rate                                    | ans       |           |           |           |           |
| Completion Contract - Tax Lag                                 | 0 years   |           |           |           |           |

## **DCF / SSA Model Comparison**

- **LMI Model**
  - **Flexible (Not Controllable)**
  - **Based on Lotus 1-2-3**
  - **Requires Extensive Off-Line Development of Some Inputs and Most Outputs**

# DCF / SSA Model Comparison

- **Westinghouse IFPS Model**
  - Features On-Line Calculation of Most Inputs
  - Requires Specific Inputs
    - Total Government Savings      • Major Program Savings
    - Commercial Savings              • Capital Investment by Category
- **Calculates On-Line**
  - Incentive Savings
  - Depreciation Recovery (CAS 409)
  - Expense Recovery
  - Cost of Money (CAS 414)
  - Profit on Recoverables
  - Loss on Savings
  - Retained Savings
- **Does Not Calculate DoD / Government Benefits (Can Be Added)**

## DCF / SSA Model Comparison

| Inputs                | LMI          | Westinghouse    |
|-----------------------|--------------|-----------------|
| Project Expense       | Similar      | Similar         |
| Project Capital       | One Lump Sum | Multiple Inputs |
| Total Govt Savings    | C...-Line    | Accommodates    |
| Major Program Savings | Off-Line     | Accommodates    |
| Commercial Savings    | Off-Line     | Accommodates    |

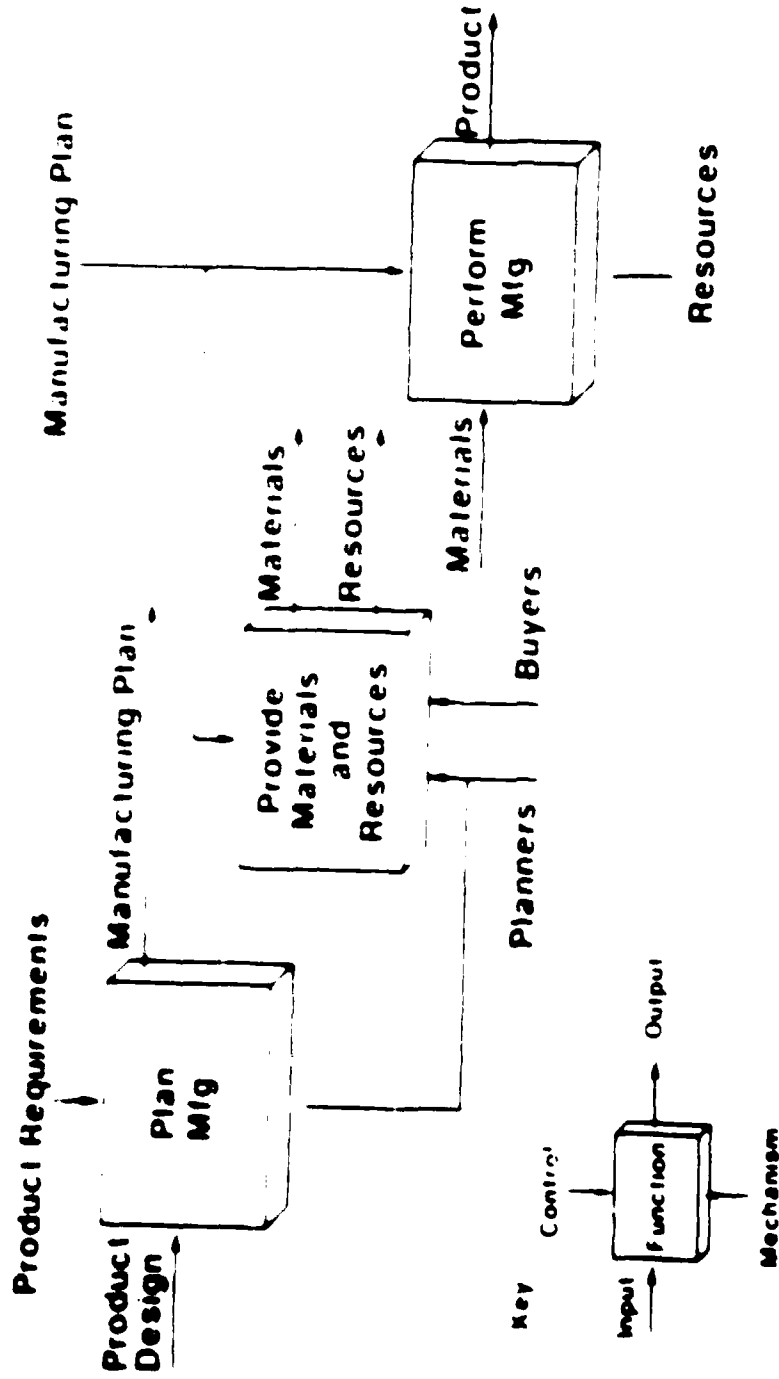
# DCF / SSA Model Comparison

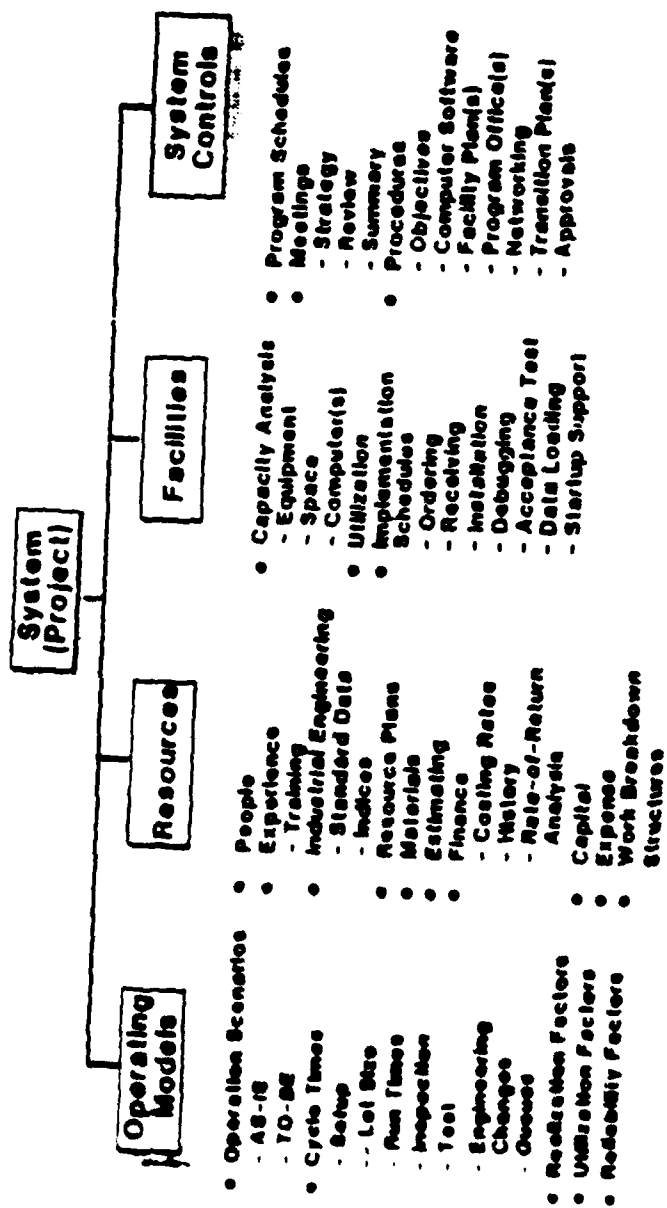
| Outputs                            | LMI                                    | Westinghouse                         |
|------------------------------------|----------------------------------------|--------------------------------------|
| Depreciation Recovery<br>(CAS 409) | Five Methods                           | Set Any Method                       |
| Expense Recovery                   | Extraneous                             | Included                             |
| Cost of Money                      | No Discount for<br>Commercial Business | Discounts for<br>Commercial Business |
| Profit on Recoverables             | Extraneous                             | Included                             |
| Loss on Savings                    | Extraneous                             | Included                             |
| Retained Savings                   | Extraneous                             | Included                             |

