

VISION96 SYMPOSIUM

Software and Systems Engineering Process Improvement at Oerlikon Aerospace

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Software and Systems Engineering Process Improvement

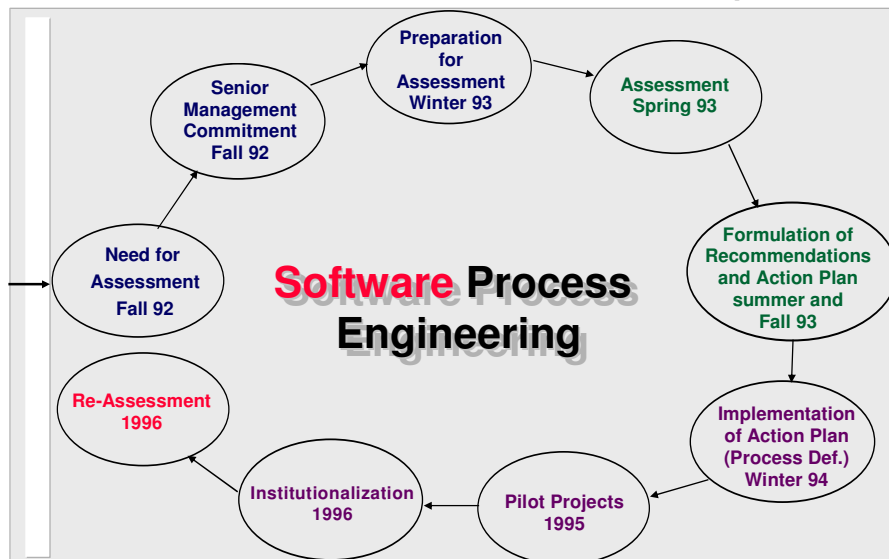
■ AGENDA

- *Introduction*
- *Software Engineering Process*
- *Systems Engineering Process*
- *Management of Change*
- *Lessons Learned*
- *Next Steps*
- *Conclusion*

■ APPLICATION DOMAINS AT OA

- *Weapon Systems*
- *Command & Control*
- *Communication & Intelligence*
- *Training & Simulation*
- *Instrumentation & Test*

EMBEDDED & REAL-TIME SOFTWARE



■ MOTIVATION & STRATEGY

- *Motivation*

- ⇒ Software Engineering is business strategic and a core competence for Oerlikon Aerospace

- *Strategy*

- ⇒ Base our process engineering on the Software Engineering Institute Capability Maturity Model
 - ⇒ Use the results of the Spring 93 assessment
 - ⇒ Put in place SEI level 2 and 3 practices
 - ⇒ Re-assess in 1996
 - ⇒ Institutionalize level 3 practices

■ MANAGEMENT COMMITMENT

- *Establishment of a Software Engineering Working Group (SEPG) of 8 members*

- *Budget Approved for:*

- Training

- Assessment

- SEPG Activities

■ OUR APPROACH TO PROCESS ENGINEERING

- *Define a Software Process and bring it under management control.*
- *Support the Process with engineering methods appropriate to the application.*
- *Support the process and engineering methods with automated tools integrated into a consistent environment.*
- *Educate personnel to design and select, and train them to use these processes, methods, and tools.*

■ ASSESSMENT

- *Software Process Assessment performed by Certified Assessors*
- *Assessment Team:*
 - ⇒ Applied Software Engineering Center
 - ⇒ Process Inc.
 - ⇒ Members of SEPG
 - ⇒ Representative of Customer

■ ASSESSMENT PARTICIPANTS

● *Middle Managers (8)*

- ⇒ Software Engineering
- ⇒ Sub-System Engineering
- ⇒ System Engineering
- ⇒ System Test
- ⇒ Configuration Management
- ⇒ Quality Assurance

● *Project Leaders (4)*

● *Practitioners (17)*

- ⇒ Configuration Management
- ⇒ Quality Assurance
- ⇒ Design, Code and Unit Test
- ⇒ Requirements Management

■ ACTION PLAN PREPARATION

● *Action Planning Workshop*

- ⇒ Three-Day Session (June)
- ⇒ Piloted by a Consultant (T. Kasse of ISPI)
- ⇒ Topics
 - *Review of Findings and Recommendations*
 - *Mini Tutorial on Level 2 and 3 Key Process Areas*
 - *Preparation of Action Plan Guidance Document on Requirements Management*

