

SHIP PRODUCTION COMMITTEE
FACILITIES AND ENVIRONMENTAL EFFECTS
SURFACE PREPARATION AND COATINGS
DESIGN/PRODUCTION INTEGRATION
HUMAN RESOURCE INNOVATION
MARINE INDUSTRY STANDARDS
WELDING
INDUSTRIAL ENGINEERING
EDUCATION AND TRAINING

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Proceedings of the REAPS Technical Symposium

Paper No. 1: Alternatives for Effective CAD/CAM Utilization

U.S. DEPARTMENT OF THE NAVY
CARDEROCK DIVISION,
NAVAL SURFACE WARFARE CENTER

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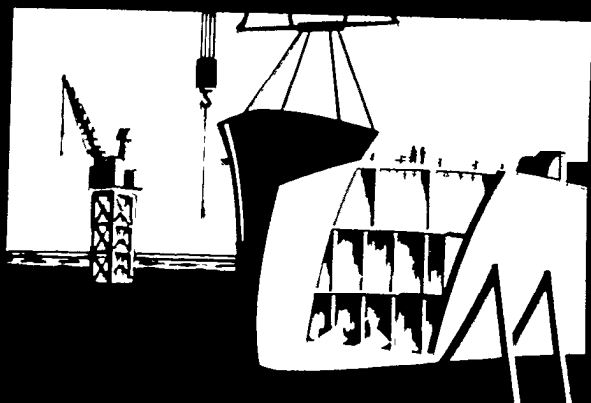
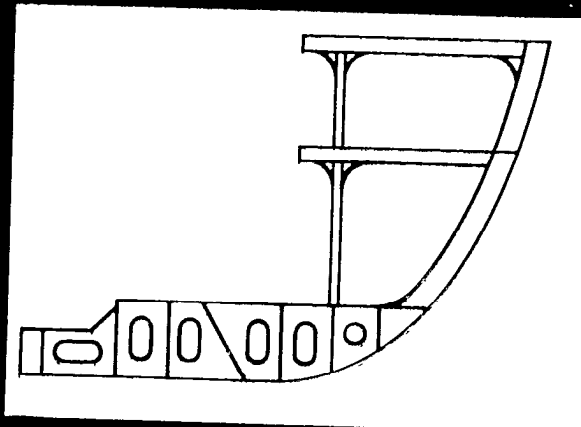
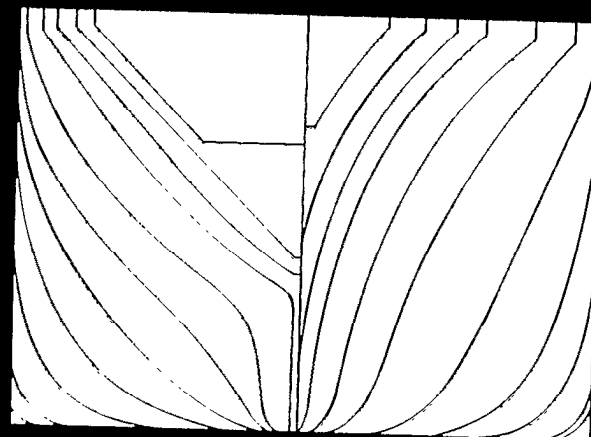
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R ESEARCH
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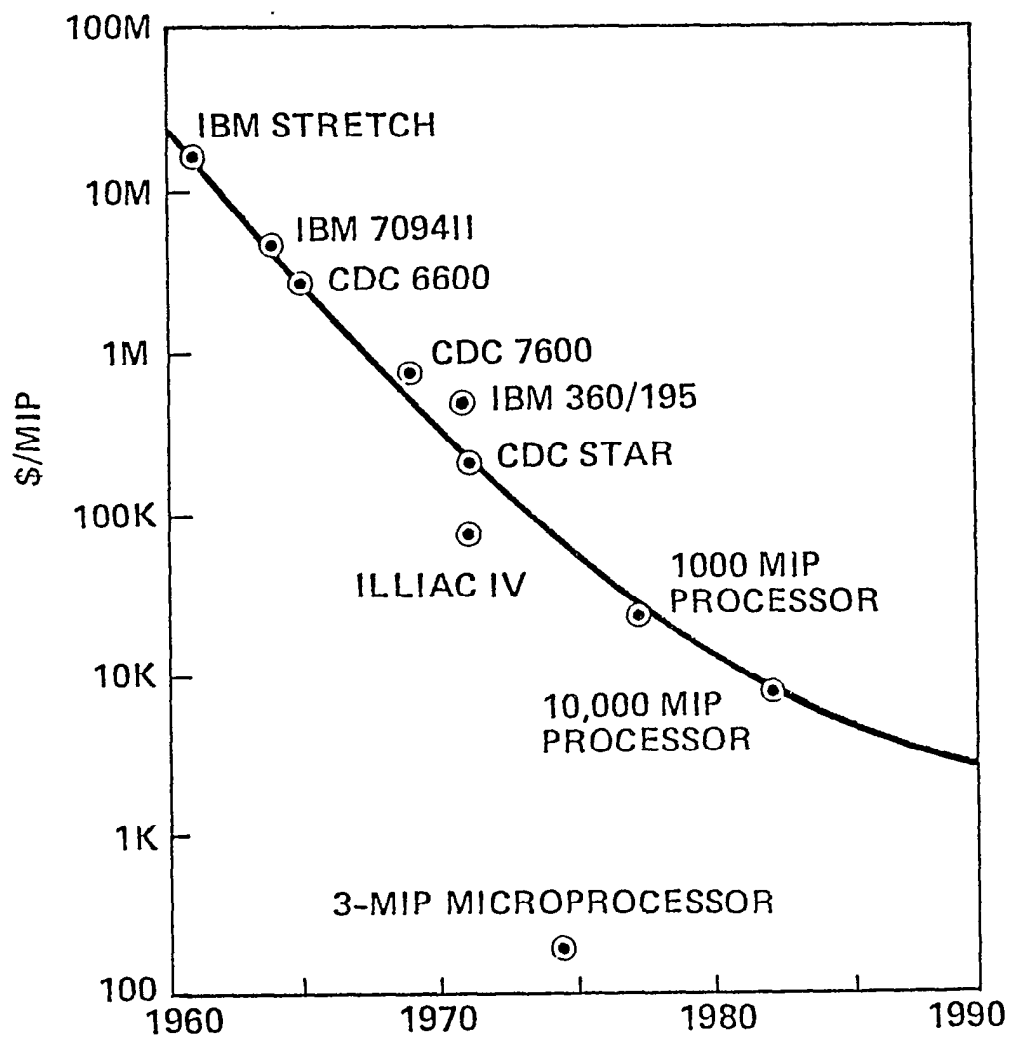
ALTERNATIVES FOR EFFECTIVE CAD/CAM UTILIZATION

