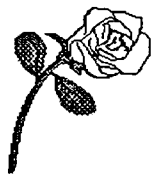
ROSE
Introduction to the
U.S. Air Force Reuse Workshop

Reusable Objects Software Environment (ROSE)



Agenda

- Who, What When Where, Why
- How
- The Goals
- Current Status

ROSE is a SOC Software Initiative

** Who, What, When, Where, Why **

Problem : MOD Software Is Difficult to Use and Expensive to Sustain

- Developed for an Environment which Placed a High Value on Machine Efficiency; *Machine Dependent SW*
- Software Sustaining was not Part of the Software Engineering Approach; *Extremely Complex SW*
- Vast Majority of the Software was Developed using an Ad hoc Software Engineering Process; *Undocumented SW*
- Software Reuse was not Part of The Software Engineering Approach; *Redundant SW*

Provide Safer Software That is More Resilient to Change

Solution : A Framework for MOD Domain Specific Reuse

What

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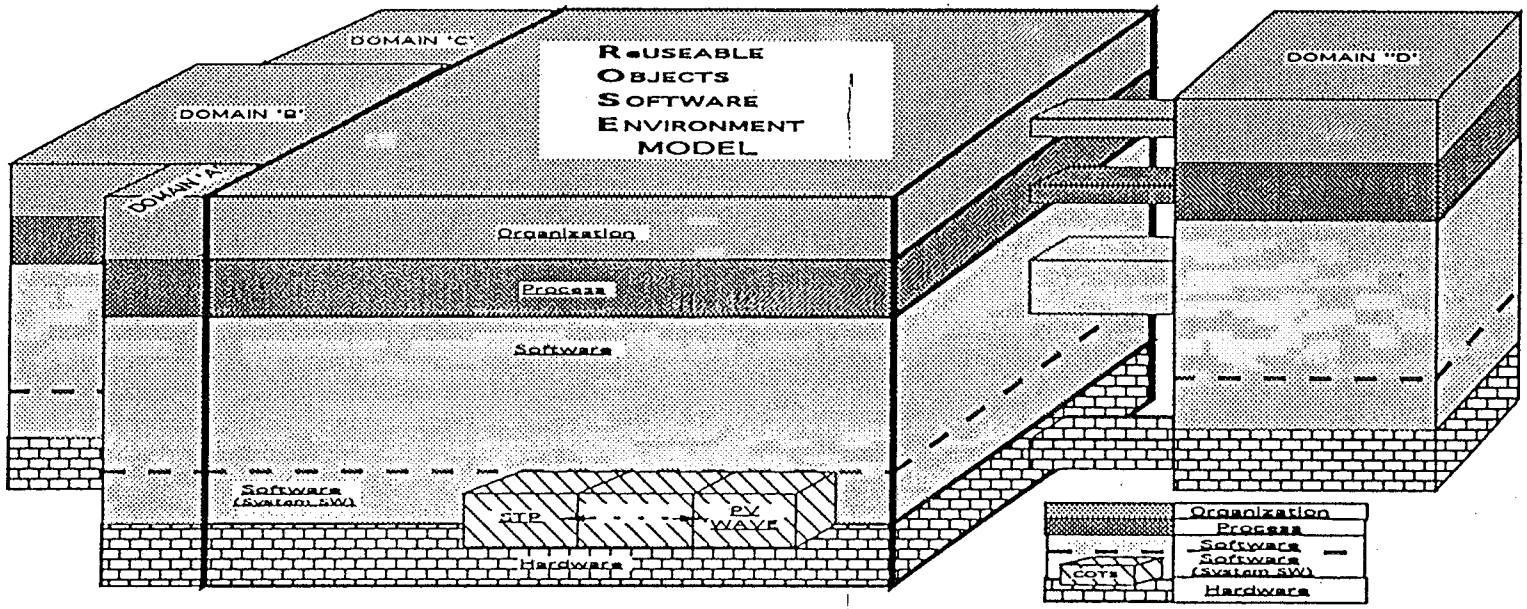

ROSE Reengineering Will Address

Hardware Objects: Performance, Data Storage, Configuration, etc.as Opportunities Arise

Software Objects: Complexity, Maintainability, Reuseability, Consolidation, Portability, etc.

Process Objects: Software Life Cycle, Project Life Cycle, SW Ops etc.

Organization Objects: Efficiency, Skill Requirements, etc.

This Environment Requires an Infrastructure that Supports the Entire Software Engineering Life Cycle

ROSE Will Address Flight Design Software Systems First

Where

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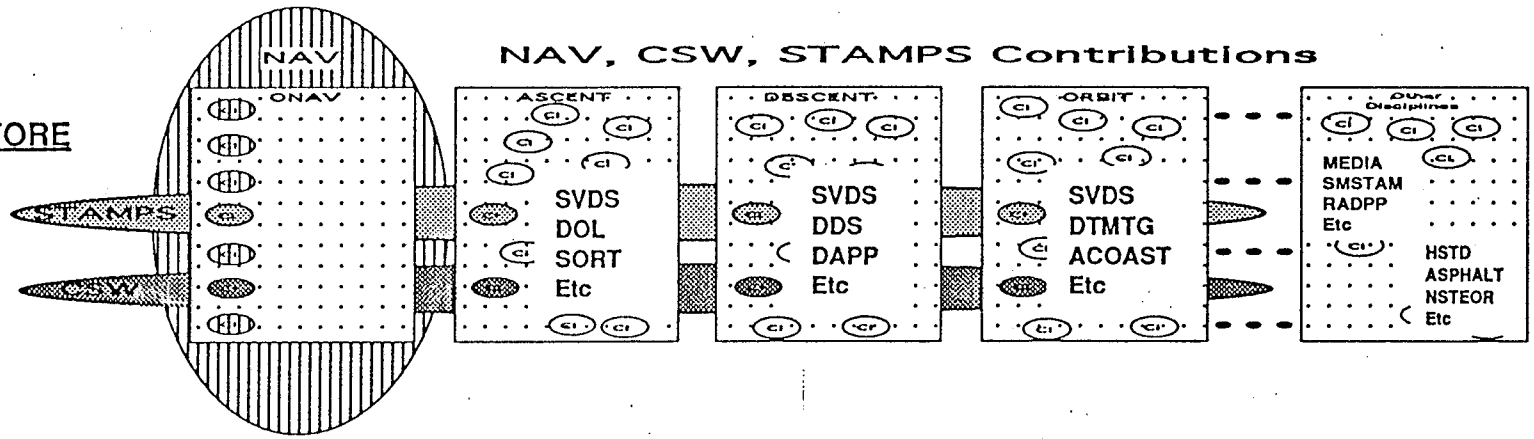
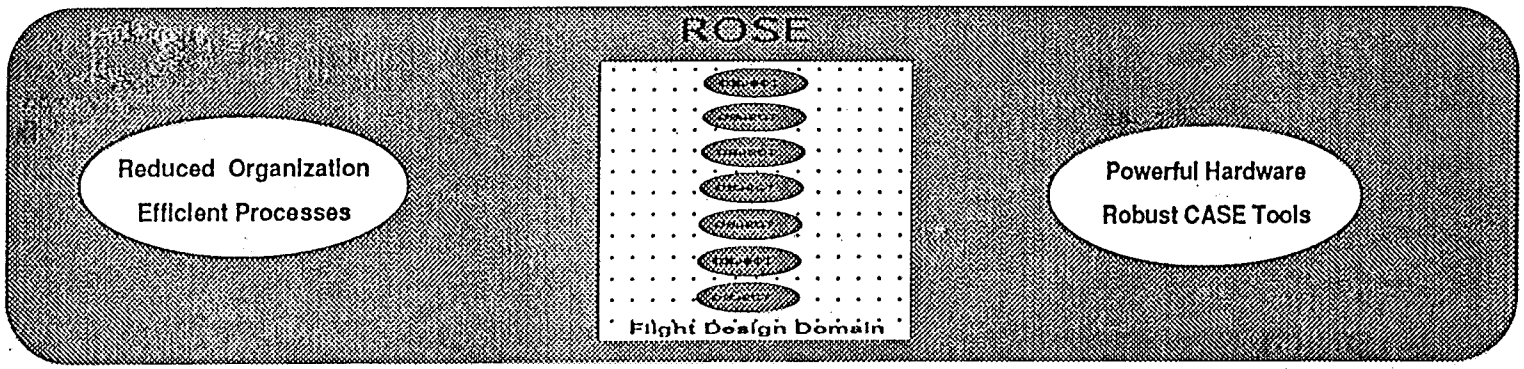
The Reusable Objects Software Environment is a Common, Consistent, Consolidated Implementation of Software Functionality Using Modern Object Oriented Software Engineering Including Designed-in Reuse and Adaptable Requirements