● *Follow-up Activities*

- ⇒ Weekly Sessions of SEPG
- ⇒ Review of Guidance Documents (7) with consultant (Aug.)
- ⇒ Review of Proposed Charters
 - Steering Committee
 - Software Engineering Process Group
 - Working Groups

■ GUIDANCE DOCUMENT FOR WORKING GROUPS

● Content

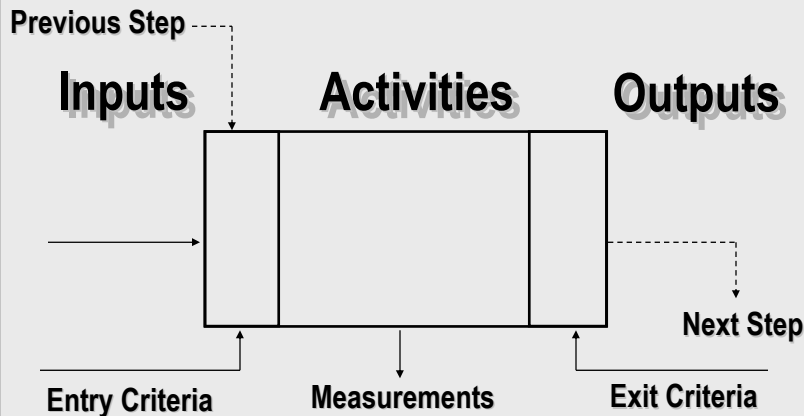
- ⇒ Goal
- ⇒ Scope and Complexity
- ⇒ Expected Involvement of the Organization
 - Process Owner
 - Key Players
- ⇒ Facilitator
- ⇒ Suggested Implementation Steps
- ⇒ Risk Issues
- ⇒ Reasonable Timetable for Implementation
- ⇒ Effort Commitment
- ⇒ Reference Documents

■ WELL-DEFINED PROCESS

● *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

■ PROCESS NOTATION: ETVX



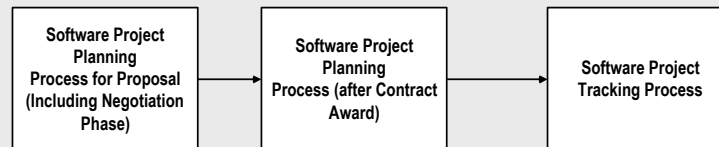
■ PROCESS DEFINITION STEPS - 1

- *Review the Findings of the Assessment*
- *Introduction to the Capability Maturity Model (CMM)*
- *Preparation of a Plan by the Working Group*
- *Brainstorm on current strengths and weaknesses*
- *Understand the Current Process*
- *Compare the Current Process with the CMM*
- *Describe first level process steps (Top View)*
- *Describe second level of the process using notation*
- *Describe/Update, if necessary, third level components:*
 - ⇒ Procedures
 - ⇒ Users' Guides
 - ⇒ Checklists

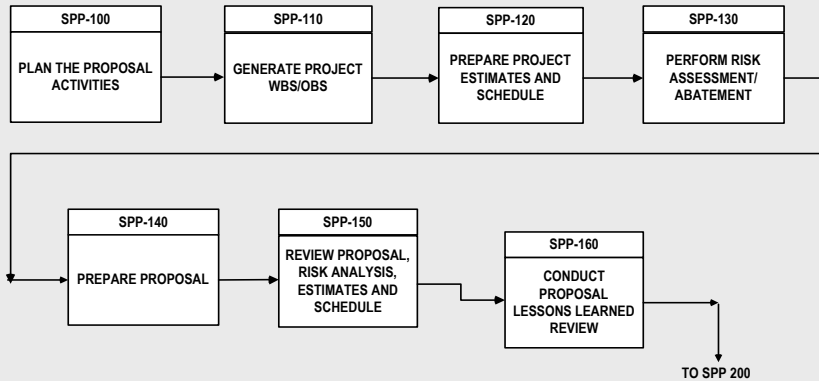
■ PROCESS DEFINITION STEPS - 2

- *Review Process Steps (CMM)*
- *Select a Pilot Project*
- *Brief Participants*
- *Monitor the Pilot*
- *Modify the Process*
- *Institutionalize the Process*
 - ⇒ *Modify, if necessary, policies and procedures*
 - ⇒ *Develop the Training Material*
 - ⇒ *Train all users (technical and others) of the Process*
 - ⇒ *Monitor the utilization of the Process*
 - ⇒ *Measure the Process and Products*
 - ⇒ *Improve the Process*