## DCF / SSA Model Application

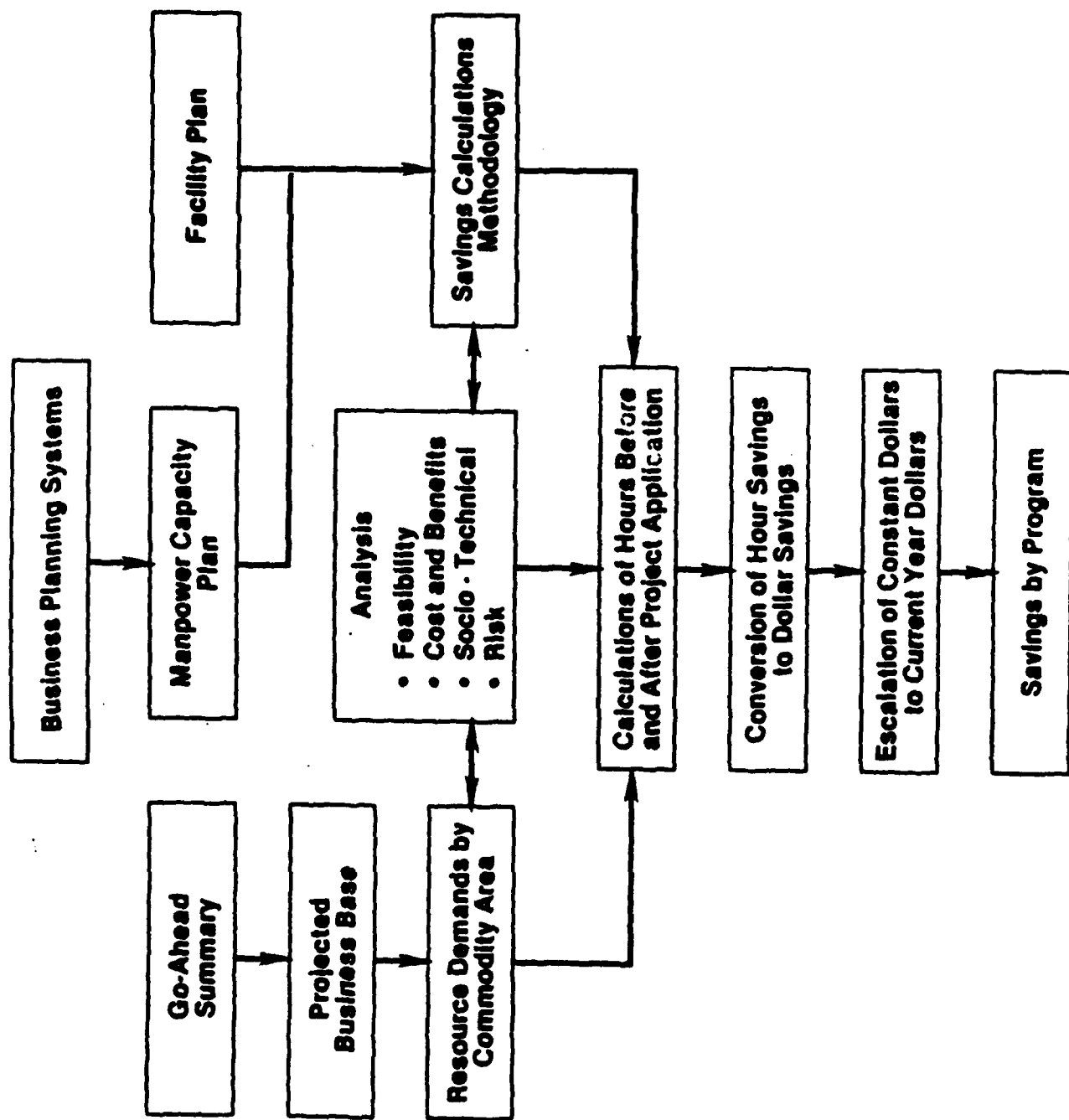
- Perform Top-Down Structured Factory-Wide Analysis
- Utilize Structured Cost Benefits Analysis Methods
- **CBA MUST BE IN COMPLIANCE With:**
  - DD633 Format
  - Cost Accounting Standards
  - Contractor Disclosure Statement
  - Negotiated Rates and Factors
- Perform DCF Rate-of-Return Analysis
  - Establish Acceptable Hurdle Rate
  - Calculate Appropriate Shared Savings Incentive Dollar Value Needed To Realize Hurdle Rate

# IDEF $\phi$ Function Model





# Technology Modernization Project Evaluation



# DoD Cost / Pricing Format (DD633)

## 1. Purchased Materials and Services

A. Purchased Parts

B. Subcontracted Items

C. Development Materials

## 2. Procurement Burden

## 3. Interdivisional Transfers

## 4. Engineering

A. Labor

B. Overhead

## 5. Factory

A. Labor

B. Overhead

## 6. Other Costs

A. Computer

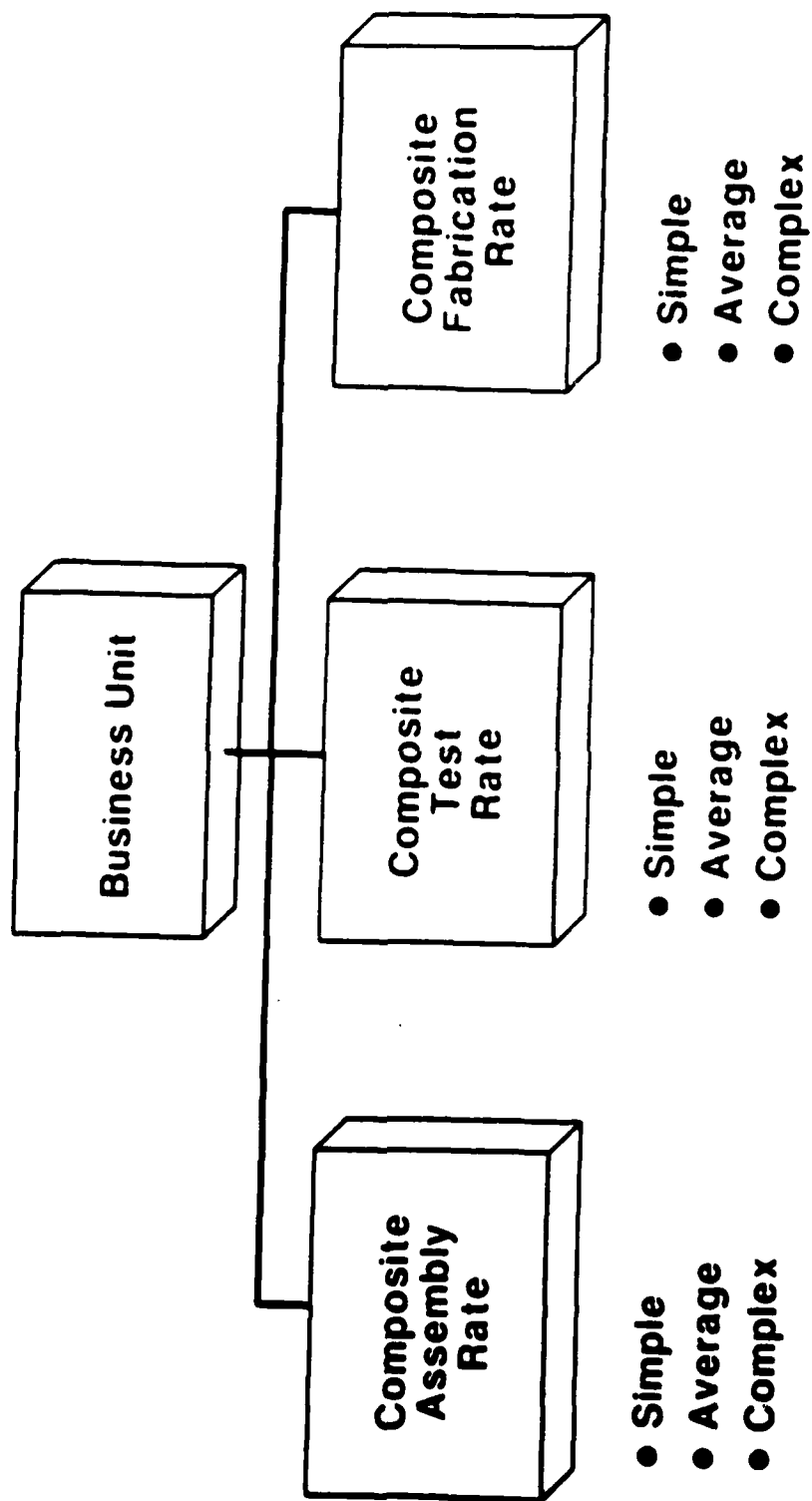
B. Travel

C. Tooling

D. Miscellaneous

# Aggregate Costing Rates

## Sample Business Unit Rates Breakdown



# Aggregate Costing Rates

- Direct Labor
- Departmental Overhead
- Allocations

# Aggregate Costing Rates

- Direct Labor
  - Wage Rate
  - Holiday / Vacation
  - Benefits

# **Aggregate Costing Rates**

- **Departmental Overhead**
  - **Meetings / Training / Travel**
  - **Supervision / Administration**
  - **Support**
  - **Equipment Depreciation**
  - **Utilities**
  - **Maintenance**
  - **Space**
  - **Expendables**
  - **Miscellaneous**

