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Monte Carlo

A Software Factory for the Canadian Government Year 2000 Conversion

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Agenda

- *Introduction*
- *Software Factory*
- *Year 2000 Conversion Process*
- *Government of Canada Year 2000 Program*
- *Lessons Learned*
- *Questions*

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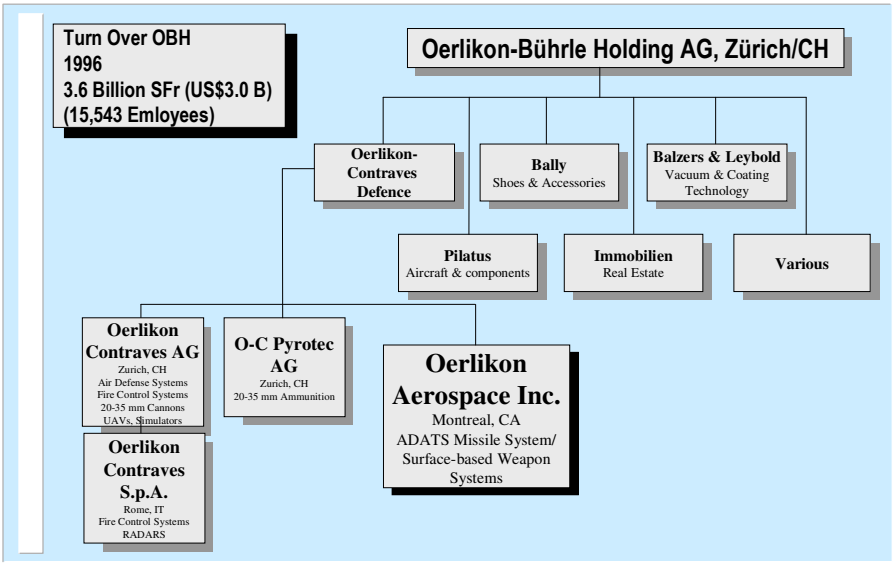

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- *System Integrator of an Air Defense System*
- *Application Domains*
  - Command, Control & Communication
  - Weapons & Sensors
  - Training & Simulators
  - Instrumentation & Test
  - Platform Systems

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- *Over 120 Systems and Software Engineers*
- *Certified as Level 2 - Software Engineering Institute in 1997*
  - Has met 8 of the 17 Level 3 Goals
    - *Peer Reviews*
    - *Software Product Engineering*
- *ISO 9001 since 1993*
- *NATO Secret Organization*
- *Extensive Test & Integration Facilities*
  - 18 Bays & Labs

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Software Factory

- *Based on Work by M. Cusumano*
- *Objectives of a Factory*
  - ↓Strategic Management and Integration
    - *Long-term rather than project-centered objectives*
    - *Links with product & marketing strategies*
    - *Allocation of resources to ensure experimentation and process R&D*
  - ↓Planned Economies of Scope
    - *Sharing of resources such as:*
      - Processes, methods and tools,
      - Personnel experience,
      - Specifications.

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Software Factory

- *Commitment to Process Improvement*
  - ↓Demonstration of long-term commitment
  - ↓Allocation of resources to build infra-structures
  - ↓Development of policies and incentives.
- *Product - Process Focus*
  - ↓Focus on related product types (e.g. Real-Time, Business)
  - ↓Standardized processes, methods and tools.
  - ↓Tailoring guide
  - ↓Alternative processes for non-routine projects
- *Process/Quality Analysis and Control*
  - ↓To achieve greater predictability (quality, cost and schedule)
  - ↓Investments in data collection and analysis

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Software Factory

- *Tailored and Centralized Process R&D*
  - To exploit scale and scope economies
- *Skills Standardization and Leverage*
  - Training of new entrants on standard processes, methods and tools
  - To facilitate establishment of common framework and culture
- *Systematic Reusability*
  - Planning for reuse across projects
- *Dynamic Standardization*
  - Process for periodically reviewing and improving assets.
- *Computer Aided Tools and Tool Integration*
- *Incremental Product and Variety Improvement*
  - Focus on Quality and Productivity, not radical innovations

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Year 2000 Factory Processes

- *A Well-Defined Process is one with documented, consistent and complete:*
  - Policies, Standards and Procedures
  - Inputs and Outputs
  - Entry and Exit Criteria
  - Activities
  - Specified Roles
  - Measurements
  - Templates and Checklists

Year 2000 Factory Processes

- *Process Asset Library*
  - Policies
  - Process Descriptions
  - Guides, Forms and Templates
  - Tailored Processes
  - Process and Product Measures
  - Lessons Learned
  - Charter of Process Groups
  - Training Material
  - Historical Data

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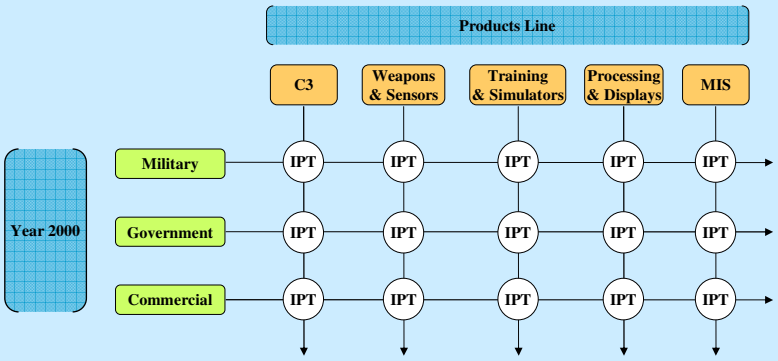
Year 2000 Software Factory