BEFORE



AFTER



ROSE Emphasizes Consolidation And Reuse

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ROSE is a Community Effort

Who

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- **SOC** (Space Operations Contract)
  Project Management, System Engineering, Facilities Engineering, Domain Experts, Analysts, and Programmers
- **NASA** (Software Technology Branch and its contractors - INet & Lincom)
  CASE Support, Lab Support, Training, Technology Insertion
- **UHCL** (University of Houston Clear Lake)
  DMS Expertise, Lab Support, Training, Process Engineering
- **SPC** (Software Productivity Consortium)
  Evolutionary Spiral Process

We are a Customer Driven and Process Oriented Team

We Started in Dec '92

When

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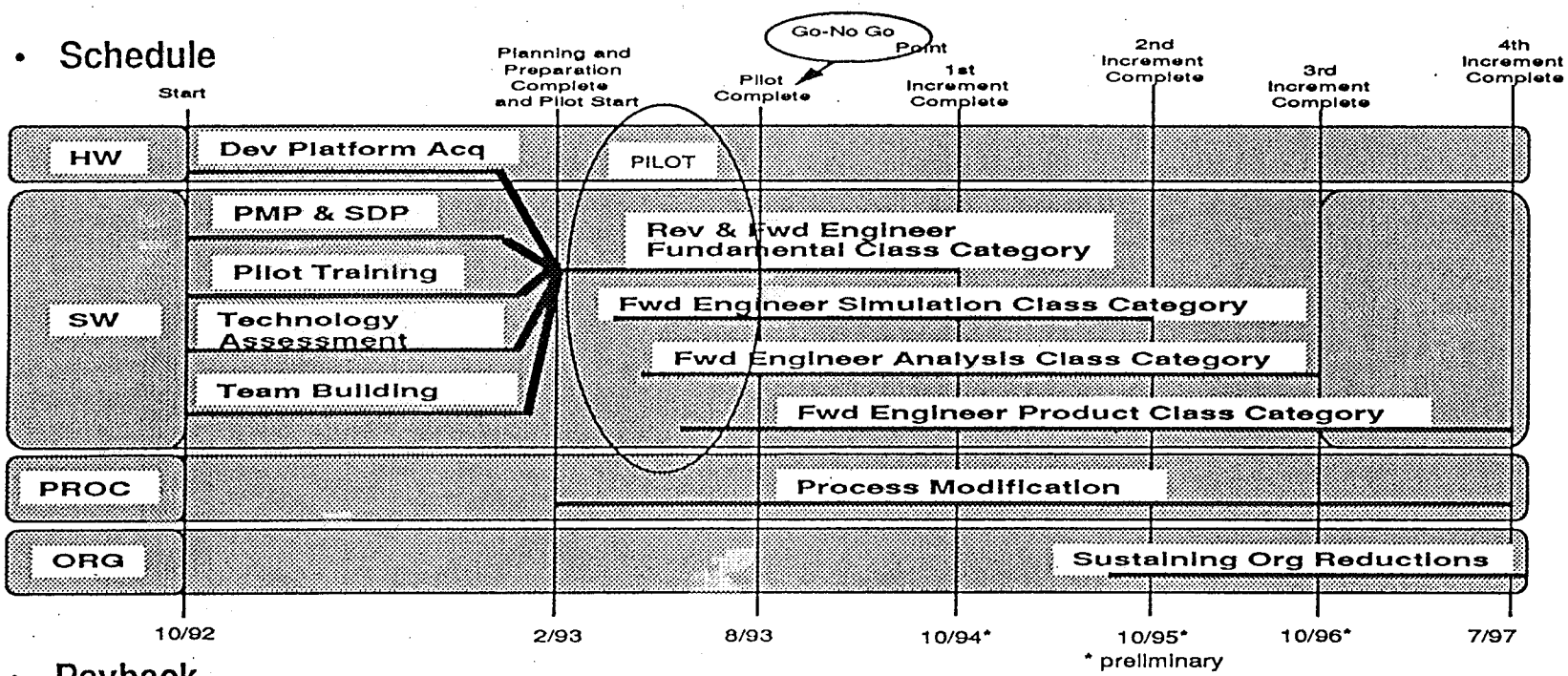
- COST
  - 10 EP for the Pilot -140 EP for the Project -$1.6 M Material Costs

- Schedule



- Payback

FY		FY93	FY94	FY95	FY96	FY97	FY98
Cost	$	1.2	0.1	0.1	0.1	0.1	
	EP	30	35	35	35	15	
	Cum	30	65	100	135	150	150
Payback	EP	0	0	3	13	43	51
	Cum	0	0	3	16	59	110

** How **

Method

How

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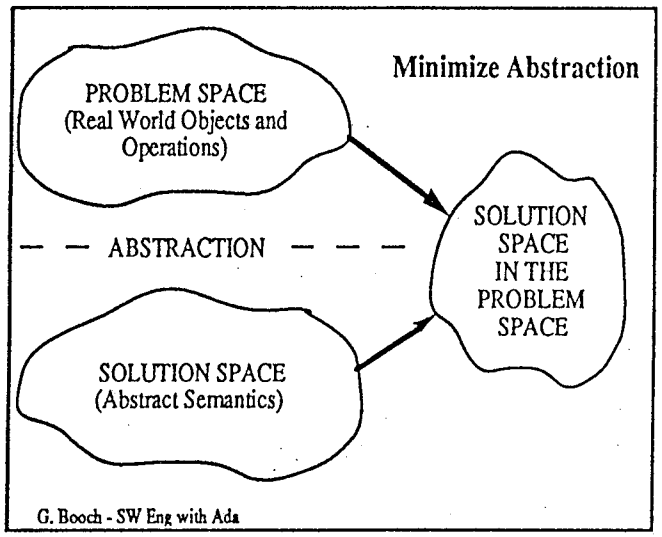