# Aggregate Costing Rates

- Allocations
  - Management Administration
  - Materials
  - Technical
  - Product Assurance
  - Computer
  - Finance
  - Miscellaneous



ATTACHMENT B IFPS SAMPLE DCF MODEL

MODEL IN VERSION OF 10/10/85 13.07 -- 11 COLUMNS 50 VARIABLES

10/29/85

SAMPLE DCF ANALYSIS REPORT

|                      | YEAR 1 | YEAR 2  | YEAR 3  | YEAR 4 | YEAR 5 | YEAR 6 | YEAR 7 | YEAR 8 | YEAR 9 | YEAR 10 | TOTAL   |
|----------------------|--------|---------|---------|--------|--------|--------|--------|--------|--------|---------|---------|
| EXPENSE              | 750.0  | 3750.0  | 2500.0  | 2500.0 | 500.0  |        |        |        |        |         | 10000.0 |
| EQUIPMENT            |        |         |         |        |        |        |        |        |        |         | 12000.0 |
| BUILDING             |        |         |         |        |        |        |        |        |        |         | 12000.0 |
| CASH FLOW ADJ        |        |         |         |        |        |        |        |        |        |         | 12000.0 |
| CAPITAL              |        |         |         |        |        |        |        |        |        |         | 22000.0 |
| TOTAL INVESTMENT     | 750.0  | 5750.0  | 7500.0  | 4500.0 | 1500.0 |        |        |        |        |         |         |
| INCENTIVE SAVINGS    |        | 75.0    | 2250.0  | 2500.0 | 2500.0 | 1075.0 | 1410.0 | 1410.0 | 1410.0 | 1290.0  | 9200.0  |
| DEPR RECOVERY        | 442.9  | 111.1   | 500.0   | 1331.1 | 1331.1 | 1427.1 | 1427.1 | 1427.1 | 1427.1 | 1290.0  | 9922.9  |
| EXP. DEFERRED        |        |         |         |        |        |        |        |        |        |         | 2400.0  |
| SAVINGS LOSS         |        |         |         |        |        |        |        |        |        |         | 1000.0  |
| COST OF MONEY        |        |         |         |        |        |        |        |        |        |         | 4545.4  |
| RETAINED SAVINGS     |        |         |         |        |        |        |        |        |        |         | 3775.0  |
| INVEST CREDIT        | 42.3   | 412.3   | 777.5   | 1097.5 | 1312.5 | 1527.5 | 1742.5 | 1957.5 | 2172.5 | 2387.5  | 11542.3 |
| ADJ DEPR TAX ADJ     |        |         |         |        |        |        |        |        |        |         | 1000.0  |
| EXPENSE TAX ADJ      | 36.9   | 160.4   | 42.0    | 69.0   | 53.3   | 516.6  | 317.4  | -105.6 | -552.0 | -507.3  | 952.5   |
| NET CASH FLOW        | -20.5  | -1416.7 | -2320.7 | -550.0 | 2791.7 | 3296.6 | 1047.9 | 1221.1 | 717.9  | 411.3   | 5761.0  |
| IRR                  | 25.5   |         |         |        |        |        |        |        |        |         |         |
| CUMULATIVE SAVINGS   | 250.0  | 5000.0  | 5250.0  | 5500.0 | 5750.0 | 6000.0 | 6250.0 | 6500.0 | 6750.0 | 7000.0  | 71000.0 |
| CUMULATIVE SAVINGS   | 150.0  | 4500.0  | 4750.0  | 5000.0 | 5250.0 | 5500.0 | 5750.0 | 6000.0 | 6250.0 | 6500.0  | 66000.0 |
| MAJOR PUBLIC SAVINGS |        |         |         |        |        |        |        |        |        |         | 1000.0  |

VIII.A.5 - DCF/SSA

b. LTV Paper Test

## DCF/LMI/WESTINGHOUSE PAPER TEST

DTIC Aerospace and Defense  
Vought Aero Products Division

Westinghouse model's cash flow analysis realistically follows the accounting/pricing methodology employed by defense contractors

LMI model's cash flow analysis has the following deficiencies:

- Does not recognize savings realized from commercial application of project technology

- Does not allow differing classes of depreciable capital investment

- Does not consider depreciation and expense as recoverable costs generating taxable income

LMI model is cumbersome requiring numerous slide calculations outside the model; this deficiency is overcome in the Westinghouse model's performing many internal calculations that simplify user effort

Understandably Westinghouse rates and factors are utilized in their model's formulas; with some modification these rates and factors could become user data inputs

Westinghouse model has good flexibility with multiple year expenditure entries, asset classes and service lives

Model data requirements are compatible with test site data bases

## DCF/LMI/WESTINGHOUSE PAPER TEST

Resource requirements are reasonable and output format provides good analysis visibility

Models provide good evaluative measures for manufacturing investment projects; rate of return and contractor's cash flow

Modification of the models for adaptation in a similar fashion to manufacturing efficiency projects could be accomplished by inclusion of evaluative measures such as the ratio of government cash flow to contractor cash flow

DP-111-28

VIII.6 - Summary Remarks/Conclusion and  
Recommendations

a. Summary Remarks

**Table V.-D.-1.-1. Generic Criteria Useful in  
Evaluating Productivity Management  
Methodologies (PMGC)**

|                    |                                                                                                                                                                                                                                                                                                                                    |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PMGC <sub>1</sub>  | • Does the methodology incorporate a 2-5 year strategic planning process?                                                                                                                                                                                                                                                          |
| PMGC <sub>2</sub>  | • Does the planning process, by which the 2-5 year plan is developed, substantively involve all major, relevant, and appropriate key decision makers in the organization?                                                                                                                                                          |
| PMGC <sub>3</sub>  | • Does the methodology recognize the need for a competent "champion"?                                                                                                                                                                                                                                                              |
| PMGC <sub>4</sub>  | • Does the methodology incorporate mechanisms for managing change within a political and sociological culture?                                                                                                                                                                                                                     |
| PMGC <sub>5</sub>  | • Does the methodology ensure that productivity basics are understood consistently by all persons in the organization?                                                                                                                                                                                                             |
| PMGC <sub>6</sub>  | • Does the methodology consider and incorporate a process by which general awareness about the win-win features of productivity improvement can be developed? Does the methodology recognize that there are strong pressures/restraining forces impeding productivity improvement that must be forthrightly and openly dealt with? |
| PMGC <sub>7</sub>  | • Does the methodology incorporate the notion of stages of development or evolution for the productivity effort?                                                                                                                                                                                                                   |
| PMGC <sub>8</sub>  | • Is there genuine,, real, long-lasting top management support for the effort? Does the methodology provide a mechanism for getting and keeping the support?                                                                                                                                                                       |
| PMGC <sub>9</sub>  | • Does the methodology adequately provide for integration of specific models, techniques, and steps within the methodology and a mechanism for integrating these with other management systems?                                                                                                                                    |
| PMGC <sub>10</sub> | • Does the methodology define how the productivity management plan will integrate with the business plan, marketing plan, capital budgeting plan, long-range (5-25 year) strategy plan, etc.?                                                                                                                                      |
| PMGC <sub>11</sub> | • Does the methodology utilize state-of-the-art participative management techniques, at all levels of management, to drive productivity improvement plans?                                                                                                                                                                         |

Table V.-D.-1.1. (cont.)