- *Integrated Product Team Approach*



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Factory Processes

- *Document Inspection*
  - Formal Peer Review Process
  - Over 350 Inspections performed to date
- *Configuration Management*
- *Quality Assurance*
- *Lessons Learned*
- *Staffing Management*
- *Performance Management and Training*
- *Documentation Management*

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Factory Processes

- *Contract Management*
- *Procurement Management*
- *Design Engineering*
- *Software Development*
- *Software Maintenance*
- *Software Reverse Engineering*
- *Software Project Planning,Tracking and Oversight*

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Factory Processes

- *Systems Engineering Process*
  - Systems Engineering Capability Maturity Model (SE-CMM) from EPIC-SEI
  - Generic Systems Engineering Process (GSEP) and Integrated Systems and Software Engineering Process (ISSEP) from Software Productivity Consortium (SPC)

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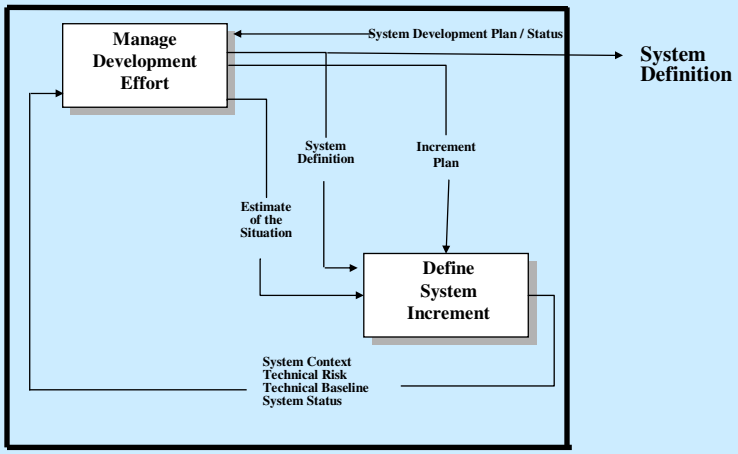
Systems Engineering Process



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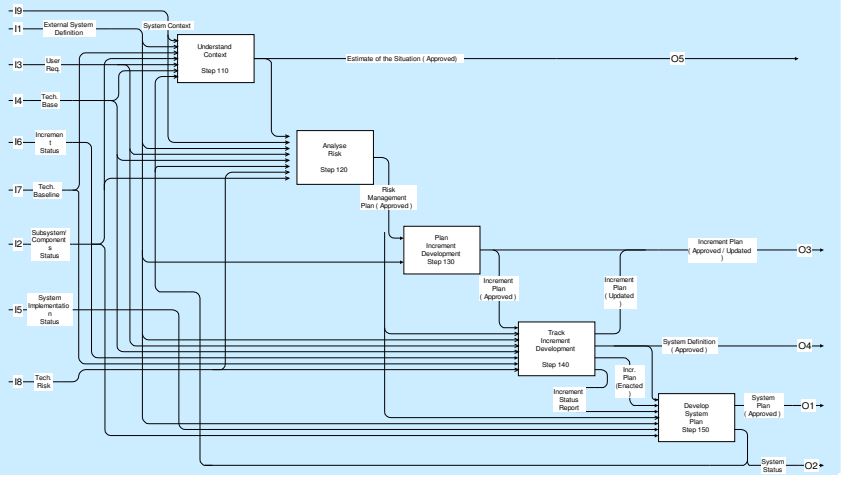
■ Management Activities of S.E. Process



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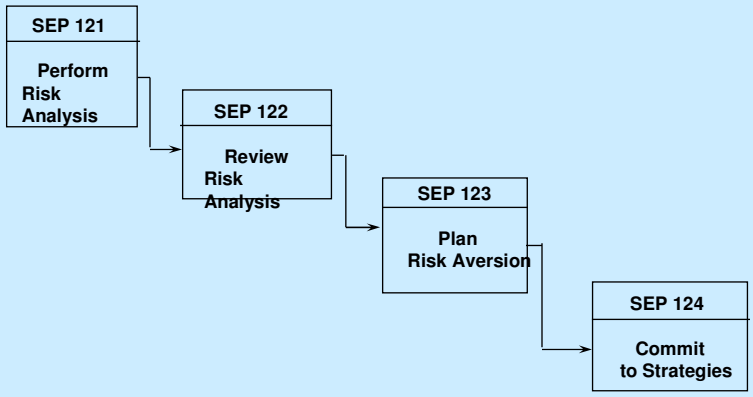
■ Step 120 - Analyze Risks