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Corporate Manager, CAD/CAM
General Dynamics Corporation
Data Systems Services
St, Louis, Missouri

As Corporate Manager, Mr. Breen is currently responsible for corporate reporting of CAD/CAM activities, directing tactical and strategic CAD/CAM planning, and ensuring high productivity gains through CAD/CAM implementations for General Dynamics Corporation.

Mr. Breen is a graduate of Purdue University with a degree in mathematics. In the past, he has been responsible for implementing automated tools for shipbuilding disciplines, and instrumental in initiating early REAPS program activities. He has been involved in the implementation of interactive graphics, DNC/CNC, group technology, photogrammetry, robotics and automated inspection systems in Electronics, Aerospace and Shipbuilding industries.

SYSTEM COST PER MILLION INSTRUCTIONS PER SECOND (MIPS)



CAD/CAM PURPOSE:

DATA CONFIGURATION CONTROL

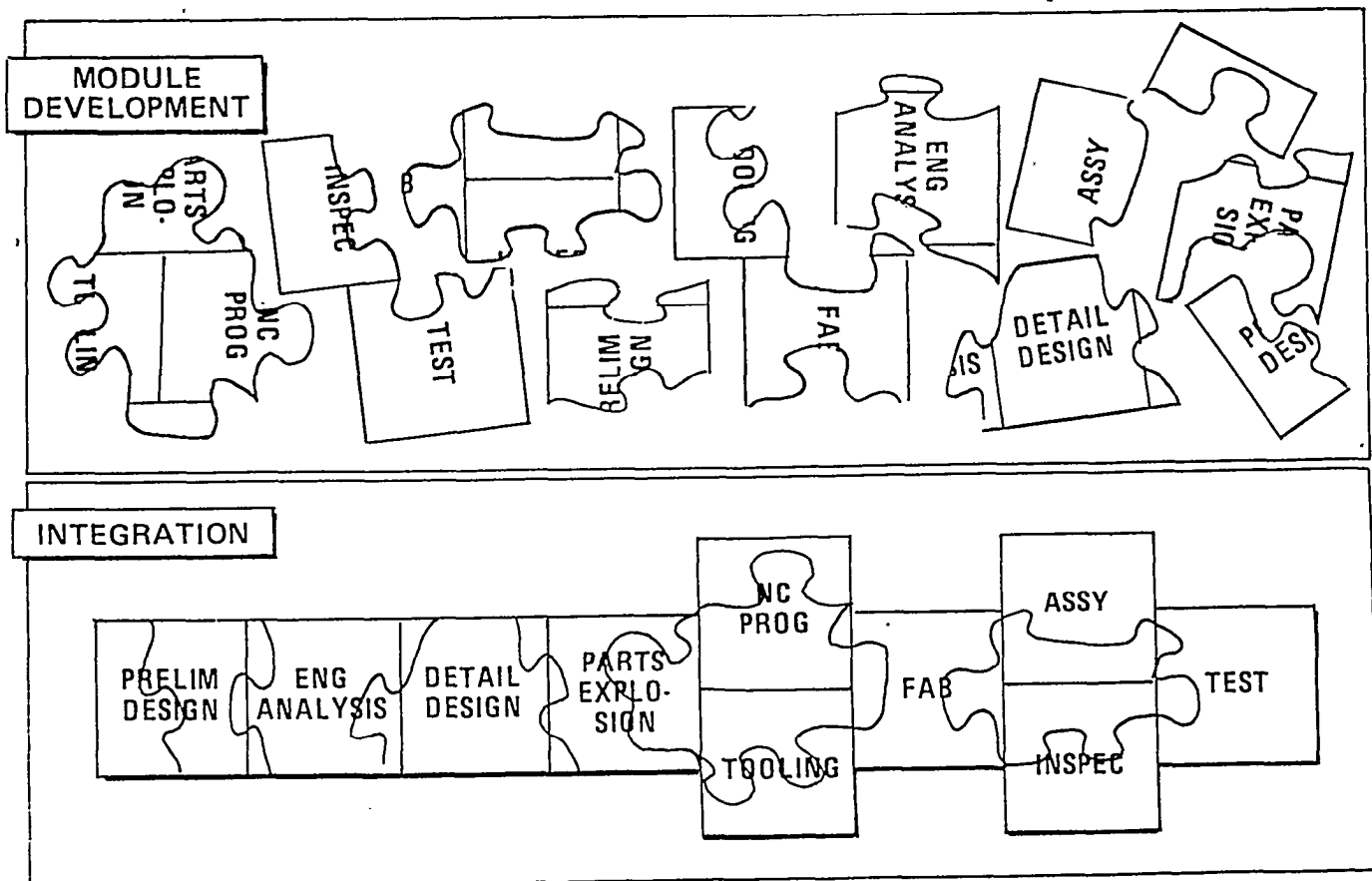
- AS DESIGNED
- AS BUILT
- REVISION/CHANGE
- STATUS

CAD/CAM OBJECTIVE:

INCREASED PRODUCTIVITY

- REDUCED SCHEDULE
- REDUCED MANHOURS
- BETTER DESIGN
- BETTER MATERIAL UTILIZATION
- BETTER RESPONSIVENESS TO CHANGE
- LOWER COST

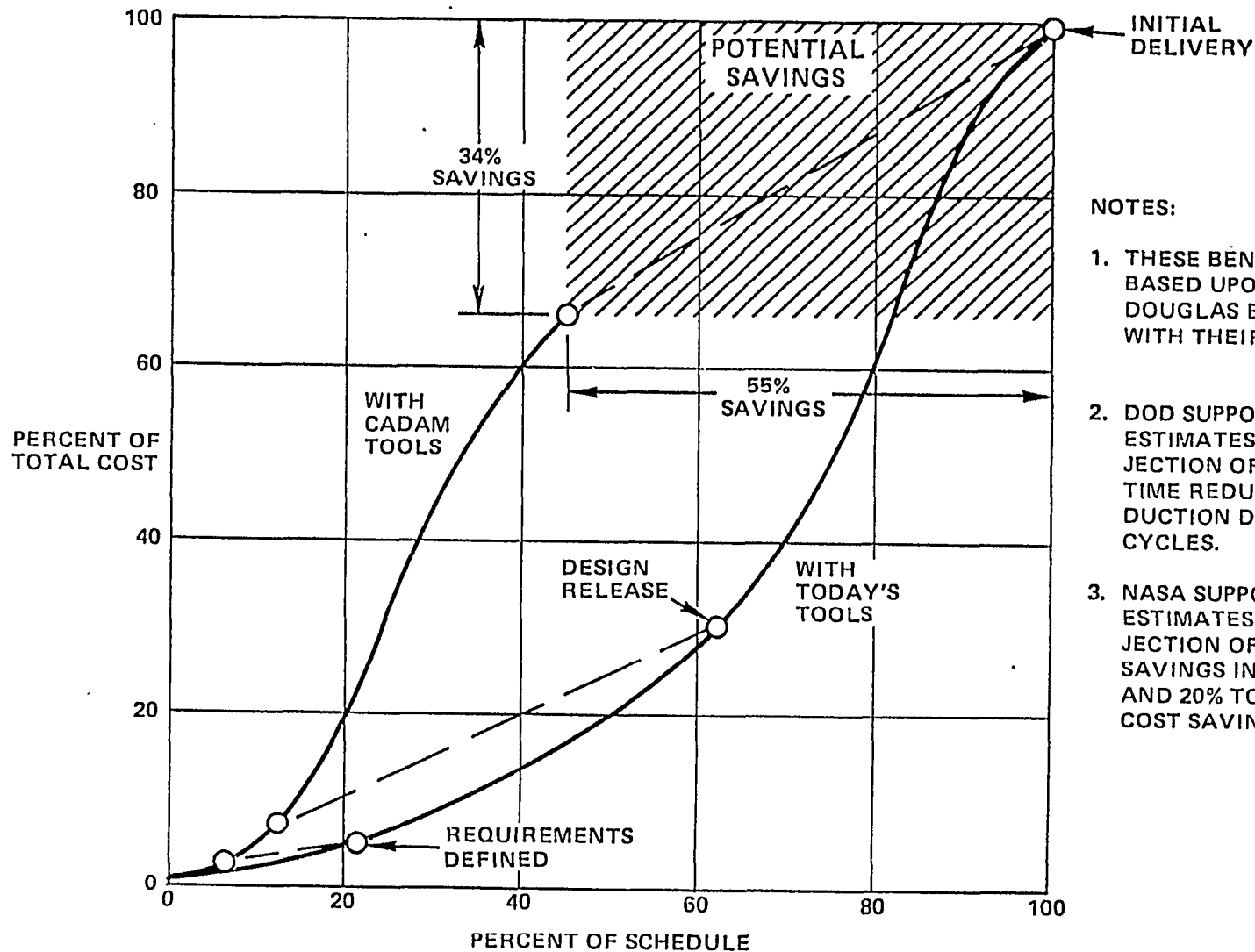
GOAL: INTEGRATED SYSTEM



FORECASTED EVENTS IN THE DEFENSE INDUSTRY ARE:

- ⑩ FEASIBILITY DEMONSTRATION OF THE DESIGN AND MANUFACTURE OF PRINTED CIRCUIT BOARDS AND MECHANICAL PARTS WITHOUT GENERATING AN ENGINEERING DRAWING OR ANY OTHER PAPER DOCUMENT IN AT LEAST FIVE OF THE MAJOR DEFENSE COMPANIES BY 1979
- ROUTINE USE OF INTEGRATED CADAM TOOLS ON 50 PERCENT OF NEW PRODUCT DESIGNS IN THE DEFENSE INDUSTRY BY 1982
- ELIMINATION OF THE DRAWING (PAPER DOCUMENTATION) AS A MEANS OF TRANSMITTING ENGINEERING DESIGN TO MANUFACTURING IN 50 PERCENT OF DEFENSE PLANTS BY 1985
- ⑩ UP TO 55 PERCENT REDUCTION IN DEVELOPMENT SCHEDULE (GO-AHEAD TO PROTOTYPE DELIVERY) AND UP TO 37 PERCENT REDUCTION IN PROTOTYPE DEVELOPMENT COSTS ROUTINELY ACCOMPLISHED IN 50 PERCENT OF THE DEFENSE INDUSTRY BY 1987

CAD/CAM POTENTIAL SAVINGS

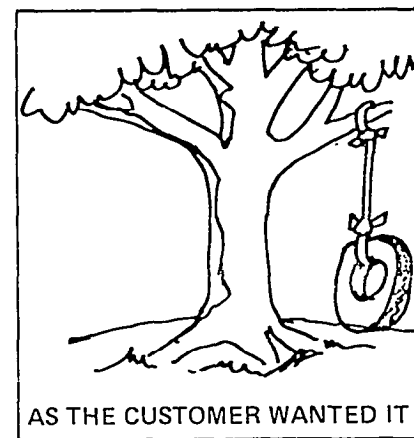
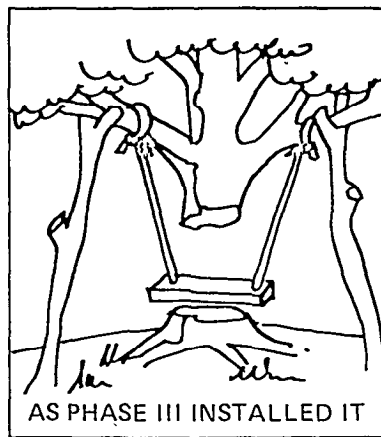
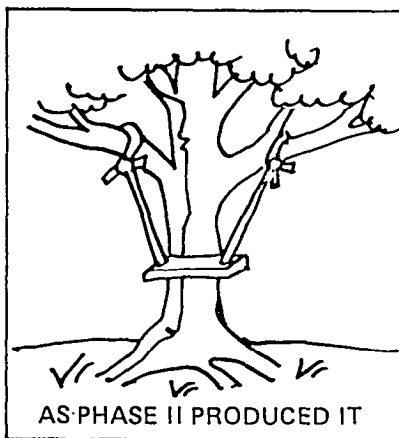
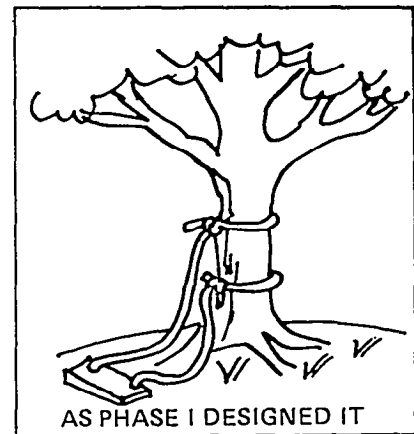
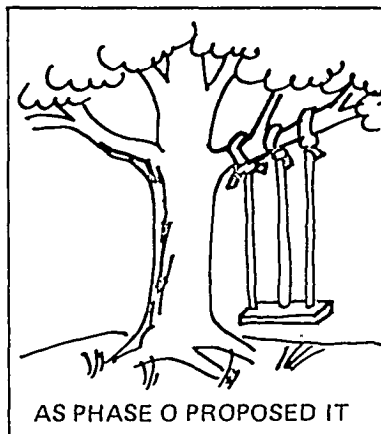
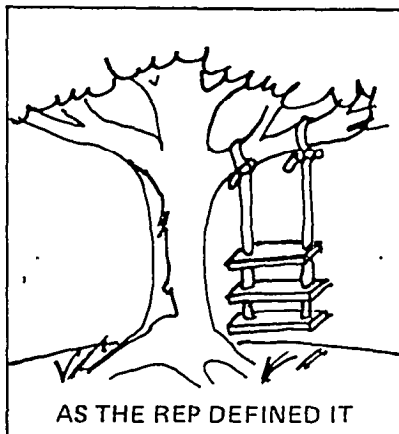