- |                    |                                                                                                                                                                                                                                                                                                                             |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PMGC <sub>12</sub> | • Does the methodology specifically deal with how to link strategic productivity improvement planning to action planning and effective implementation?                                                                                                                                                                      |
| PMGC <sub>13</sub> | • Does the methodology incorporate mechanisms that encourage and promote disciplined management of budgets (all resources) at various levels of management and supervision?                                                                                                                                                 |
| PMGC <sub>14</sub> | • Does the methodology incorporate continuing and proactive development of improvement measurement and evaluation systems? Does the methodology specifically incorporate state-of-the-art productivity measurement and evaluation techniques?                                                                               |
| PMGC <sub>15</sub> | • Does the methodology strongly encourage periodic measurement and evaluation system audits that check to ensure that those things which truly constitute system performance are measured?                                                                                                                                  |
| PMGC <sub>16</sub> | • Does the methodology recognize the difference between measurement and evaluation systems for control purposes versus those for development and improvement purposes?                                                                                                                                                      |
| PMGC <sub>17</sub> | • Does the methodology discourage measuring A while hoping for B?                                                                                                                                                                                                                                                           |
| PMGC <sub>18</sub> | • Does the methodology define how various measurement and evaluation systems will integrate into a cohesive, effective management system that supports proactive productivity management?                                                                                                                                   |
| PMGC <sub>19</sub> | • Does the methodology allow for personalized scoreboard building by sections, work groups, departments, etc.?                                                                                                                                                                                                              |
| PMGC <sub>20</sub> | • Does the methodology promote continuing, proactive development of control and improvement techniques related to all resources? Does the methodology specifically incorporate state-of-the-art productivity control and improvement approaches and techniques for labor, capital, energy, materials, and data/information? |
| PMGC <sub>21</sub> | • Does the methodology encourage periodic audits of control and improvement procedures? Do we audit what we really reward?                                                                                                                                                                                                  |
| PMGC <sub>22</sub> | • Does the methodology discourage rewarding A while hoping for B?                                                                                                                                                                                                                                                           |

Table V.-D.-1.-1. (cont.)

- |                    |                                                                                                                                                                                                                         |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PMGC <sub>23</sub> | • Does the methodology encourage and promote innovation at all levels of the organization?                                                                                                                              |
| PMGC <sub>24</sub> | • Does the methodology utilize a "cost-driver" analysis to identify where improvement efforts are best directed?                                                                                                        |
| PMGC <sub>25</sub> | • Does the methodology define how to successfully link control and improvement to measurement and evaluation, and vice versa?                                                                                           |
| PMGC <sub>26</sub> | • Does the methodology focus on building effective management systems as opposed to just automating? Are our improvement efforts piecemeal attempts to optimize subsystems at the expense of larger system performance? |
| PMGC <sub>27</sub> | • Does the methodology strive to create goal-congruity/win-win situations? If the organization wins, will the individual win also?                                                                                      |
| PMGC <sub>28</sub> | • Does the methodology successfully utilize state-of-the-art participative management techniques for productivity improvement plan identification, development, and implementation?                                     |
| PMGC <sub>29</sub> | • Does the methodology focus on execution of management basics as an early step in productivity improvement?                                                                                                            |
| PMGC <sub>30</sub> | • Does the methodology hold management, staff, and employees accountable in a disciplined, consistent fashion?                                                                                                          |
| PMGC <sub>31</sub> | • Does the methodology incorporate planning for maintaining excellence once it is achieved?                                                                                                                             |
| PMGC <sub>32</sub> | • Do all levels of management and staff understand the methodology? Does the methodology incorporate plans to involve management in its development and to continue education as to the methodologies execution?        |
| PMGC <sub>33</sub> | • Is the methodology designed so as to be self motivating?                                                                                                                                                              |
| PMGC <sub>34</sub> | • Is the methodology as simple as possible?                                                                                                                                                                             |

Table V.-D.-1.-2. Generic Criteria Useful  
in Evaluating Productivity Measurement  
and Evaluation Models that will  
also Support Incentive methodology\*  
(PHEM GC)

- PHEMGC<sub>1</sub>
  - Is the model easy to use?
    - Ease of Application
- PHEMGC<sub>2</sub>
  - Ease of Application for Prime Contractors.
  - Ease of Application for Subcontractors.
- PHEMGC<sub>3a</sub>
  - Does model utilize existing company data bases?
    - Percent of data needed that is available.
- PHEMGC<sub>3b</sub>
  - Does the model require developing new company data bases? If needed data is not available, can model be modified to provide valuable information?
    - New data bases that must be developed to use model.
- PHEMGC<sub>4a</sub>
  - What does the model measure? (directly & indirectly)
    - Effectiveness
    - Efficiency
    - Quality
    - Productivity
    - Quality of Work Life
    - Innovation
    - Profitability
- PHEMGC<sub>4b</sub>
  - Is the model primarily designed for:
    - cost/benefit, cash flow projection and analysis?
    - cost/benefit, cash flow tracking & validation?
    - productivity measurement & evaluation?
    - a control tool?
    - an improvement tool?
    - a department, function, or workgroup analysis tool?
    - a plant, division, or company analysis tool?
    - a project or program analysis tool?
- PHEMGC<sub>5</sub>
  - Model usefulness for Manufacturing Efficiency Projects? for Manufacturing Investment Projects?
- PHEMGC<sub>6</sub>
  - Implementation Costs?
    - general magnitude
    - design & development
    - implementation
    - operation and maintenance

\* Incentive Methodology in this application infers Government to Contractor Incentive Systems such as IMIP.

Table V.-D.-1.-2. (cont.)

|                      |                                                                                                                     |
|----------------------|---------------------------------------------------------------------------------------------------------------------|
| PHEMGC <sub>7</sub>  | • Ability to measure and allocate savings to multiple programs?                                                     |
| PHEMGC <sub>8</sub>  | • Ability to have productivity improvement projects and business programs added and deleted? Flexibility of model?  |
| PHEMGC <sub>9</sub>  | • Ability to delineate commercial and government program benefits?                                                  |
| PHEMGC <sub>10</sub> | • Quality of model output? Appropriateness of model output portrayal? Flexibility of output for variable audiences? |
| PHEMGC <sub>11</sub> | • Accessibility of necessary input data? Preprocessing of input data required?                                      |
| PHEMGC <sub>12</sub> | • Auditability of model?                                                                                            |
| PHEMGC <sub>13</sub> | • Ability of model to handle long cycle times, multiple products, frequent design changes, product mix changes?     |
| PHEMGC <sub>14</sub> | • Ease of translation and transfer of model within defense industry?                                                |
| PHEMGC <sub>15</sub> | • Perceived complexity of model?                                                                                    |
| PHEMGC <sub>16</sub> | • Ability of model to satisfy needs of multiple users (i.e., Congress, DoD, contractor, managers, staff, etc.)?     |
| PHEMGC <sub>17</sub> | • Uniqueness and perceived utility of information provided by model?                                                |
| PHEMGC <sub>18</sub> | • Perceived implementation cost?                                                                                    |
| PHEMGC <sub>19</sub> | • Ease of linkage, and quality of the link between what the model measures and incentive methodology?               |
| PHEMGC <sub>20</sub> | • Model's conformance to accepted cost accounting practices?                                                        |
| PHEMGC <sub>21</sub> | • Does the model follow functional (organizational chart) analysis or a cost-structured approach?                   |
| PHEMGC <sub>22</sub> | • Model's allowance for comparing and contrasting "As Is and As Were" cost baselines vs. "To Be" cost baselines?    |

Table V.-D.-1.-2. (cont.)

- |                      |                                                                                                                                                            |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PHEMGC <sub>23</sub> | • Ability of model to incorporate uncertainty and risk?                                                                                                    |
| PHEMGC <sub>24</sub> | • Ability of model, using existing data, to track productivity improvement?                                                                                |
| PHEMGC <sub>25</sub> | • Ability of model to treat multi-dimensionality of performance and productivity, i.e., ability of model to examine cost factors and non-economic factors? |
| PHEMGC <sub>26</sub> | • Ability of model to substantively involve users and people in the system in its development, evolution and use?                                          |
| PHEMGC <sub>27</sub> | • Ability of model to guide, direct, and even motivate action and implementation?                                                                          |
| PHEMGC <sub>28</sub> | • Ability of model to support decisions?                                                                                                                   |
| PHEMGC <sub>29</sub> | • Ability of model to satisfy the goals of DoD and contractors?                                                                                            |
| PHEMGC <sub>30</sub> | • Ability of model to be integrated successfully into typical defense industry management systems?                                                         |

**D. Comparison and Evaluation Methodology**

**2. Specific Criteria**

- CDEF:**
- a) Has a functional structure been used?
  - b) Have function groups been identified?
  - c) Has the financial reporting structure been "mapped" against the functional structure?
  - d) Has a comprehensive Manufacturing Cost Model been identified?
  - e) Have Critical Success Factors and the related performance measures been identified?
  - f) Have "as is" and "to be" cost baselines been established?
  - g) Has project risk been considered?
  - h) Has the synergistic impact of the technology improvements been considered?
  - i) Has a benefits tracking plan been developed?