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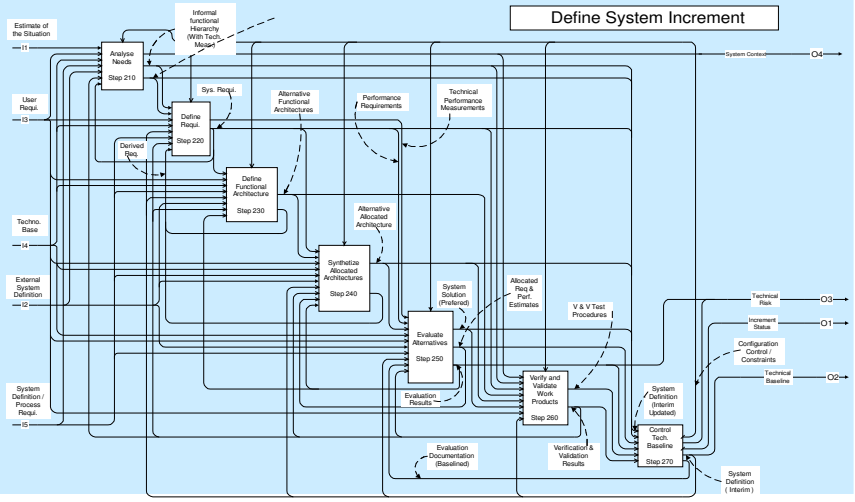
■ Technical Activities of S.E. Process



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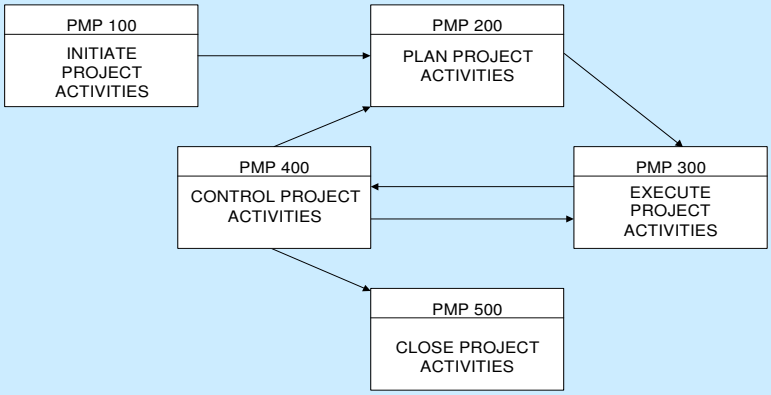
■ Project Management Process

■ Adapted from the Project Management Institute



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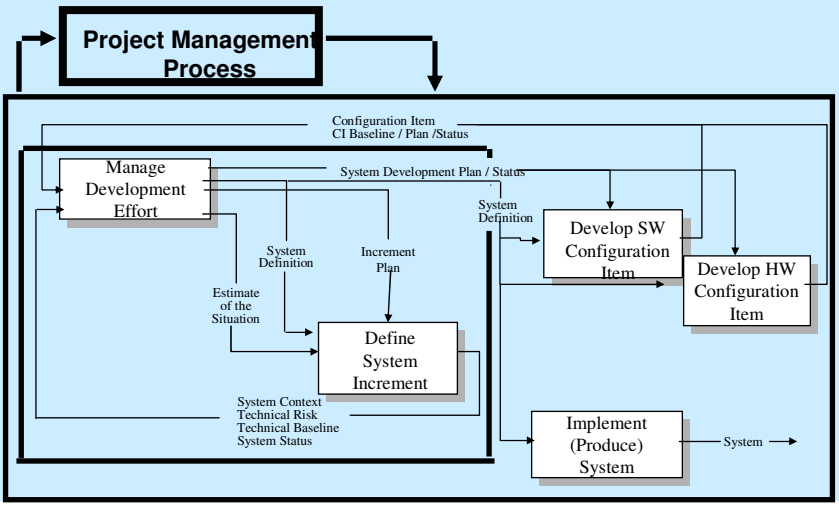
Project Management and Engineering Processes



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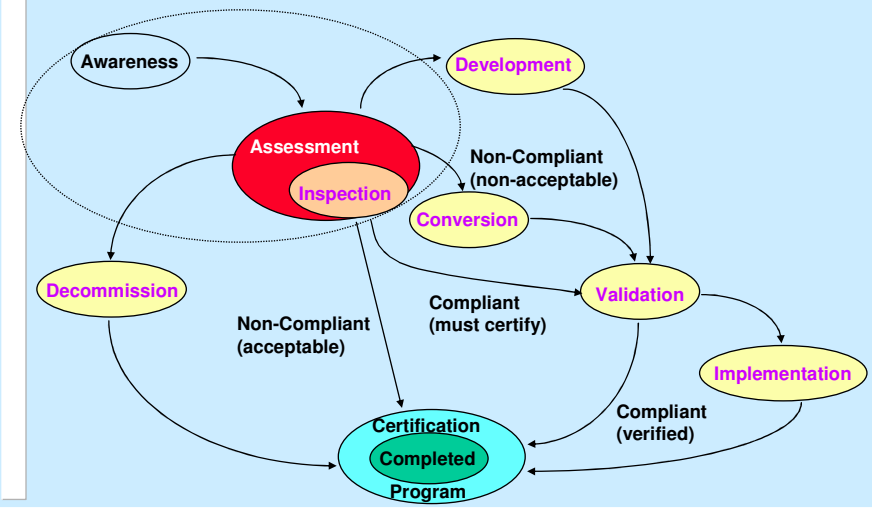
Overview of Year 2000 Process