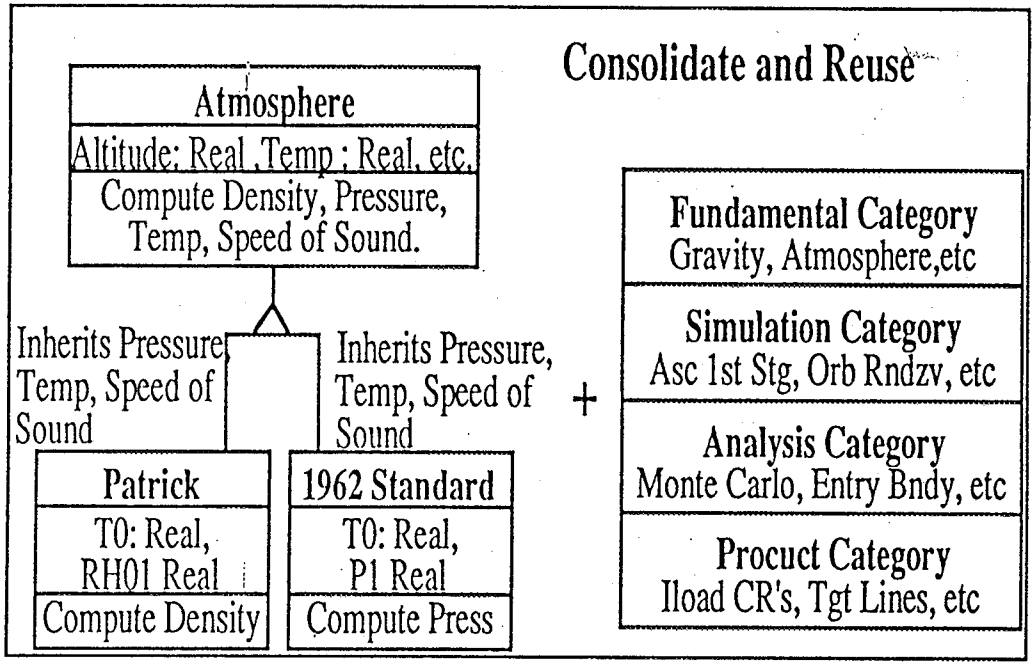

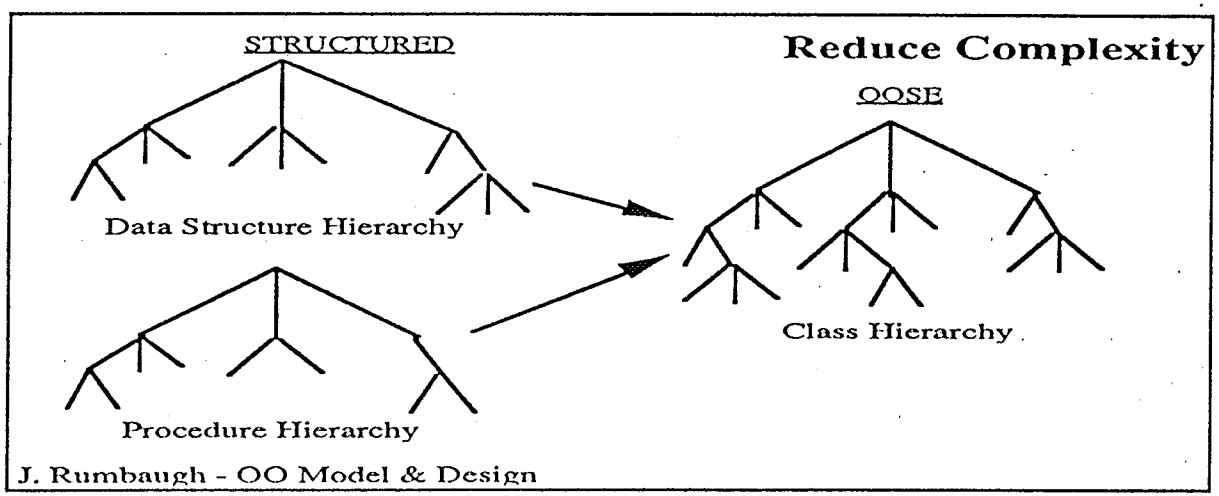

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The Project Process

How

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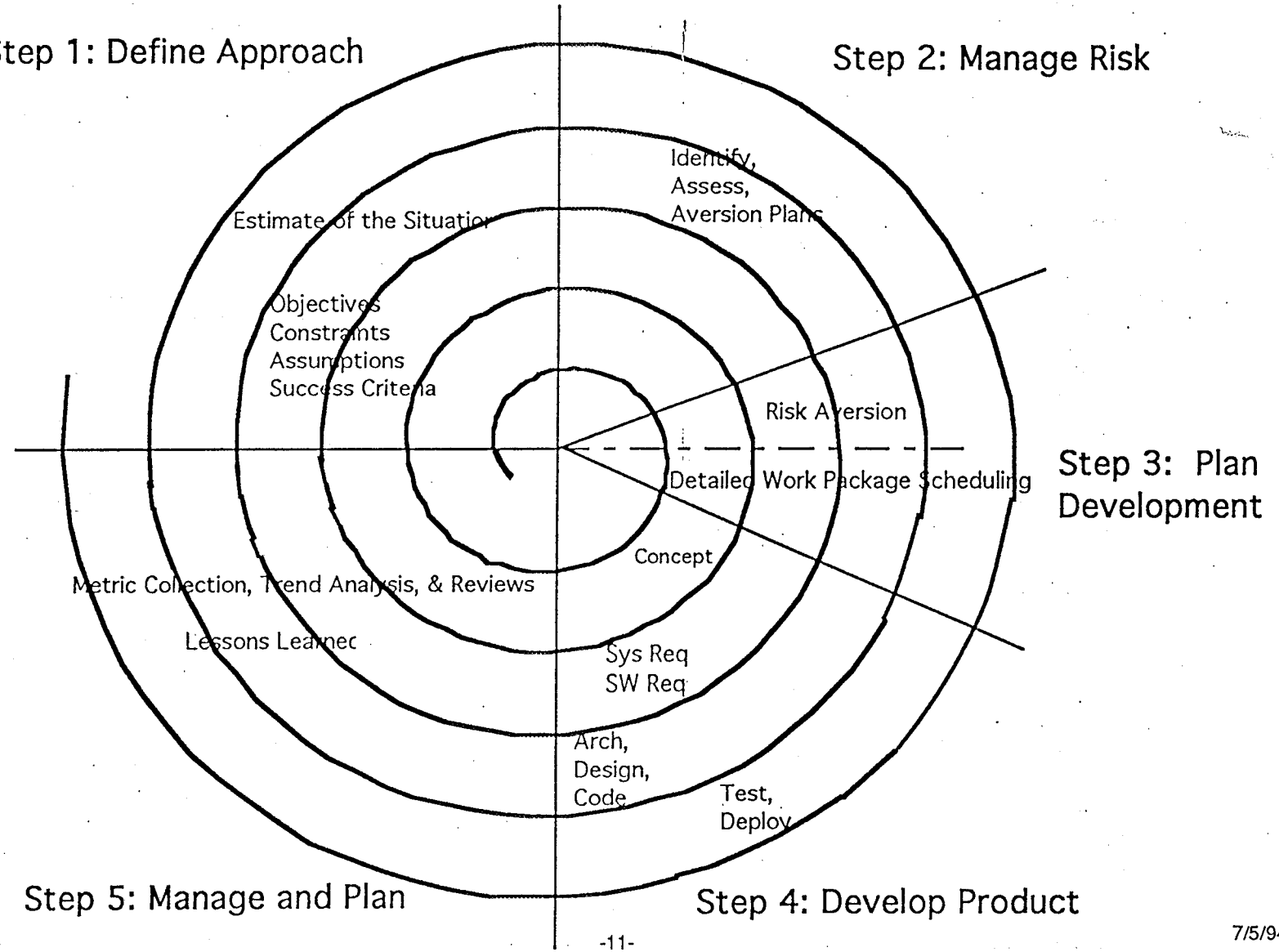
ROSE Reengineering Evolutionary Spiral Process Model