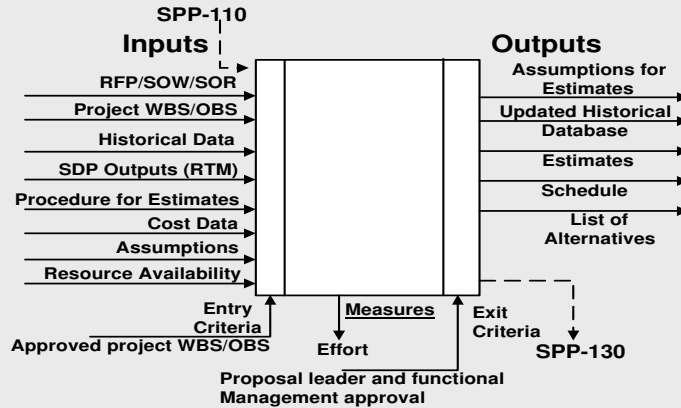
■ VIEW OF **FIRST** LEVEL OF THE PLANNING AND TRACKING PROCESS



■ **VIEW OF SECOND LEVEL OF THE
PLANNING AND TRACKING PROCESS**



■ **VIEW OF THIRD LEVEL OF THE
PLANNING AND TRACKING PROCESS**



■ PROCESS ASSET LIBRARY - 1

● *Repository of Process Artifacts:*

- ⇒ Process Definition Process
- ⇒ Process Descriptions
- ⇒ Policy
- ⇒ Forms and Templates
- ⇒ Examples of Documents Produced
- ⇒ Business Cases
- ⇒ Proposal
- ⇒ Software Development Plan
- ⇒ Software Specifications
- ⇒ Tailored Processes
- ⇒ Lessons Learned
- ⇒ Versions History
- ⇒ Process Owner Identification
- ⇒ Charter of SEPG
- ⇒ Training Material

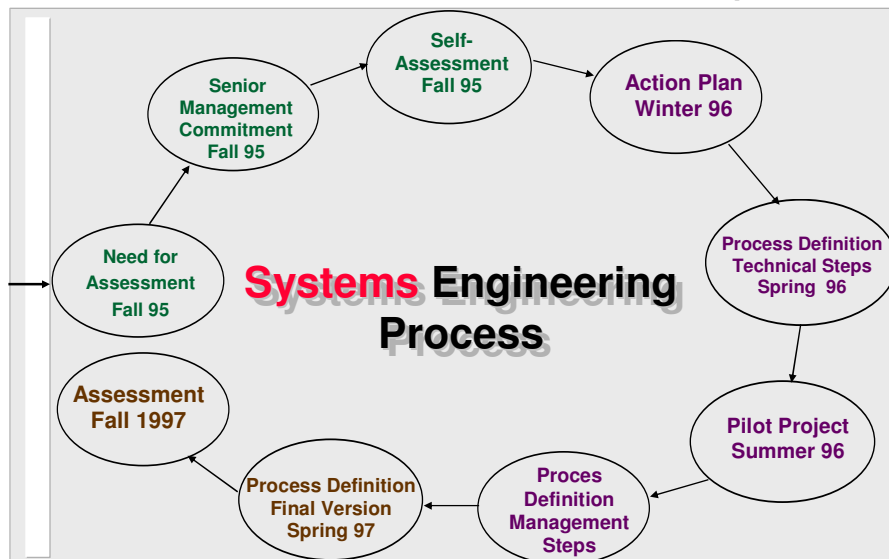
■ PROCESS ASSET LIBRARY - 2

● *Repository of Process Artifacts:*

- ⇒ Quality Data (Results of Inspections, Defects per Phase)
- ⇒ QA Reports and Corrective Actions
- ⇒ List of Software Tools and Version
- ⇒ Historical Data (e.g. Project Estimates, Calibrating Data for Size and Costs Estimations)
- ⇒ Software Methodologies Documentation
- ⇒ Tailoring Guidelines
- ⇒ Improvement Process