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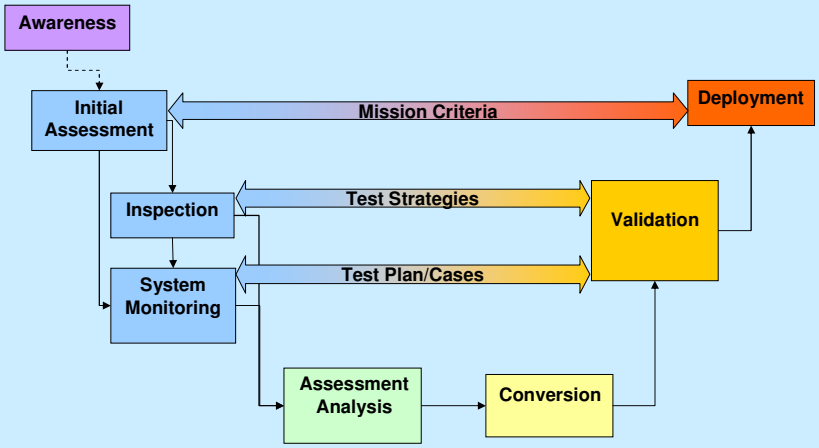
Five Phase Process Conversion Framework



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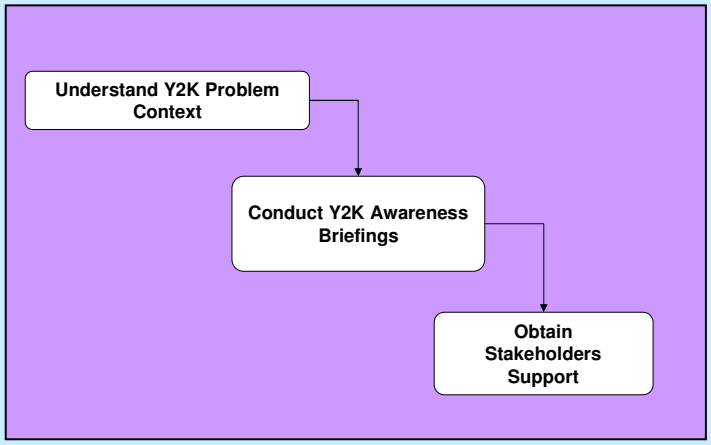
Phase 0: Awareness



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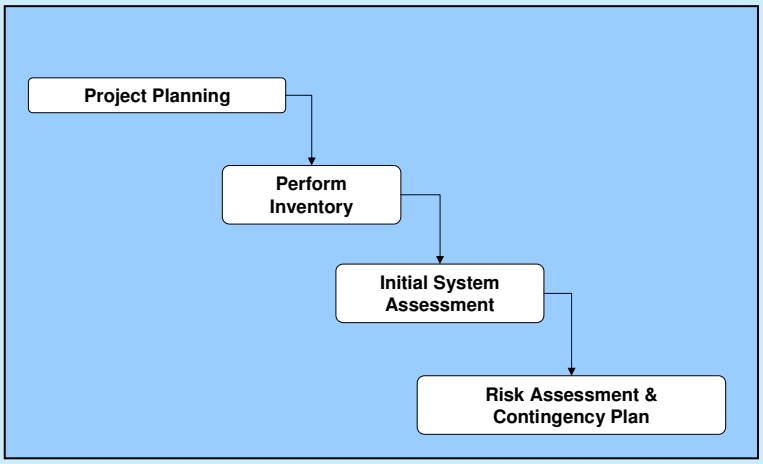
Phase 1:Initial Assessment



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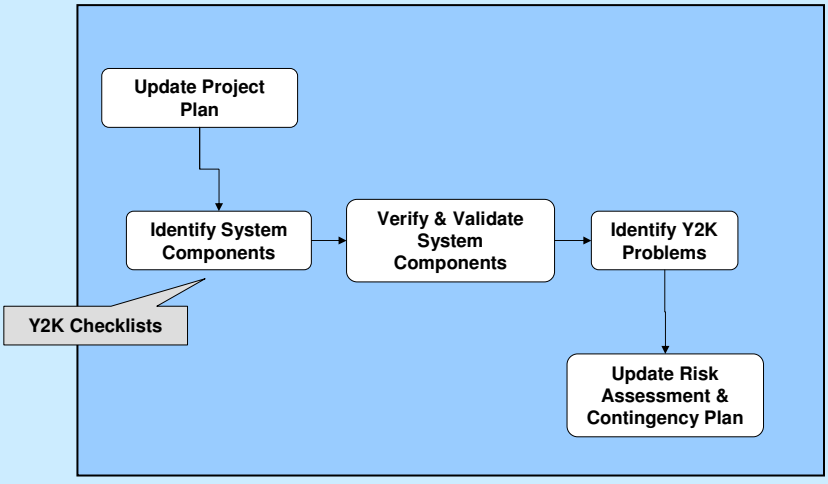
Phase 1: Inspection