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The Product Process

How

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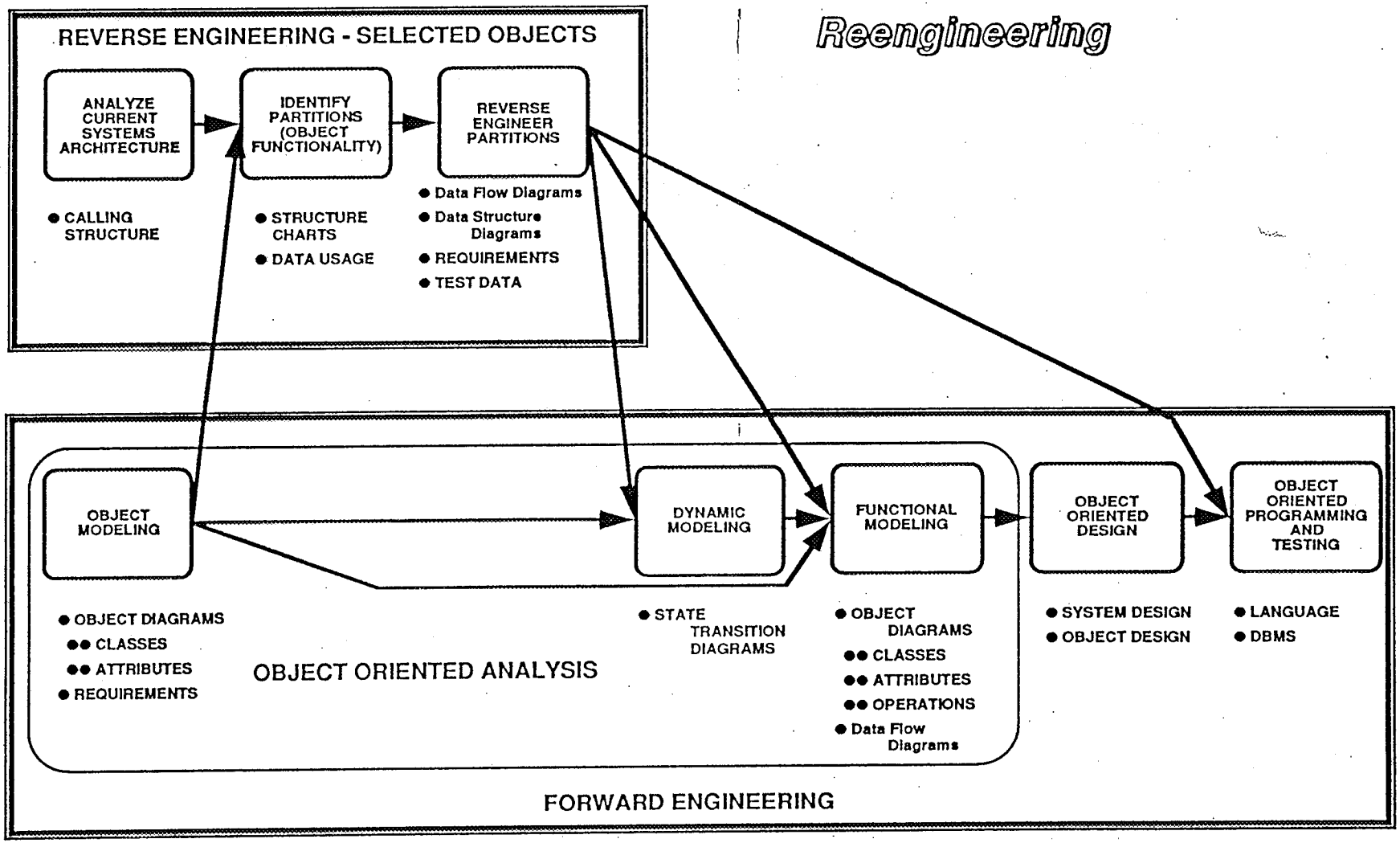

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The Platform

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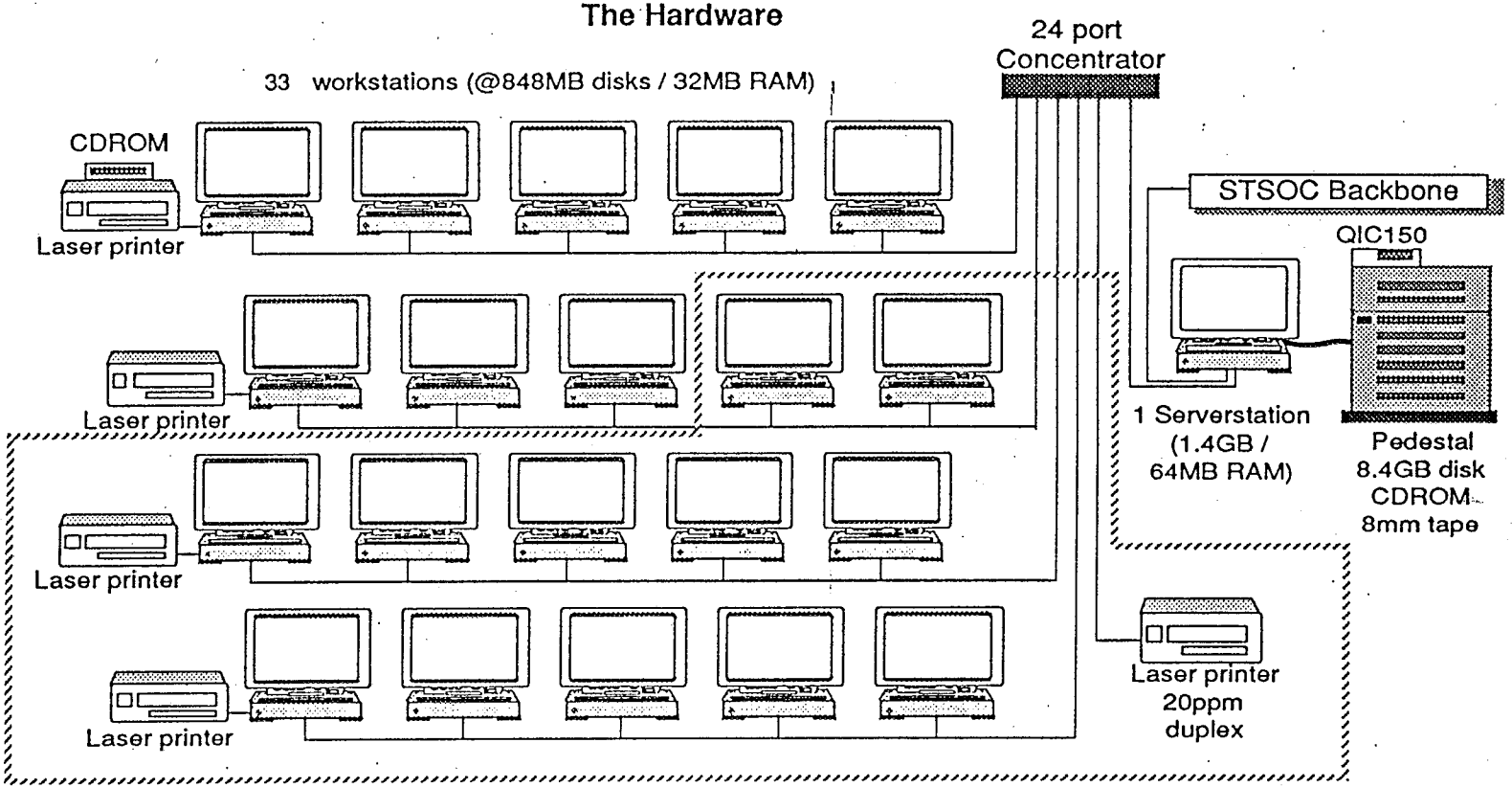
The Hardware