■ SW ENGINEERING PROCESS GUIDEBOOK

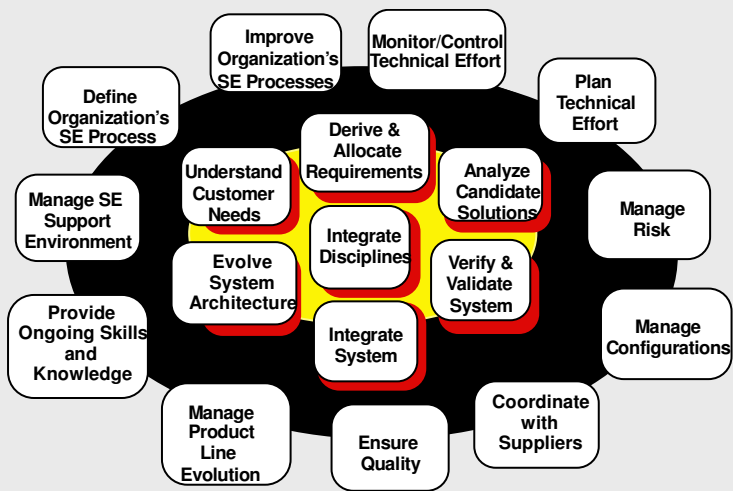
- *Distributed to all affected persons (e.g. CM, QA, SE)*
- *Content of Guidebook is kept under CM Control:*
- *Each person signs for a copy*
- *Versions of documents are sent to owners*
- **Content:**
 - ⇒ Policy
 - ⇒ Process Descriptions
 - ⇒ Procedures
 - ⇒ Forms and Checklists
 - ⇒ Guides (e.g. Requirements Specification Guide)
 - ⇒ Templates and Examples



■ **SYSTEMS ENG. SELF-ASSESSMENT: FALL 95**

- **Participants**
 - ⇒ Two Engineering Managers
 - ⇒ Three Systems Engineers
- **Model Used**
 - ⇒ Systems Engineering Capability Maturity Model (SE-CMM)
 - ⇒ SE-CMM Appraisal Method and Questionnaire
- **Process Areas addressed**
 - ⇒ Engineering
 - ⇒ Project
 - ⇒ Organization
- **Prioritization of Effort**
 - ⇒ Engineering Process Areas

■ **SYSTEMS ENG.- CMM PROCESS AREAS**



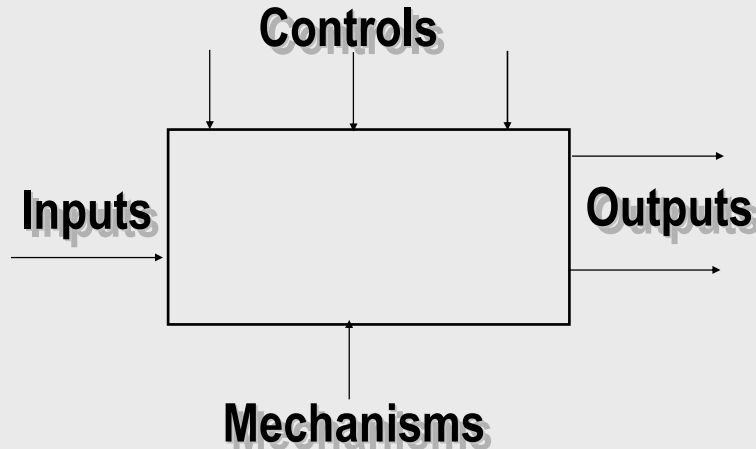
■ SYSTEMS ENGINEERING PROCESS DEVELOPMENT STEPS

- *Establish One Multi-Disciplined Working Group*
 - ⇨ Systems Engineers
 - ⇨ Software Engineers
 - ⇨ Quality Assurance Representative
 - ⇨ SEPG Members
- *Use SE-CMM and GSEP as frameworks*
- *Define Technical Activities of the SE Process*
- *Define Management Activities of the SE Process*
- *Use Beta Version of Process in Pilot Projects*
- *Revise Process and Deploy in Organization*
- *Formal Assessment of Systems Engineering Process*