**MPPM:** Does the model:

- a) provide an overall, integrated measure of productivity for a plant, division, firm, etc.?
- b) provide an analytical mechanism for evaluating past performance?
- c) provide important information for budget control?
- d) provide constant value information on performance?
- e) assess and evaluate bottom-line impact on profits from shifts in productivity and price-recovery?
- f) track results of specific productivity improvement interventions or track total results of all productivity improvement interventions?
- g) assist with establishment of productivity management planning?

- h) provide in a succinct, integrated report containing information related to
  - changes in resource utilization and output composition.
  - traditional "pie chart," cost driver analysis data.
  - partial factor, multi-factor, and total productivity ratios.
  - performance indexes, changes in productivity, price-recovery and profits from period to period.
  - the constant-value dollar impact of productivity and price-recovery changes on profits.
- i) provide management teams with the ability to forecast and simulate business conditions, cost patterns, productivity trends, and to analyze these changes (controlled, constrained or otherwise ) on overall performance.
- j) motivate more proactive productivity management efforts on part of management teams.
- k) reflect good management system design (i.e., consider who is managing and what is being managed in relation to what we are managing with).
- l) promote total factor (energy, capital, labor, materials, data/information) productivity management decision-making.

TABLE V.-E.-1.

MFPMM CDEF DCF(LMI)

|                                              |                                        |                          |                               |
|----------------------------------------------|----------------------------------------|--------------------------|-------------------------------|
| 1 Ease of Use                                | Moderate                               | Moderate                 | Moderate                      |
| 2 Ease of Use: Primes                        |                                        |                          |                               |
| 3a Data Availability                         | Good at Macro Analysis                 | Usually not available    | Good, but requires estimation |
| 3b Data Base Development                     | Not necessary for LTV type application | Necessary                | Necessary in some areas       |
| 4a Measure: Effec.                           | Not Directly                           | Not Directly             | Indirectly                    |
| 4a Measure: Effic.                           | Indirectly                             | Yes (costs)              | Projects                      |
| 4a Measure: Qual.                            | Indirectly                             | No                       | Not Directly                  |
| 4a Measure: Prod.                            | Directly                               | No                       | No                            |
| 4a Measure: QWL                              | No                                     | No                       | No                            |
| 4a Measure: Innov.                           | Very Indirectly                        | Impact of Mfgg. Improve. | Projects Impact               |
| 4a Measure: Prof.                            | Directly                               | Yes (costs)              | Yes                           |
| 4b Focus: CBA                                |                                        | X                        | X                             |
| 4b Focus: CBT                                |                                        | X                        |                               |
| 4b Focus: PM6E                               | X                                      |                          |                               |
| 4b Focus: Control                            | X                                      | X                        |                               |
| 4b Focus: Improvement                        |                                        |                          |                               |
| 4b Focus: Group/Fnt.                         |                                        | X                        |                               |
| 4b Focus: Plant/Firm                         | X                                      | X                        | X                             |
| 4b Focus: Project/Program                    |                                        | X                        |                               |
| 5 Useful for: MEP                            | X                                      | Not Intended Focus       | Not Intended Focus            |
| 5 Useful for: MIP                            | X                                      | X                        | X                             |
| 6 Implementation Costs                       |                                        |                          |                               |
| 6 Implementation Costs: General Mag.         | Mod                                    | H1                       | Lo                            |
| 6 Implementation Costs: Design & Devel.      | Mod                                    | H1                       | Lo                            |
| 6 Implementation Costs: Implement.           | Lo                                     | Lo                       | Lo                            |
| 6 Implementation Costs: Optns & Maint.       | Lo                                     | Lo                       | Lo                            |
| 7 Meas. & Allocate Savings to Mult. Programs |                                        |                          |                               |
| 8 Flexibility                                | Good in LTV Type Applic.               | Good once sys. set up    | Good                          |
| 9 Commercial vs. Government                  | Depends on data avail.                 | ?                        | ?                             |
| 10 Output Quality                            | Needs Improvement                      | Needs Improvement        | Needs Improvement             |

TABLE V.-E.-1.

MFPM

CDEF

DCF(LMI)

| Access of Input Data                          | Good in LTV-type Applic.          | Needs to be Developed                 | Estimation & Base Line Data |
|-----------------------------------------------|-----------------------------------|---------------------------------------|-----------------------------|
| 11                                            | Good                              | Good                                  | ?                           |
| 12 Auditability Primes                        | Requires Modification             | At program level is designed for this | Designed for Setting        |
| 13 Appropriateness in Typica Defense Setting  | No Data                           | Situation specific                    | Apparent Problems           |
| 14 Translation & Transfer                     | H1                                | H1                                    | H1                          |
| 15 Perceived Complexity                       | Feasible                          | Not Clear                             | Feasible                    |
| 16 Satisfy Multiple Users                     | Not Clear                         | Not Clear                             | To Govat. Yes/Client?       |
| 17 Utility of Info. Provided                  | H1                                | H1                                    | Mod-Lo                      |
| 18 Uniqueness of Info Provided                | H1                                | H1                                    | Mod                         |
| 19 Perceived Implementation Cost              | Very Good                         | Not Sure/CBT                          | Very Good                   |
| 20 Link to Inc. Method.                       | Possible                          | Forced                                | Forced                      |
| 21 Conform to Acctg.                          |                                   |                                       |                             |
| 21. Functional (org.chart) vs. Cost Structure | X LTV Applic.<br>X Possible       | X                                     | X                           |
| 22 "As Is" to "To Be" Comp.                   | Yes                               | Yes                                   | Yes                         |
| 23 Incomp. Uncert. & Risk                     | Yes                               | Yes                                   | Not Clear/Possible          |
| 24 Track Prod. Imp.                           | Yes                               | CBT Data Avail.?                      | No                          |
| 25 Multi Dimensionality                       | Yes (Partial)                     | ?                                     | No                          |
| 26 User Involvement                           | Not High in LTV Applic.           | Lo                                    | Lo                          |
| 27 Motivate Improvement                       | Possible, not high in LTV Applic. | Weak                                  | No                          |
| 28 Support Decisions                          | Yes                               | Yes                                   | Yes                         |
| 29 Satisfy DoD?                               | Possible                          | Assume So                             | Yes                         |
| Contractors?                                  | ?                                 | ?                                     | ?                           |
| 30 Integratable into Mgmt Systems             | Yes                               | Yes                                   | Assume there already        |

VIII.A.6 - Summary Remarks/Conclusions and  
Recommendations

b. Conclusions and Recommendations

# **General Recommendations and Conclusions**

---

## **Overall conclusion:**

**Contractors need to institute, promote, and maintain a broad-scope productivity management methodology which would represent a "grand strategy" for their business unit(s).**

## Overall Conclusion Cont'd

**A productivity management methodology should encompass the productivity elements of:**

# Planning Measurement Evaluation Control Improvement

**LTV/VAPD has developed, instituted, promoted, and is maintaining such a methodology. (Development is a continuing process).**

## **Other Conclusions**

- **Individually, none of the three "models" (or methodology as the case may be) can accomplish:**
  - 1) An integrated productivity management methodology, and
  - 2) All the performance improvement goals desired by the Government and contractors.
- **Collectively, the three models (or methodologies) can be integrated into an effective productivity management methodology. Development work on each is still required.**

## **Other Conclusions Cont'd**

- The CDEF "model" performs well against objectives and criteria for which it was designed.
- The node-tree activity structure (IDEF Analysis\*) can differ significantly from a company's organizational/accounting structure, thus requiring significant effort to develop.
- LTV has perceived the cost of implementing the complete CDEF methodology at VAPD to be high, relative to other approaches (e.g., develop separate cost center accounting for each MIP).

**\* IMIP Guide 5000-XX.G requires that an IDEF-type analysis be performed.**

## **Other Conclusions Cont'd**

- The MFPPMM must be modified to function in the defense industry environment.
- LTV/VAPD has made conversions to the MFPPMM and has found the model useful.
- Of the three models tested, only the MFPPMM actually measures input-output productivity.\*

\* Possible exception, the DCF model is an aggregate, end-result profitability measure. (Capital investment input; Annual savings output).