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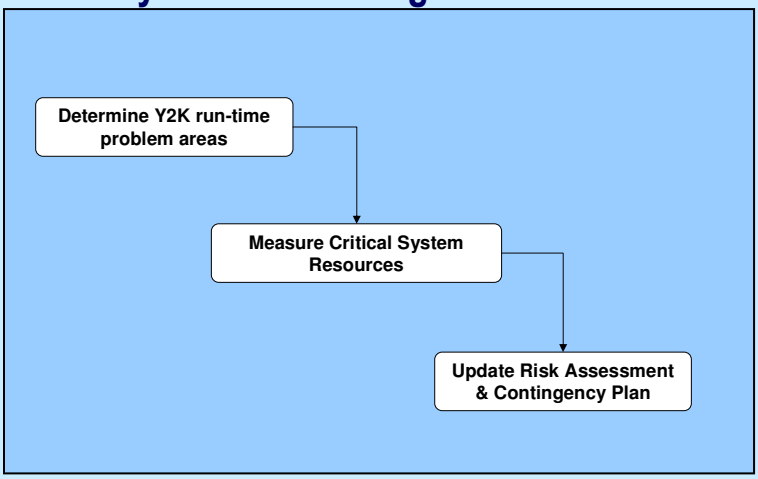
Phase 1: System Monitoring



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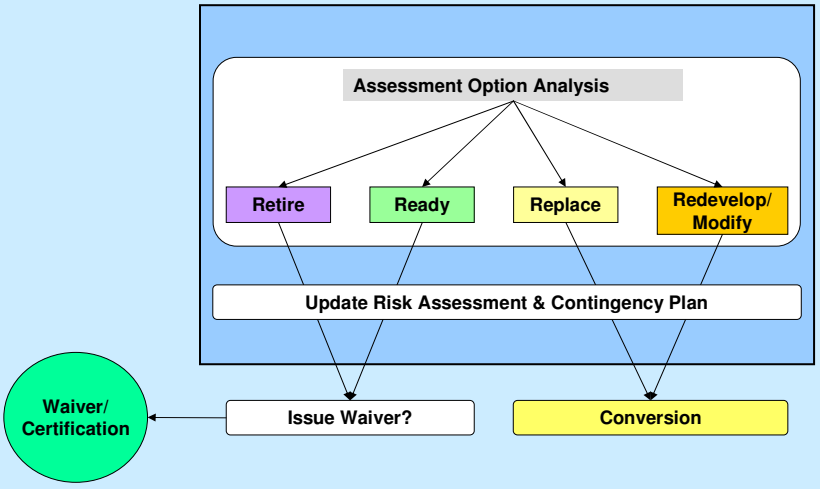
Phase 1: Assessment Analysis



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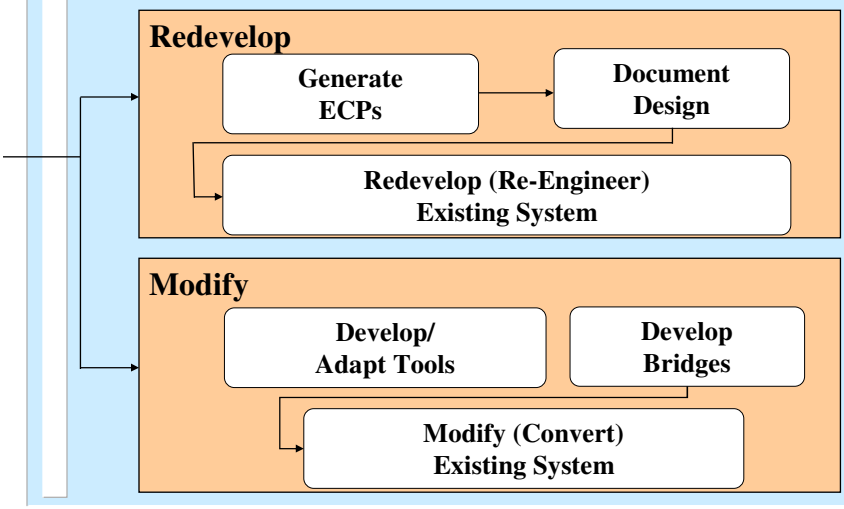
Phase 2: Conversion



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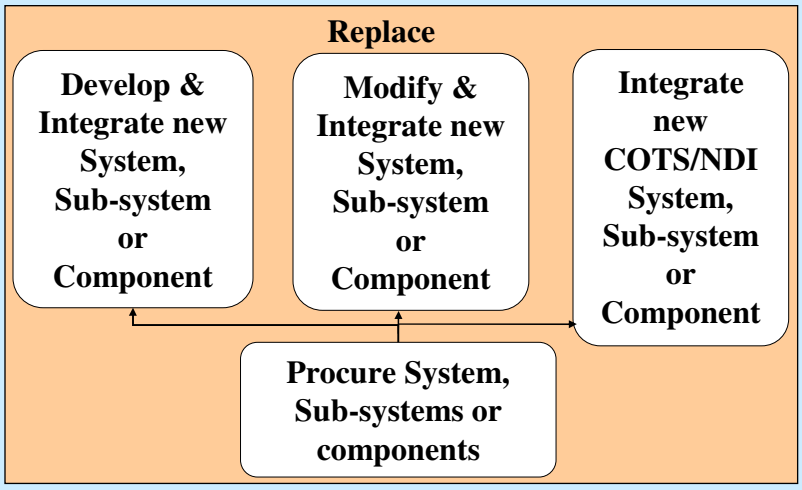
Third Phase: Conversion - 2