Full ROSE System Schematic

The Tools

Forward Engineering

Paradigm + : Object Modeling

Object Center(C++) : Code, debug, test

Reverse Engineering

STP : SASD

Refine Fortran: Structural Info

Project Management

PACS : RSOC PM Tool

MSoft Project: Scheduling

** The Goals **

Modernize MOD

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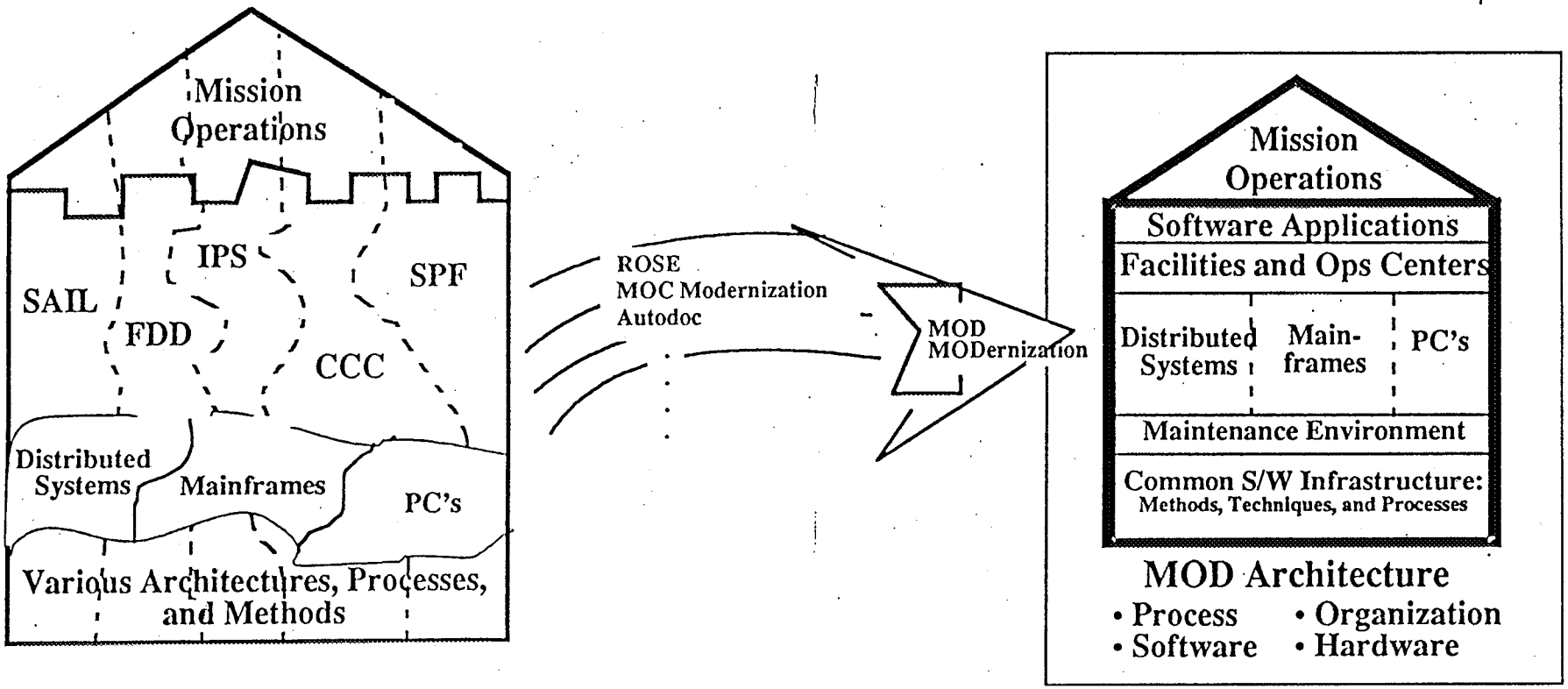

Vision

A modernized MOD software environment that reduces the cost of maintenance and evolution for NASA's legacy "man-rated" systems. This environment consists of reusable software objects and systems and a common maintenance process housed in a generic MOD architecture.

Evolve Our Engineering Technique To Reuse

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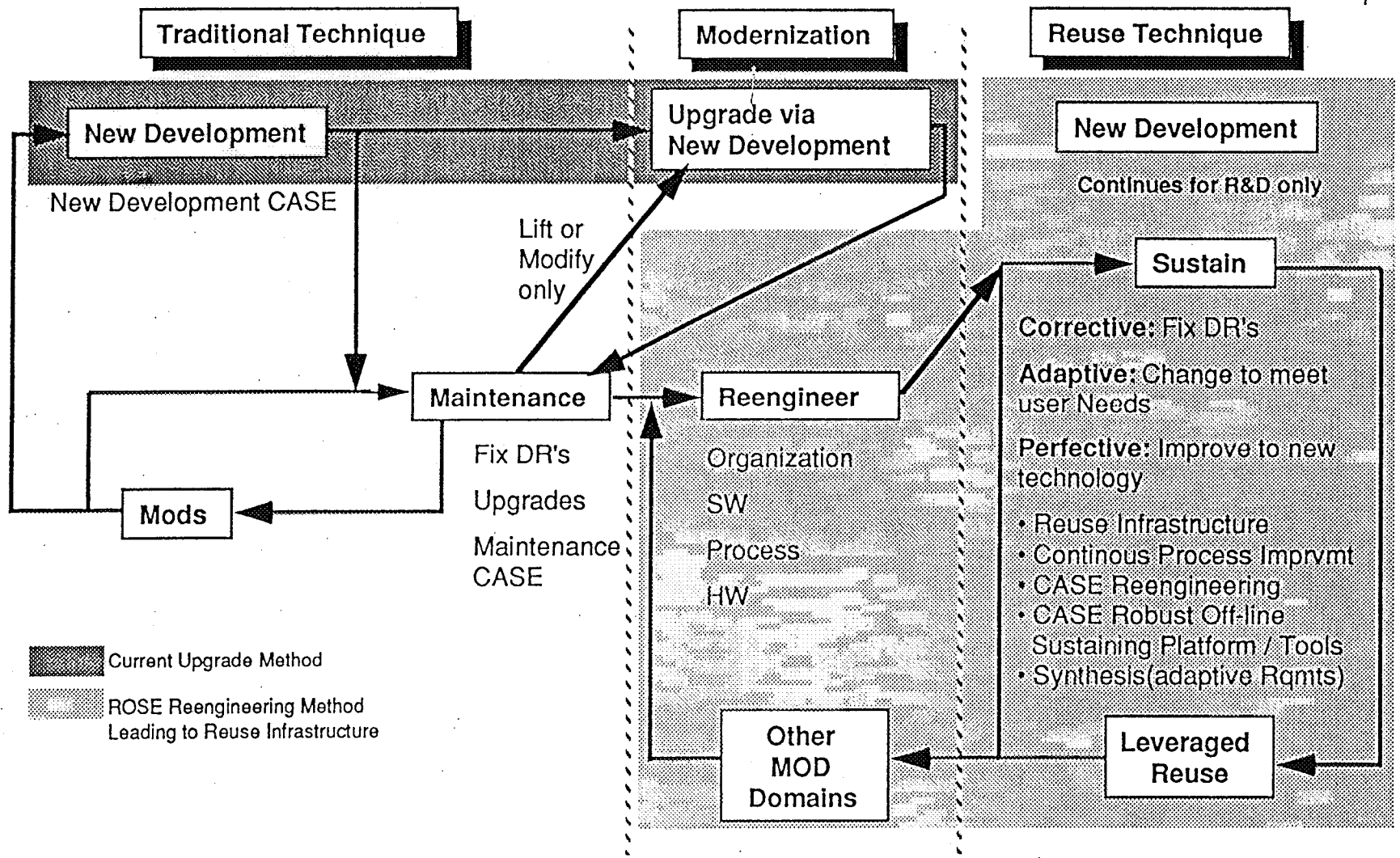