NOTES:

1. THESE BENEFITS ARE BASED UPON McDONNELL DOUGLAS EXPERIENCE WITH THEIR CAD SYSTEMS
2. DOD SUPPORTS THESE ESTIMATES WITH A PROJECTION OF A 5:1 AVERAGE TIME REDUCTION IN PRODUCTION DEVELOPMENT CYCLES.
3. NASA SUPPORTS THESE ESTIMATES WITH A PROJECTION OF 25% TO 90% SAVINGS IN FLOWTIME AND 20% TO 60% TOTAL COST SAVINGS.

DEVELOP vs PROCURE

- TOTAL SYSTEM NOT "OFF THE SHELF"
- SYSTEM ELEMENTS ARE AVAILABLE
- DEVELOPMENT COSTS EXCEED PROCUREMENT COSTS
- DEPENDENCE ON SUPPLIERS
- INTEGRATION OF PROCURED ELEMENTS



M A I N T A I N

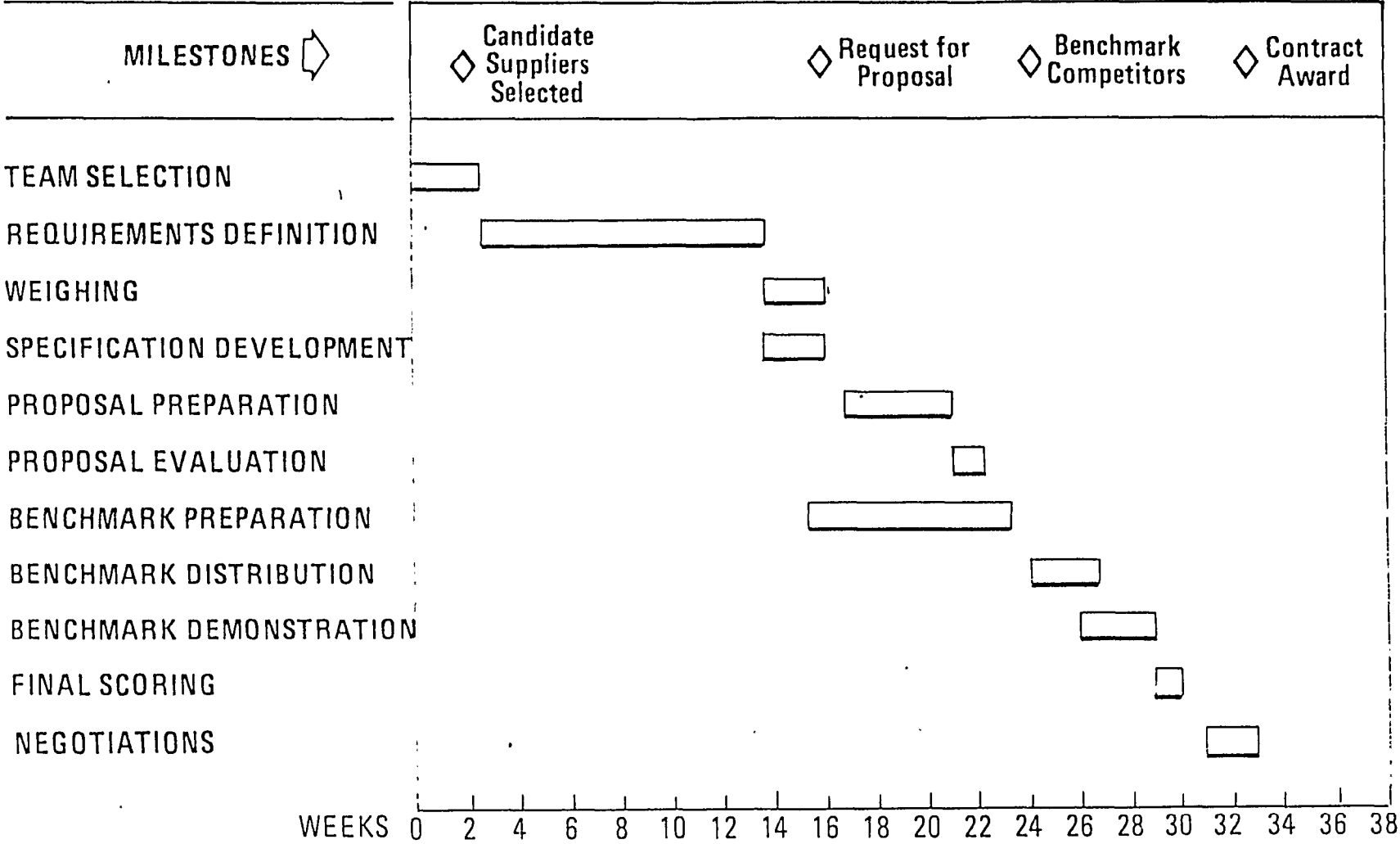
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I N T E R A C T I V E G R A P H I C S

K e y E l e m e n t s

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- I N T E G R A T E D C I R C U I T D E S I G N
- E L E C T R I C A L S C H E M A T I C S
- A R T W O R K
- S T R U C T U R A L D E S I G N
- M E C H A N I C A L D E S I G N
- D R A F T I N G
- N E S T I N G
- N U M E R I C A L C O N T R O L
- P I P I N G L A Y O U T

SCHEDULE



FUNCTIONAL / TECHNICAL SPECIFICATION

Major Areas

- APPLICATION REQUIREMENTS
- SYSTEM SOFTWARE REQUIREMENTS
- HARDWARE REQUIREMENTS
- RELIABILITY AND MAINTENANCE
- DOCUMENTATION
- SOFTWARE SUPPORT
- HUMAN FACTORS (Environment)
- BENCHMARK
- ACCEPTANCE TESTS

CAD/CAM REQUIREMENT:

MANAGEMENT COMMITMENT

- PLANNING
- JUSTIFICATION
- TRACKING
- MEASUREMENT

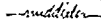
RECOMMENDED STRATEGY:

IDENTIFY REQUIREMENTS

IMPLEMENT EXISTING TECHNOLOGY

SUPPORT RESEARCH AND DEVELOPMENT

GENERAL DYNAMICS
Data Systems Services



"We don't have your system designed yet, but I brought along what we have."

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