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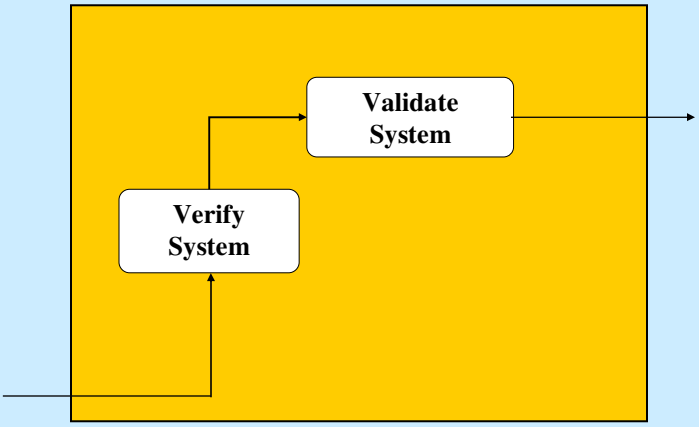
Phase 3: Validation



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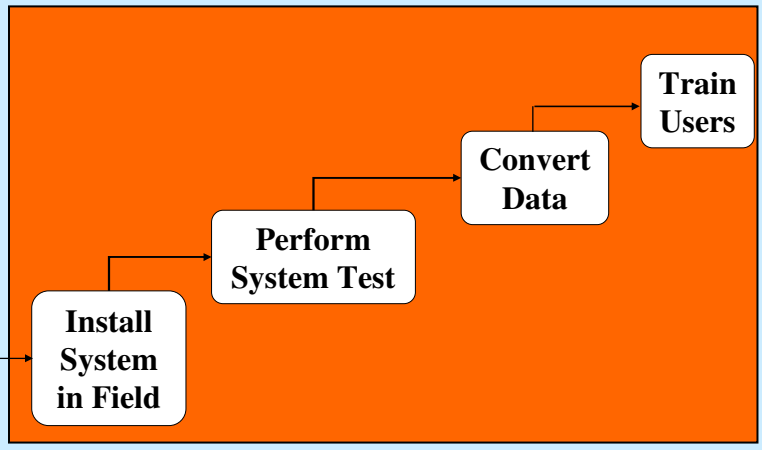
Phase 4: Deployment



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Meaning of "Due Diligence"

- *Following a documented process*
- *Showing objective evidence that supports the Y2K status of a system:*
  - Compliant
  - Not compliant
  - To be tested
  - To be retired
  - Waiver accepted

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Certification Process

- *Certifiers from the Factory received training from DOD's USAF*
- *ISO 9000 guidelines applied for IV&V (I.e. Independent Verification and Validation):*
  - readability, completeness, correctness, consistency)
- *IV&V plan generated in accordance with customer's Year 2000 Process and best practices.*

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Purpose of On-Going Certification Activities

- *Increase confidence that Y2K goal will be met*
- *Establish evidence of "due diligence" or verify evidence of "due diligence"*
- *Establish accountability and ownership*
- *Product Assurance*
- *Process Assurance*

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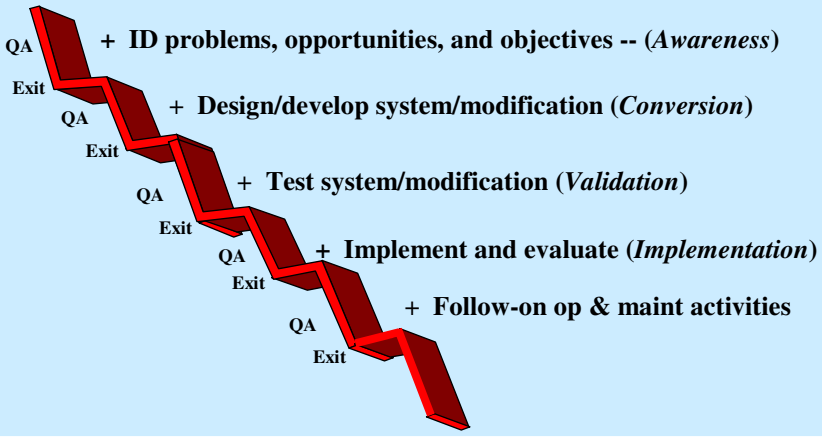
Certification Activities in Y2K Process



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Involvement of the Factory in Canadian Government Year 2000 Activities

- *Department of National Defense*
- *Canadian Coast Guard*
- *Nav Canada*
- *Post Canada*

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Department of National Defense (DND)

- *Year 2000 Milestones*
  - ↓Project Management Office Established - May 97
  - ↓Request For Proposal Issued - July 1997
    - *Selection was based on the lowest dollar per point scored*
  - ↓Proposal Submitted - Sep 97
  - ↓Selection of Contractors Completed - Nov 97
  - ↓Contracts Signed - Dec 97
  - ↓Task Issued for Quotation - Jan 98
  - ↓Task Approved - Feb 98

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Department of National Defense (DND)

- *2,000 Systems in DND's Inventory*
  - 750 Systems Identified as Critical
- *Critical Systems Divided in 5 Domains*
  - Battlefield Surveillance Systems/Weapon Systems
  - Command, Control, Communication & Intelligence Systems
  - Management Information Systems
  - Telecommunication Systems
  - Miscellaneous (e.g. infrastructures)