## **Other Conclusions Cont'd**

- The DCF/SSA model is primarily an analysis and decision-making tool for planning and forecasting purposes.
- There are major deficiencies in the software developed by LMI for IMIP implementation purposes.
- Also, there is an inadequate user's manual for the software.

## **Other Conclusions Cont'd**

- IMIP guidelines are inadequate with reference to submitting/justifying manufacturing efficiency projects.
- The impact of an IMIP project on the aggregate rates used by a contractor for pricing purposes may not be clearly understood by either contractor or Government.
- The translation and transfer of productivity models and methodologies from one company to another may be difficult.
- A generic methodology for productivity management efforts within the defense industry needs to be further developed and communicated.

# Recommendations

## *Primary*

---

- Combine Phases IV and V into a single, eighteen month project which would:
  - 1) Resolve specific developmental needs of the three models by a limited field test at LTV/VAPD.
  - 2) Complete the development of an integrated productivity management methodology.

## **Primary Recommendations Cont'd**

- 3) Review and evaluate the models and the integrated methodology with other defense contractors in a workshop setting.
- 4) Develop an Implementation Guide for the integrated methodology.

## **Other Recommendations Cont'd**

- Investigate and define a more precise set of specifications required by DoD for cost-tracking purposes.
- Develop a comprehensive treatise on the impact of aggregate versus project-related cost accounting rates and factors on IMIP-related projects.
- DoD needs to expand the range of incentives to encompass a contractor's "total" productivity improvements.

# Other Recommendations

*Note: The implementation of these are judged to be outside-the-scope of Phases IV and V.*

---

- Modify the LMI version of the DCF/SSA model software. Develop a more comprehensive user's manual.
- An Implementation Guide needs to be developed to fully describe the methodology and criteria requirements to use the DCF/SSA model for IMIP purposes.
- Develop a more definitive set of IMIP guidelines for submitting and justifying a manufacturing efficiency project (MEP).

VIII.B. Final Report Briefing Materials

(Presented by VPC to Dr. John Mittino,  
Deputy Assistant, Secretary of Defense)

The Study  
of  
Productivity Measurement  
and  
Incentive Methodology

Phase III

Final Report

Briefing

18 February 1986

# OVERALL GOALS OF FIVE-PHASE PROJECT

*Superordinate Goal: To Improve The Performance of  
Defense Contractors and Subcontractors*

---

- To identify and describe current productivity measurement practices in the defense contractor community.
- To identify and describe currently available productivity measurement techniques.

## OVERALL GOALS (Contd.)

- **To test, evaluate and develop (if necessary) specific productivity measurement models and methodologies at a field test site.**
- **To develop an Implementation Guide that would be useful to a broad spectrum of defense contractors relative to productivity management & measurement.**

## OVERALL GOALS (Contd.)

- To validate (as well as possible) that the models and methodologies developed and presented in the Implementation Guide are useful in a wide spectrum of defense contractor settings.
- To ensure that models and methodologies developed and described link to incentive methodologies.

# Phase I

# Contractor Survey of Productivity Measurement Practices

# Army Procurement Research Office

**To identify and describe current productivity measurement practices in the defense community.**

**To develop specific definitions of contractor productivity appropriate for the products concerned and contracts involved.**

---

## Phase I (Contd.)

---

### Activities:

Design and distribute a survey to defense contractors.

Analyze survey responses.

Visit selected contractors for more detailed follow-up.

### Results:

Survey completed.

Recommendation to test selected models.

Description of state-of-the-art practice for productivity measurement in defense contractor industry.

---

## Phase II

---

**Title:**

**Development of a Taxonomy of Productivity  
Measurement Theories and Techniques.**

**Principals:**

**D. Scott Sink  
Thomas C. Tuttle**

**Goals:**

**To identify and describe state-of-the-art  
productivity measurement techniques and theories,  
and those being practiced.**

**To develop a taxonomy for those theories  
and techniques.**

---

## **Phase II (Contd.)**

---

### **Activities:**

**Detailed literature search.**

**Selected contractor site visits.**

**Development of taxonomy.**

### **Results:**

**Comprehensive document describing productivity measurement theories and techniques.**

**Recommendation of which models to test in phases III and IV.**

## PROJECT STAFFING

|                                                      |                                                                                    |                                          |
|------------------------------------------------------|------------------------------------------------------------------------------------|------------------------------------------|
| P.I.:                                                | D. SCOTT SINK, Ph.D., P.E.<br>DIRECTOR, UPC                                        | (MFPMM TEST AND<br>ANALYSIS COORDINATOR) |
| FACULTY ASSOC.:                                      | MARVIN H. AGEE, Ph.D<br>CO-DIRECTOR, UPC                                           |                                          |
| FIELD SITE<br>COORDINATOR:                           | MR. SHONI DHIR<br>LTV/VOUGHT AEROSPACE                                             |                                          |
| CBA/TS<br>TEST AND ANALYSIS<br>COORDINATOR:          | MS. BETTY THAYER<br>PRICE WATERHOUSE                                               |                                          |
| IMIP/DCF/SSA<br>TEST AND<br>ANALYSIS<br>COORDINATOR: | MR. RICHARD ENGHALL<br>WESTINGHOUSE MANUFACTURING<br>SYSTEMS AND TECHNOLOGY CENTER |                                          |
| OVERALL PROJECT<br>SUPPORT:                          | DR. THOMAS C. TUTTLE<br>DIRECTOR, MCPQWL                                           |                                          |

**ADVISORY BOARD AND SUPPORT GROUP**

**OFFICE OF SECRETARY OF DEFENSE:**

**DR. RICHARD A. STIMSON, DOD  
MR. DOUGLAS REEVES, DOD  
MR. MONTE NORTON, APRO  
MR. WAYNE ZABEL, APRO  
COL. RONALD DEEP, AFBRMC  
DR. TOMAS C. VARLEY  
MR. DICK POWER, DOD**

**DEFENSE SYSTEMS MANAGEMENT COLLEGE:**

**MR. DAVID D. ACKER, TECHNICAL CONTRACT OFFICER  
MR. WILBUR V. ARNOLD  
LT. COL. JOHN R. BRAMBLETT  
MR. WILLIAM NOTLEY**

**DEFENSE SUBCONTRACTORS:**

MR. GLEN PETERS, HONEYWELL AEROSPACE AND DEFENSE  
MR. BILL FALER, BOEING AEROSPACE CORP.  
MR. A.R. AFFLECK, NORTH AMERICAN AIRCRAFT OPERATIONS  
MR. DICK BETKE, TRW SPACE AND TECHNOLOGY GROUP  
MR. HAROLD GORDON, BELL HELICOPTER

# PHASE III

GOAL -- TO EXECUTE A "PAPER TEST" OF THE THREE MODELS AND  
EVALUATE MODEL APPLICATIONS AT A FIELD SITE

## OBJECTIVES --

01 -- EVALUATE EASE OF MEASURING AND EVALUATING  
PRODUCTIVITY (PERFORMANCE) WITH THESE THREE  
MODELS.

02 -- DEVELOP COMPREHENSIVE DESCRIPTION OF INPUTS  
AND OUTPUTS FOR EACH MODEL.

03 -- COMPARE, CONTRAST RESULTS OF PAPER TEST  
FOR THREE MODELS

04 -- IDENTIFY AND DESCRIBE IN DETAIL DATA  
REQUIRED TO DRIVE EACH MODEL.

05 -- DESCRIBE UNIT OF ANALYSIS (ie. APPLICATION)  
FOR EACH MODEL IN THE PAPER TEST. DESCRIBE MOST  
APPROPRIATE APPLICATION.