Reengineering to a Reuse Infrastructure is Cost Effective

Domain Specific Reuse

Where

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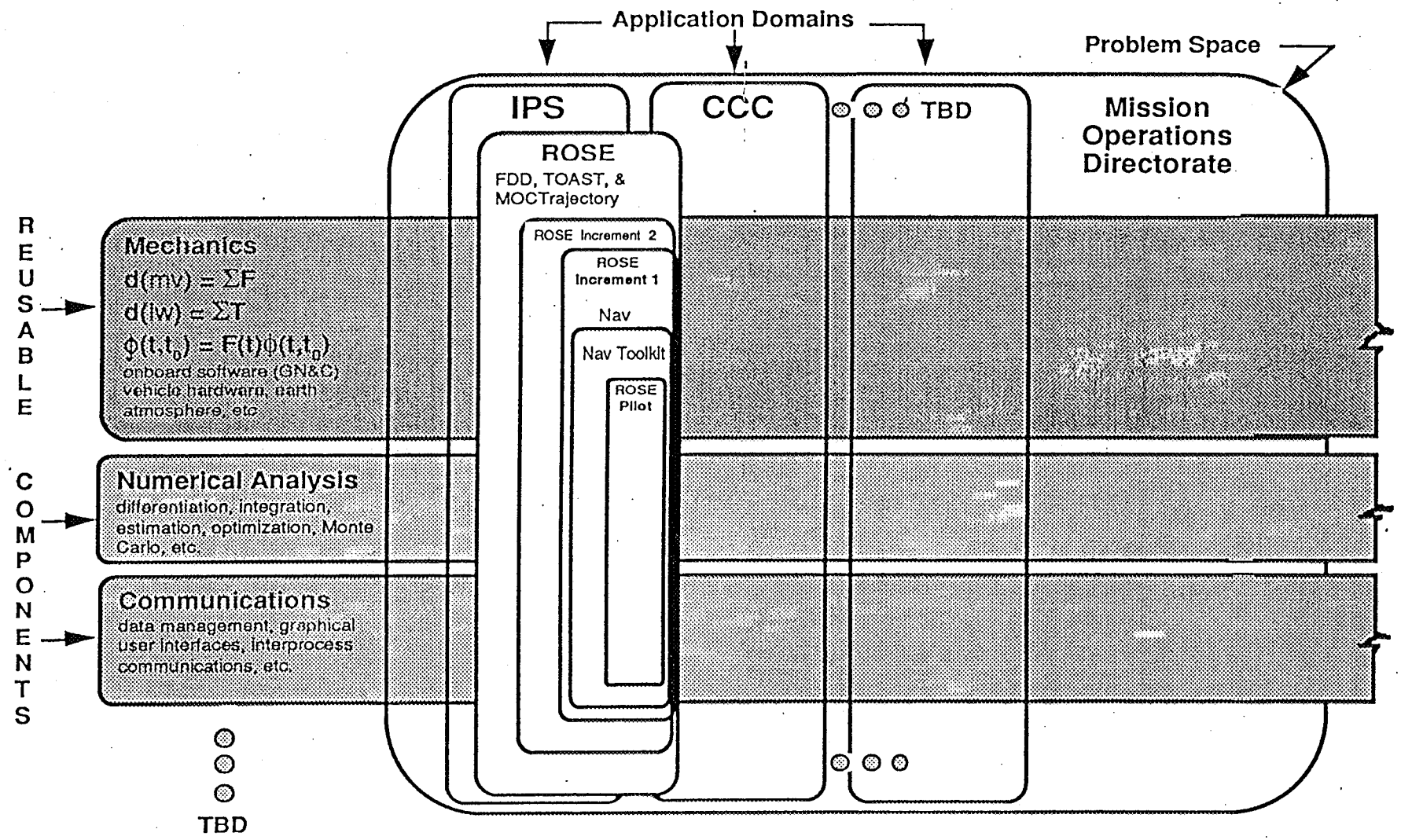

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Domain Engineering: Leveraged Reuse and Synthesis

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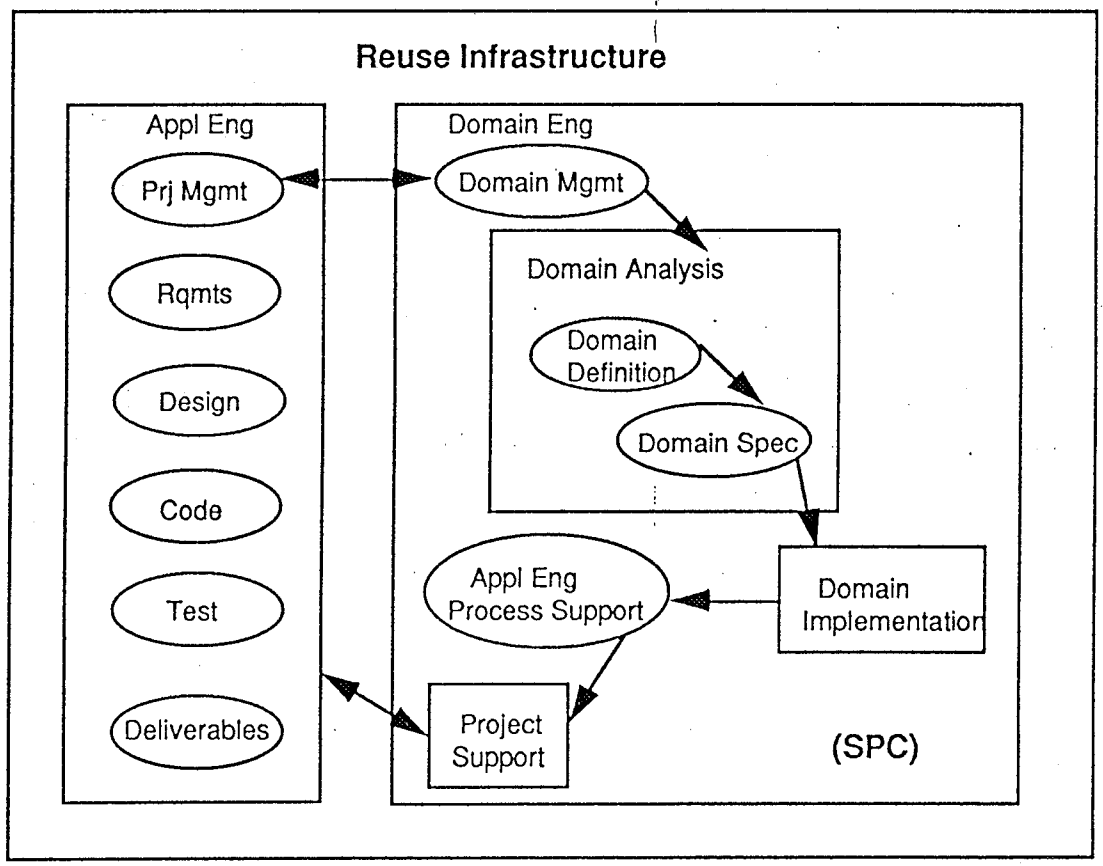
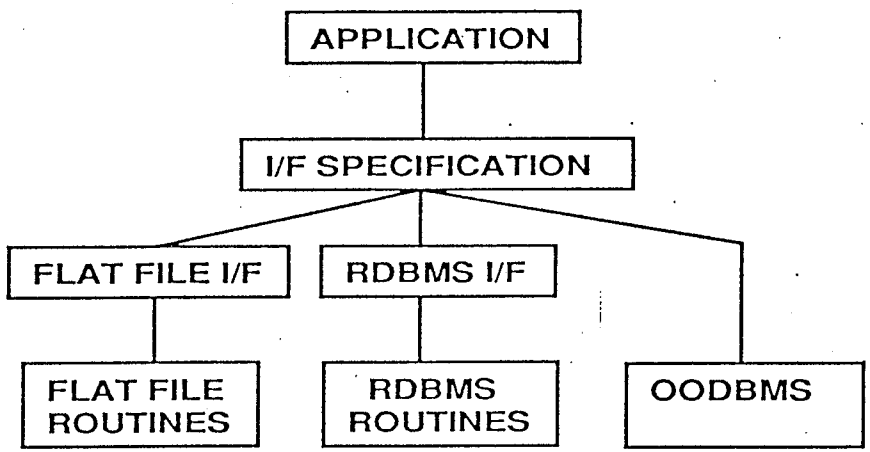