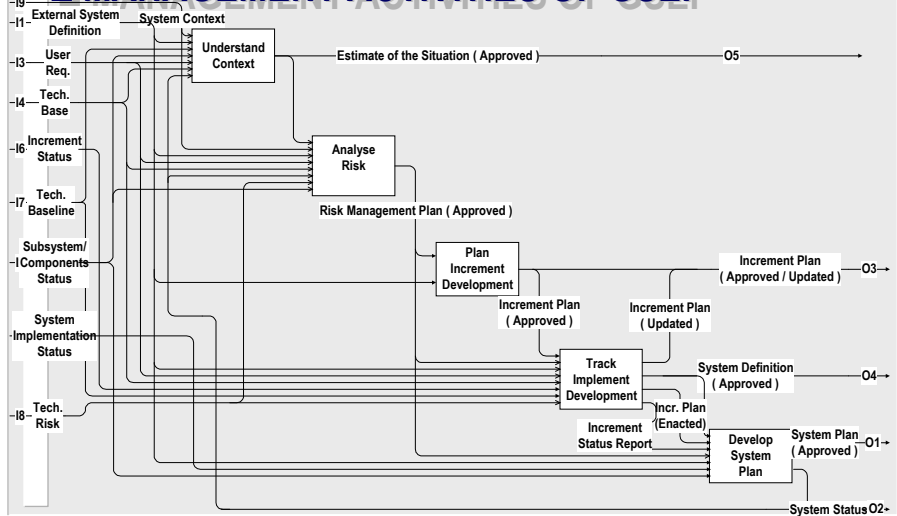
■ SE PROCESS WORKING GROUP: SECONDARY TASKS

- *Identification of Process and Product Metrics*
- *Identification of Methods and Best Practices*
- *Prepare Estimation Guidelines*
- *Monitor Interfaces with Software Eng. Process*
- *Compliance With ISO 9001 Requirements*
- *Systems Engineering Glossary*
- *Establish a System Eng. Process Asset Library*

■ **PROCESS NOTATION: IDEF0**



■ **MANAGEMENT ACTIVITIES OF GSEP**



■ LESSONS LEARNED - 1

- *Create common Vision for Mgmt and Practitioners*
 - ⇒ Reduce Cycle Time
 - ⇒ Increase Quality and Productivity
- *Develop a Process Improvement Plan*
 - ⇒ Link Between Project Requirements and Process Activities
 - ⇒ Multi-Year Plan to show long term commitment
- *Select Pilot Projects*
 - ⇒ Success of Pilot Projects facilitates adoption of Processes, Methods and Tools

■ LESSONS LEARNED - 2

- *Fix the Process not the People*
 - ⇒ Provide a “Safety Net” to allow Practitioners to learn while using the new Process
 - ⇒ Mistakes are Acceptable If we learn from them
- *The Management of the “Soft Issues” are as important as the “Hard Issues”*
 - ⇒ *it is 25% SW, 25% HW & 50% “Peopleware”*

■ NEXT STEPS

- *Continuous training Program for Software and Systems Engineers at Oerlikon Aerospace*
- *Electronic Process Asset Library on Local Area Network (INTRANET)*
- *Evaluation and adoption of Systems and Software Methods and Case Tools (I-CASE environment)*
- *Migration towards Integrated Product Teams*
 - ⇒ *Modify Organizational Structure and clarify of Roles and Responsibilities*
 - ⇒ *Modification to Performance Management Program (e.g. Team Based Performance)*

■ CONCLUSION

- *OUR Organization is making substantial effort to define and improve both Software and Systems.*
- *Significant Progress in Process Improvement also implies a Cultural Change in the organization:*
 - ⇒ *A Shift From the **NIH** (Not Invented Here) to the **NRH** (Not Re-invented Here) resulting in mission-oriented teams.*
- *Systems and Software Engineering Processes need to be defined and integrated for **EFFICIENCY** and **EFFECTIVENESS** to get the “**BANG FOR THE BUCK**”*