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Department of National Defense (DND)

- *Estimated Cost for DND's Year 2000 Conversion*
  - $ 200-400 Million (Cdn)
  - Budget comes from Operation & Maintenance and special Y2K funding
- *Management Strategy*
  - Centralized Command & Control through Year 2000 PMO
  - Decentralized execution via Managing Authority & Qualified Contractors

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Department of National Defense (DND)

- *Budget Identified so far*
  - 90M$ announced in 1998 over 4 years
  - 66M$ contracted over 4 years
- *Resources Spent so far*
  - 10M$ (interim funding)
    - *20% for Project Management*
    - *60% for MIS Projects*
    - *20% for other applications (e.g. weapon systems)*

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Canadian Air Defense Weapon System

- *Components of the Weapon System*
  - ADATS Missile System
  - Skyguard System
  - Guns
  - Javelins
  - Air Field - Battery Command Post
  - Training, Simulation
  - Support Equipment

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Government of Canada Year 2000 Program

- *Year 2000 Milestones*
  - Project Management Office Established at Treasury Board
  - Request For Proposal Issued - Dec 97
  - Proposal Submitted - Jan 98
  - Selection of Contractors Completed - Mar 98
  - Contracts Signed - Mar 98
  - Task Issued for Quotation - Apr 98
  - First Task Approved - Apr 98

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Government of Canada Year 2000 Program

- *Canadian Coast Guard*
  - Approximately 250 vessels across Canada
  - Four categories of equipment
    - *Above deck*
    - *Bellow deck*
    - *Facilities*
      - e.g. radar, search and rescue system
    - *Miscellaneous*
      - e.g. buoy, beacon

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Government of Canada Year 2000 Program

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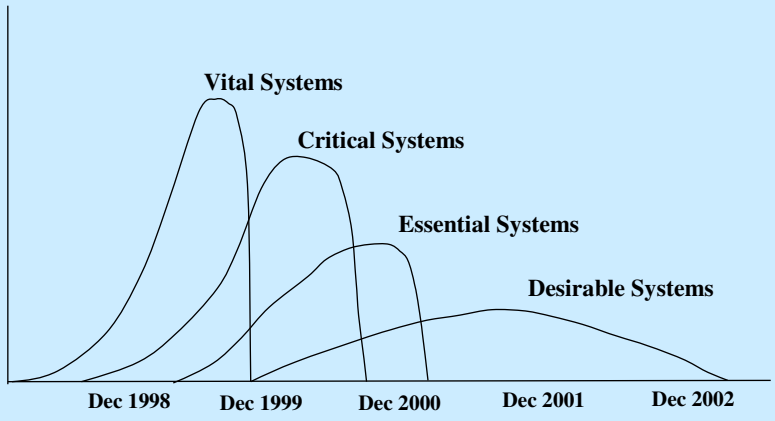
Expected Effort Distributions



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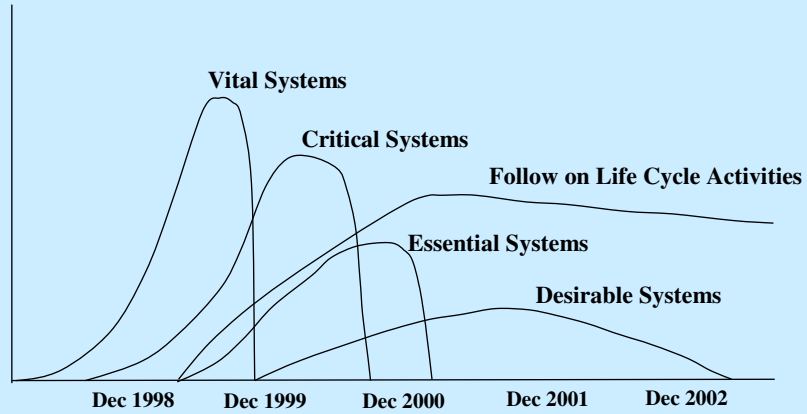
Expected Effort Distributions



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Canadian Coast Guard

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- Embedded System Triage Process

1000 Components
→ 100 "Susceptible"
→ 10 Non-compliant
→ 5 No -impact
→ 5 Replace/Retire/Redevelop

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- Nav Canada
  - *Pilot project for Airport Infrastructures*
    - ↓ Spread across Canada
- Canada Post
  - *Pilot project for Mail Processing Equipment*
    - ↓ 22 plants across Canada

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Lessons Learned

- *Awareness is Difficult*
  - Reaction 1: Y2K is "make work" for IT sector
  - Reaction 2: Y2K is limited to MIS only
  - Reaction 3 : Anger for not reacting sooner
- *Year 2000 is a Software Maintenance Project*
  - Sound Software and System Engineering practices should be applied
- *Issues of Interoperability/Interconnectivity are Difficult to Address Globally*
- *Infrastructures are the Poor Children*

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Lessons Learned

- *In Large Organizations a Czar is Required to "Make it Happen or Else"*
- *Treat Year 2000 as a "War Situation"*
- *Upper Management must be Accountable and Responsible*
- *Use "Fear Tactics" if necessary, because time is the essence*
- *We are Past Awareness - We are now in Contingency Mode*