**PHASE III**

**OBJECTIVES CONTINUED --**

- 06 -- EVALUATE ABILITIES OF THE MODELS.**
- 07 -- DESCRIBE INCENTIVE/REWARD SYSTEMS  
IN USE AT FIELD TEST SITE.**
- 08 -- RECOMMEND MODIFICATIONS TO MODELS  
FOR MORE EFFECTIVE APPLICATION.**
- 09 -- ADVISE AS TO WHETHER PHASE IV  
IS WORTHWHILE.**

## **VI.B. General Recommendations and Conclusions**

### **Overall conclusion:**

**Contractors need to institute, promote, and maintain a broad-scope productivity management methodology which would represent a "grand strategy" for their business unit(s).**

# **Overall Conclusion Cont'd**

**A productivity management methodology should encompass the productivity elements of:**

**Planning  
Measurement  
Evaluation  
Control  
Improvement**

**LTV/VAPD has developed, instituted, promoted, and is maintaining such a methodology. (Development is a continuing process).**

# **Other Conclusions**

- **Individually, none of the three "models" (or methodology as the case may be) can accomplish:**
  - 1) **An integrated productivity management methodology, and**
  - 2) **All the performance improvement goals desired by the Government and contractors.**
- **Collectively, the three models (or methodologies) can be integrated into an effective productivity management methodology. Development work on each is still required.**

## **Other Conclusions Cont'd**

- The CDEF "model" performs well against objectives and criteria for which it was designed.
- The node-tree activity structure (IDEF Analysis\*) can differ significantly from a company's organizational/accounting structure, thus requiring significant effort to develop.
- LTV has perceived the cost of implementing the complete CDEF methodology at VAPD to be high, relative to other approaches (e.g., develop separate cost center accounting for each MIP).

**\* IMIP Guide 5000-XX.G requires that an IDEF-type analysis be performed.**

## **Other Conclusions Cont'd**

- The DCF/SSA model is primarily an analysis and decision-making tool for planning and forecasting purposes.
- There are major deficiencies in the software developed by LMI for IMIP implementation purposes.
- Also, there is an inadequate user's manual for the software.

## **Other Conclusions Cont'd**

- The MFPMM must be modified to function in the defense industry environment.
- LTV/VAPD has made conversions to the MFPMM and has found the model useful.
- Of the three models tested, only the MFPMM actually measures input-output productivity.\*

\* Possible exception, the DCF model is an aggregate, end-result profitability measure. (Capital investment input; Annual savings output).

## **Other Conclusions Cont'd**

- IMIP guidelines are inadequate with reference to submitting/justifying manufacturing efficiency projects.
- The impact of an IMIP project on the aggregate rates used by a contractor for pricing purposes may not be clearly understood by either contractor or Government.
- The translation and transfer of productivity models and methodologies from one company to another may be difficult.
- A generic methodology for productivity management efforts within the defense industry needs to be further developed and communicated.

**FIGURE III-1**  
**Generic Productivity Management Methodology**  
**as Related to Defense Industry**

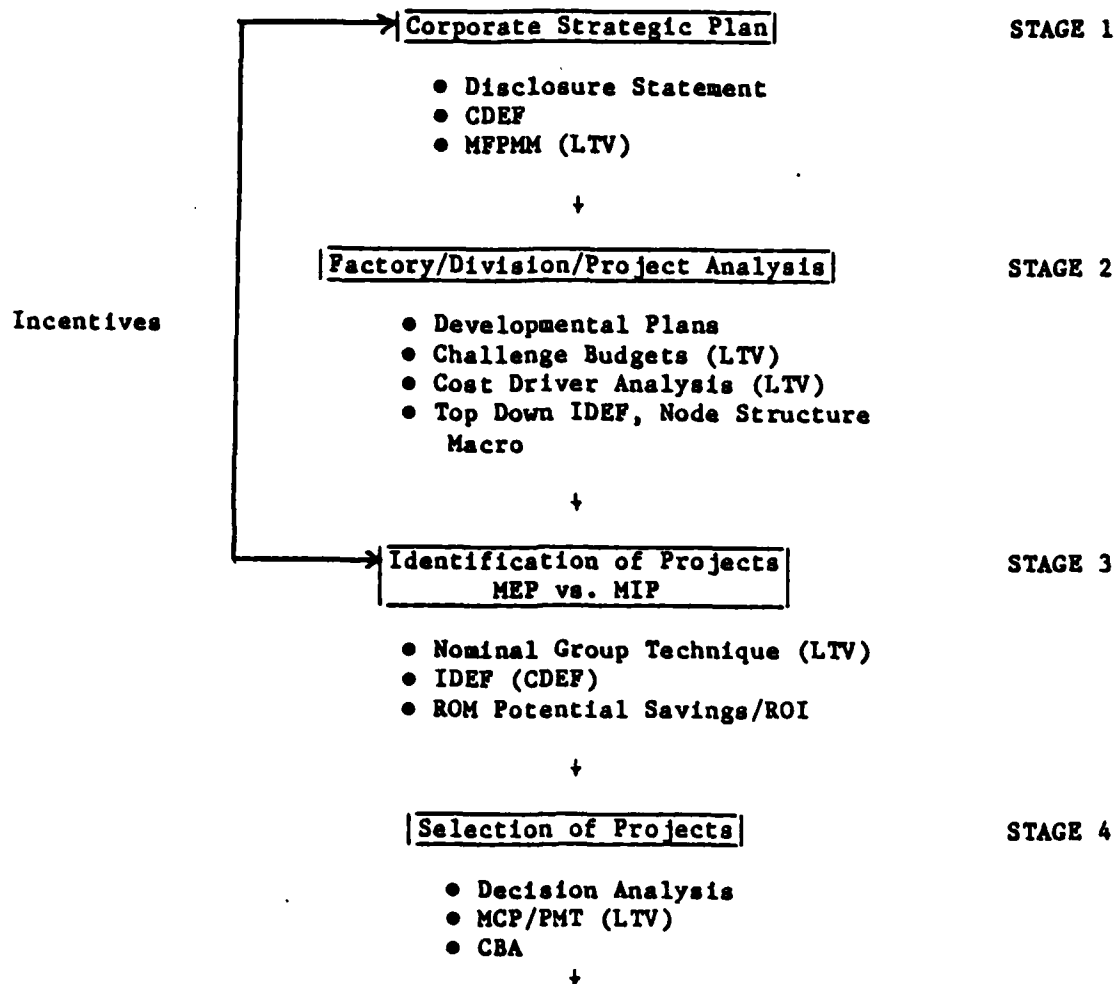


Figure III-1 (cont.)  
Generic Productivity Management Methodology  
As Related to Defense Industry