** Status **

Trade Study

- Quantified Proof that I/F Spec between Application and Database engine is not only Feasible but Doable
  - -- Allows delay of specific database engine selection and growth to higher technology



- Still Too Early to Identify Database Technology as an Opportunity for Improvement
- Continuing with review of other OODBMS's and Repeat of performance on target platform

Planning Model Extended

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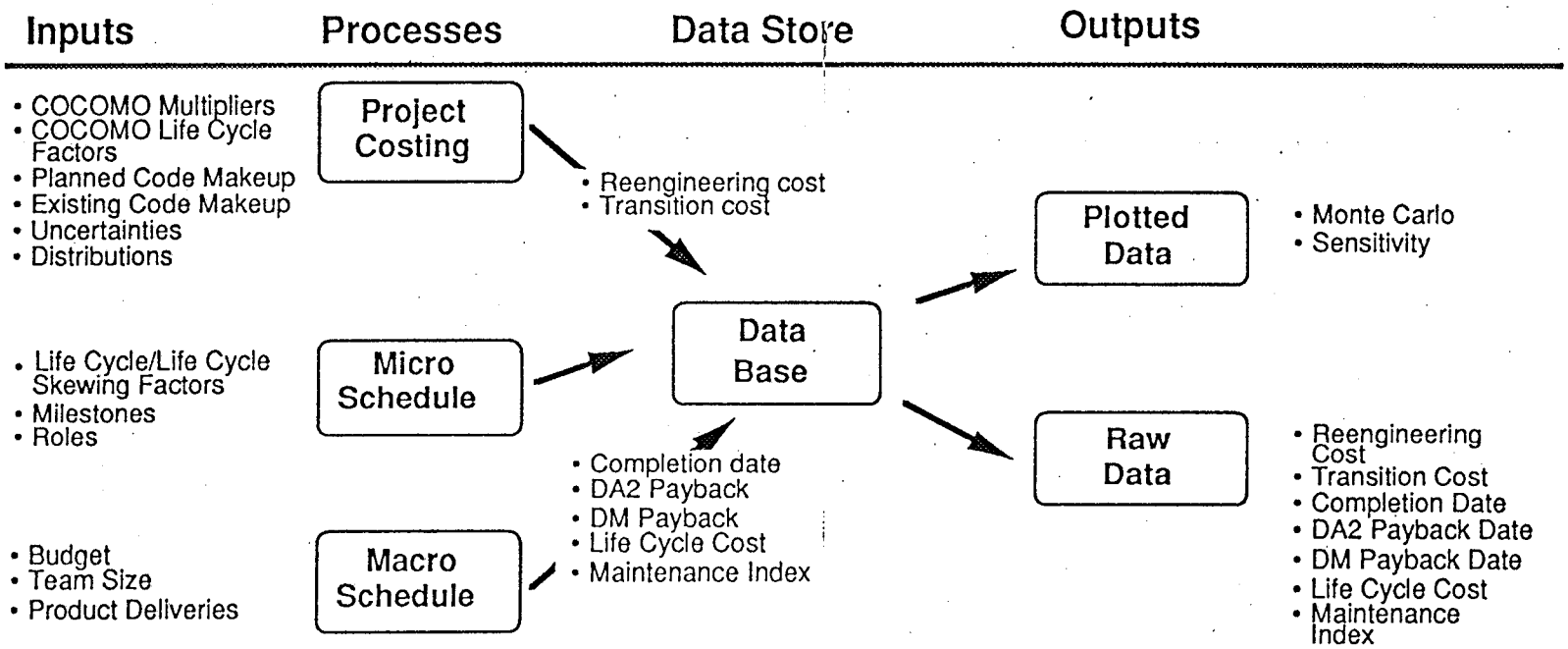

- **Model Explicitly Deals with Uncertainty**
  - -- Provides quantified uncertainty of SLOC, cost, schedule, and payback
  - -- Identifies areas which are major contributors to uncertainty
    - focus metrics on sensitive areas
    - focus action on sensitive areas

The Planning Model will be used Throughout the Project

Planning Model Output

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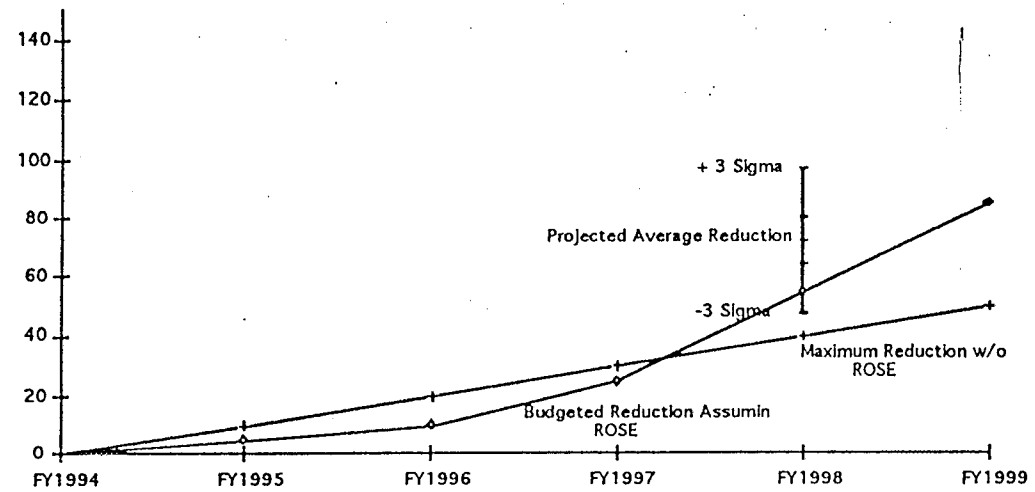
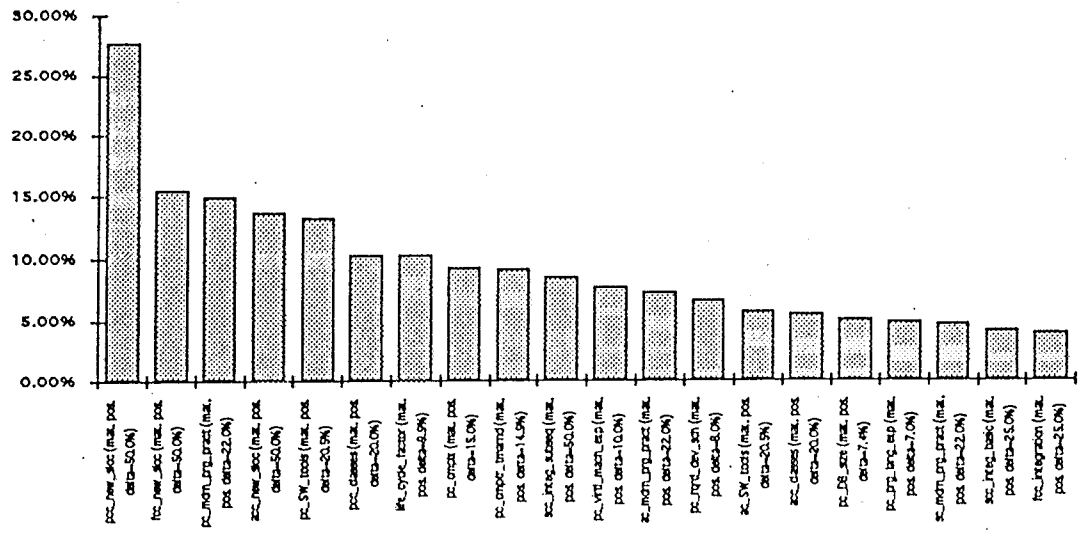
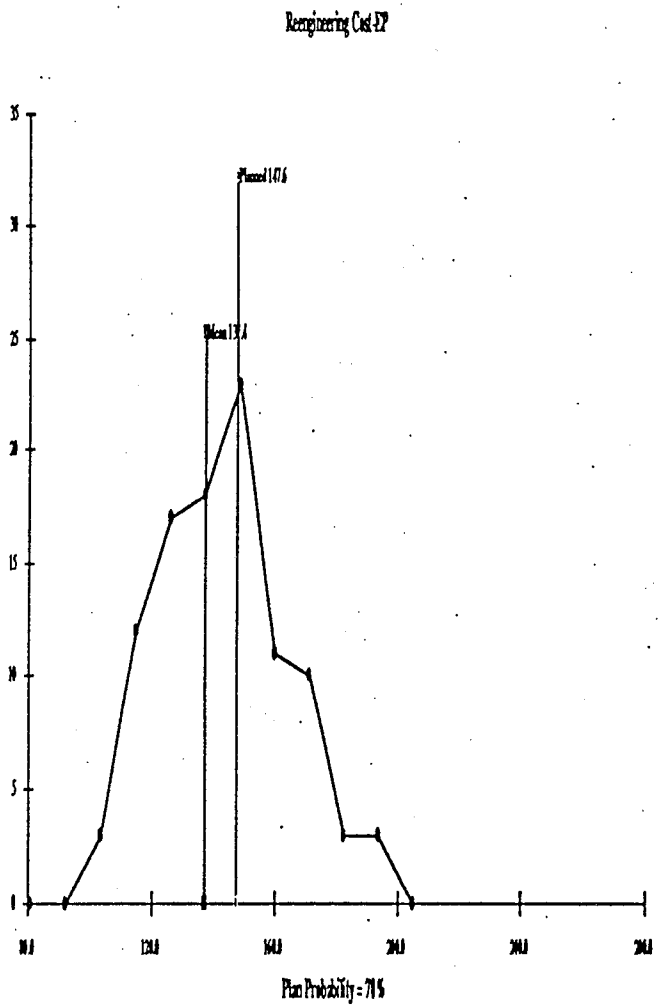
Preliminary M&M Reduction from ROSE vs. Budget Commitment