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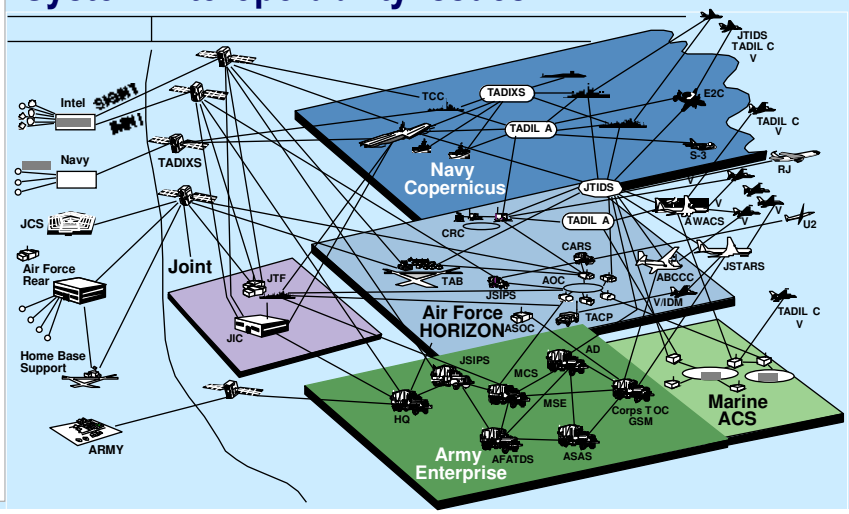
System Interoperability Issues



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> “ If progress were to continue at the rate we observed at the time of the audit, it would likely be too slow to ensure that the government systems, including those that are critical to supporting major programs and essential services, will be ready on time”

Report of the Auditor General of Canada
Information Technology: Preparedness for Year 2000
October 1997

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What Happened in Industry ?

- *MIS managers started first*
- *Manufacturing Managers underestimated the threat*
  - e.g. General Motors disclosed last march expected spending between $400 million to $ 550 million
- *Different Approaches*
  - MIS- mostly top down
  - Embedded - mostly bottom up
    - *Chip level*
    - *Interconnection between chips*
    - *System level*
    - *Interconnection between systems*

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Criticality of Systems

- *Every system must be defined and assigned criticality according to operational needs, priorities, time available and customer resources.*
- *An assessment is done on all the equipment needed to accomplish the mission and to sustain it*
  - By default, sustainment is infinite

Equipment Breakdown Structure

- *Super-System*
  - An integration of multiple systems (e.g. ship)
- *System*
  - Totality of the components that provide a capability. It includes lifecycle support equipment (e.g. ship propulsion system)
    - *I.e. maintenance, training, data acquisition and supply equipment*
- *Components*
  - Part of a system that can function with an independent entity (e.g. control card)

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Criticality of Systems

- Mission Critical Systems
  - *Breakdown would cause immediate stoppage of operation, injuries, death or environmental damage*
- Mission Essential
  - *Breakdown would reduce operation capability caused by equipment or parts breakdown. If not corrected, degradation eventually causes breakdown of mission capability*
- Mission Impaired
  - *Breakdown would not have an immediate effect on direct mission to support ongoing operations*
- Mission Desirable
  - *Breakdown would have no effect on mission*

Trends in Year 2000 Activities

- *As more and more organizations will "wake up" to Year 2000 threat, available resources will become scarce*
  - ↓ Sharing data may help a little
    - *e.g. letting private organizations having access to government Y2K databases (share data but no liability for consequences)*

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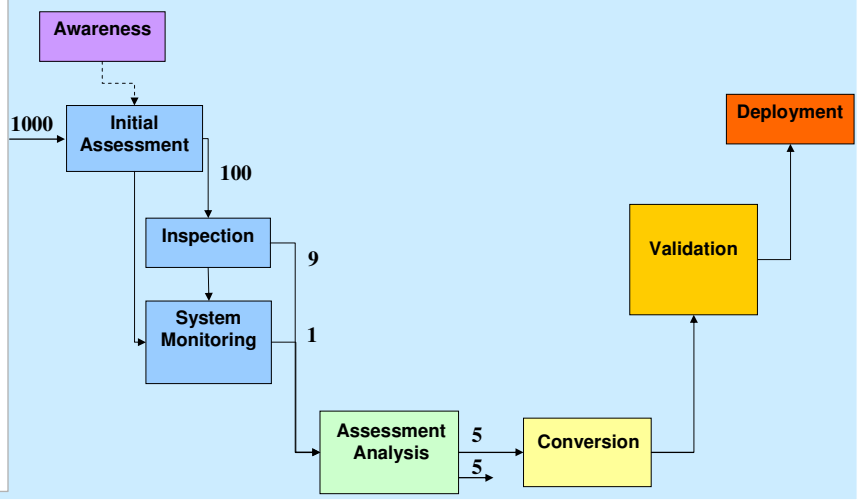
Embedded System Triage Process



Benefits of IV&V Activities

- *Technical Benefits*
  - ↓ High confidence in reliability of results
  - ↓ Assure compliance with customer's process
  - ↓ Higher team performance
    - *Increased synergy between IV&V individuals and team members when clarifying issues*
- *Management Benefits*
  - ↓ Improved visibility into project phases
  - ↓ Independent technical reviews
  - ↓ Higher consistency in applying decision criteria