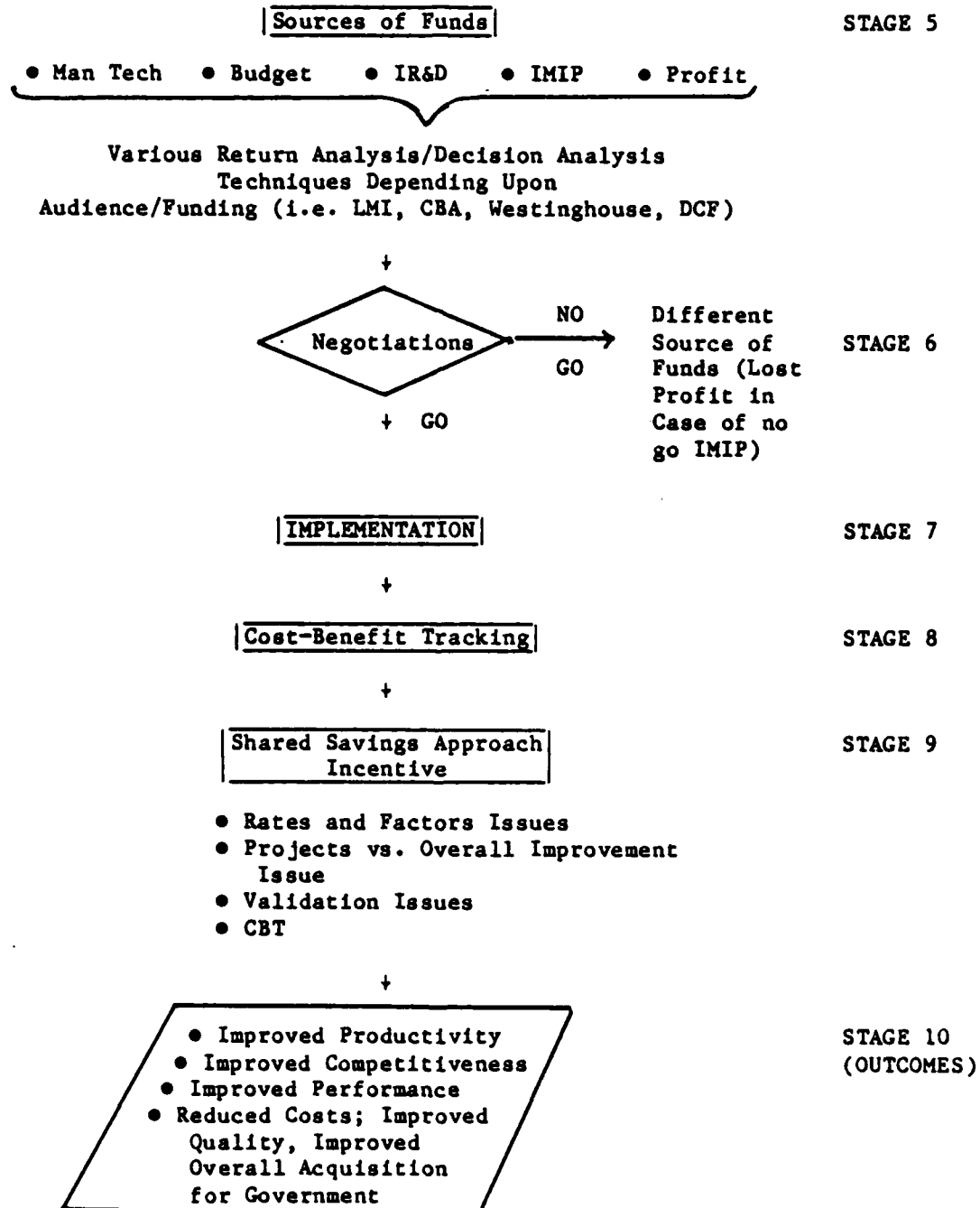
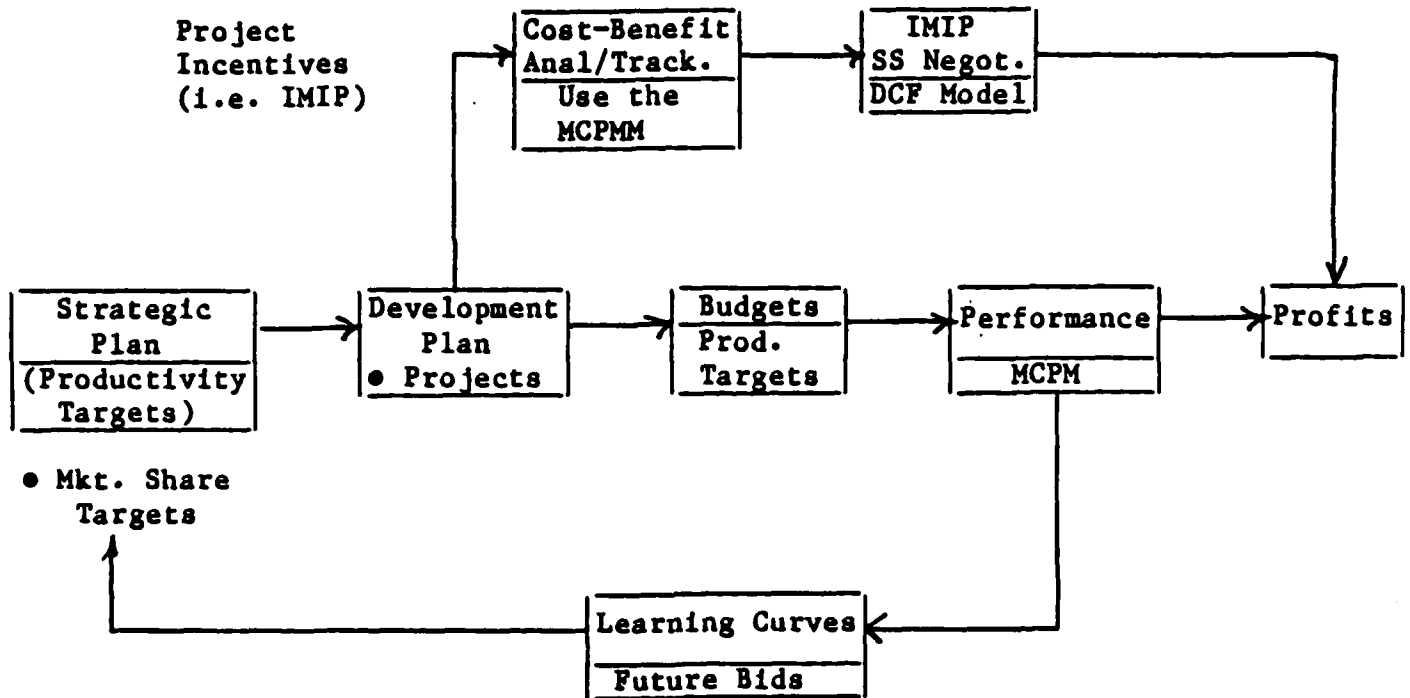


**FIGURE III-2**  
**Depiction of LTV/VAPD's Basic Approach**  
**to Productivity Management**



- Comments:**
- Process should be self-motivated
  - IMIP utilized to minimize lost profit impact
  - If there were overall total productivity improvement incentives the company would likely do what Government is after anyway and with less difficulty than by way of project focussed incentives.

# Recommendations

## *Primary*

---

- Combine Phases IV and V into a single, eighteen month project which would:
  - 1) Resolve specific developmental needs of the three models by a limited field test at LTV/VAPD.
  - 2) Complete the development of an integrated productivity management methodology.

# **Primary Recommendations Cont'd**

- 3) Review and evaluate the models and the integrated methodology with other defense contractors in a workshop setting.
- 4) Develop an Implementation Guide for the integrated methodology.

---

## **Phase IV**

---

**Title:**

**The Study of Productivity Measurement and  
Incentive Methodology - Field Test**

**Participants:**

**D. Scott Sink, Principal Investigator, VPC  
Marvin H. Agee, Investigator, VPC**

**Shoni Dhir, LTV/VAPD**

**Betty Thayer, Price Waterhouse**

**Thomas Tuttle, The Maryland Center for Productivity  
and Quality of Worklife**

## **Other Recommendations Cont'd**

- Investigate and define a more precise set of specifications required by DoD for cost-tracking purposes.
- Develop a comprehensive treatise on the impact of aggregate versus project-related cost accounting rates and factors on IMIP-related projects.
- DoD needs to expand the range of incentives to encompass a contractor's "total" productivity improvements.

---

## **Phase IV (Contd.)**

---

### **Objectives:**

**Field test the MFPPMM, CDEF, DCF/SSA, models and generic methodologies at LTV/VAPD**

**Develop a draft Implementation Guide**

**Implement at least three evaluation workshops with defense contractors (representative cross-section)**

APPENDIX A

Distribution List

Distribution List

Volumes I, II, III:

Dr. Richard A. Stimson  
Director, Industrial Productivity  
OASD(A&L)IP  
Room 2A318, The Pentagon  
Washington, D.C. 20301

Comandante  
Defense Systems Management College  
Attention: DSMC-DRI-R  
Building 202  
Ft. Belvoir, Virginia 22060-5426

Dr. Robert F. Williams  
Army Procurement Research Office  
ODCS for Logistics  
Building 12113  
Fort Lee, Virginia 23801

Mr. Shoni Dhir  
Manager, Productivity and Industrial  
Engineering  
LTV Aerospace and Defense Company  
Vought Aero Products Division  
P.O. Box 225907  
Dallas, Texas 75265

Dr. Thomas C. Tuttle  
Director  
The Maryland Center for Productivity  
and Quality of Working Life  
University of Maryland  
College Park, Maryland 20742

Mrs. Betty Thayer  
Senior Consultant  
Price Waterhouse  
6500 Rock Spring Drive  
Bethesda, Maryland 20817

Mr. Richard Engwall  
Manager, Systems Planning, Analysis  
and Assurance  
Westinghouse Manufacturing Systems  
and Technology Center  
9200 Berger Road, MS 6112  
Columbia, Maryland 21045

Distribution List (cont.)

Volume I Only:

Mr. Douglas Reeves  
Assistant to Director  
Industrial Productivity  
OASD(A&L)IP  
Room 2A318, The Pentagon  
Washington, D.C. 20301

Colonel Ronald Deep  
Director, Air Force Business  
Research Management Center  
Wright-Patterson AFB, Ohio 45433

Col. Robert L. Sims, USAF  
Chief, Operations Research and  
Economic Analysis Office  
Defense Logistics Agency  
Alexandria, Virginia 22314

Mr. Peter St. Jean  
David Taylor Ship R&D Center  
Bethesda, Maryland 20854