Delta Reengineering Cost_Maximum (percent)

(change based on maximum positive delta for input





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Return on Investment and Payback

ROI of ROSE Pilot

Measure	α	β (App)	β (ASC)	Total
Current FDD SLOC	50k	6171	3648	Est 144k
ROSE SLOC	10k	5475	447	Est 20k
Current FDD Complexity	14.4	12.7	18.1	TBD
ROSE Complexity	2.1	1.7	2.6	TBD
% SLOC Reduction	80%	11%	88%	Est 86%
% Complexity Reduction	85%	87%	86%	TBD

- Alpha Based on 36% of Rose SLOC mapped to Current FDD SLOC
- Beta Applications(App) are DOPS(realtime) and LandOPS(flight design)
- Detailed analysis available for review

Booked Payback

	FY93	FY94	FY95	FY96	FY97	FY98	FY99
Investment (EP)	16.3	35.0	35.0	35.0	35.0	15.0	0
Investment $	434k	*830k	230k	140k	150k	70k	0
Payback (EP)	0	0	5.0	10.0	15.0	30.0	30.0
Delta	(16.3)	(35.0)	(30.0)	(25.0)	(20.0)	15.0	30.0
Cumulative	(16.3)	(51.3)	(81.3)	(106.3)	(126.3)	(111.3)	(81.3)

Current Plans

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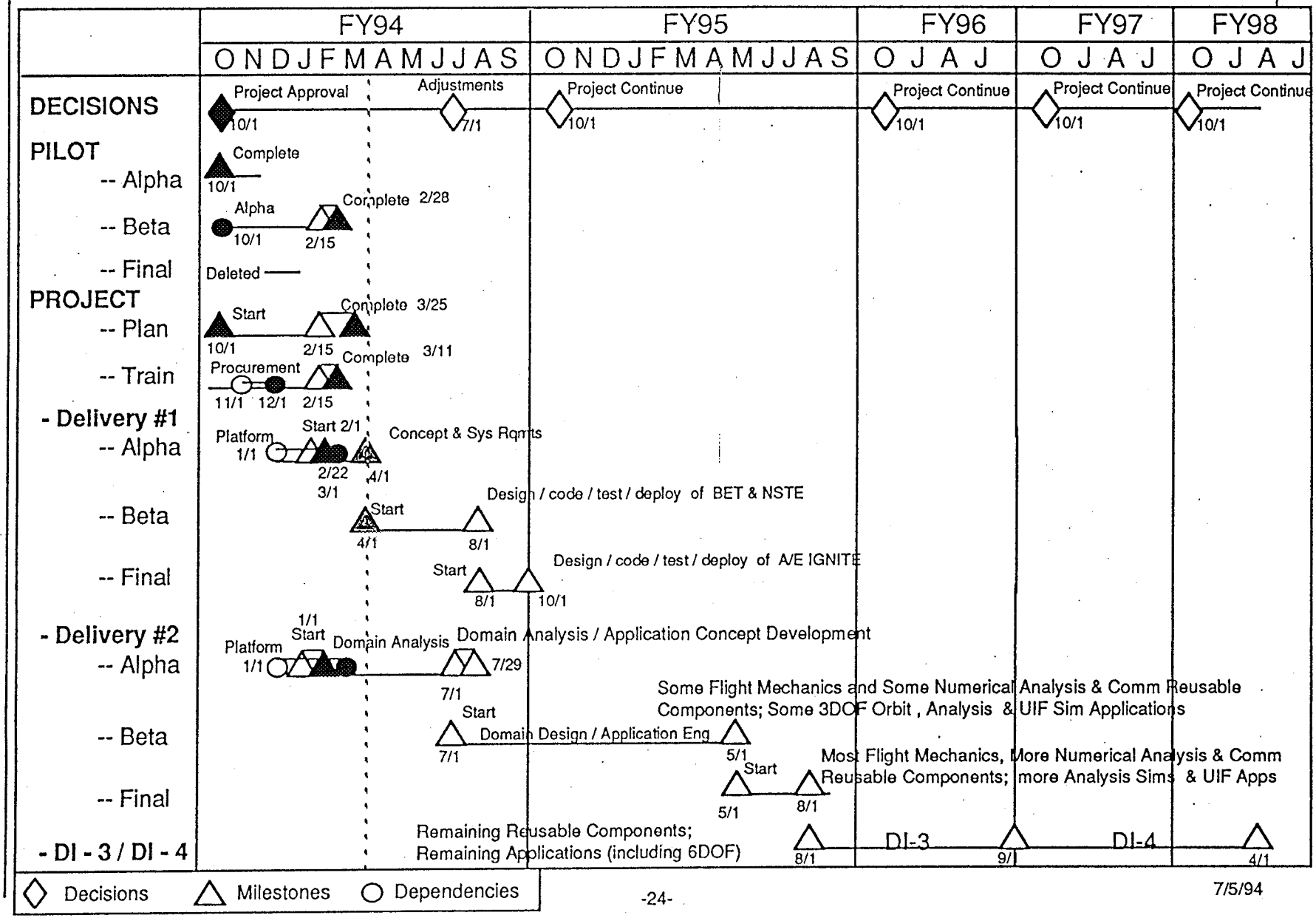

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