Apr 29th, 2:00 PM

Paper Session I-A - Re-Engineering the Modification Line of Business

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INTRODUCTION
United Space Alliance (USA) is the primary contractor responsible for processing the Space Transportation System. From the moment an Orbiter (Atlantis, Columbia, Discovery and Endeavor) touches down, USA begins the task of checking out and refurbishing the many complex systems. This processing effort culminates each time the Space Shuttle Vehicle lifts off the Launch Pad on its next space journey.
USA’s mission includes the operation and maintenance of the ground systems used for processing the launch vehicle at the Kennedy Space Center. The KSC launch site complex requires configuration control of the ground systems to guarantee the safety of the workforce and Space Shuttle Vehicles, a vital national asset. USA’s mission also includes configuration changes (ie. modifications and redesigns) to these ground systems to keep them operationally ready for shuttle processing. The impressive, internationally recognized safety record at KSC is due, in part, to the successful modification effort.
A Total Quality Management (TQM) structured effort, Re-Engineering Modification Line of Business (REMLOB) Task Team, was chartered to “develop a redefined facility, systems and equipment modification process...”. The REMLOB team investigated the existing modification process and discovered it was a patchwork of legacy processes inherited from previous contractors and NASA programs.

EXISTING MODIFICATION PROCESS
After evaluation, the team identified a number of existing process deficiencies: for example, the lack of complete and authoritative management of projects, a cumbersome change process, and inconsistent work control systems and tracking numbers making project closure unnecessarily complicated.
The greatest area for improvement, however, would be in the engineering development phase. Because the existing process is serial, previous instructions must be reiterated in the successive steps, resulting in redundant paperwork. The disconnected steps allow information to “fall through the gaps”. Misinterpretation and miscommunications cloud the initial design intent.

The figure below is color coded to depict how each organization and their expertise (Design Engineering = pink, Systems Engineering = green and Shops = yellow) operate independently, not as a team. Issues or problems detected downstream have a “ripple” effect on the preceding products. It is not uncommon for errors to be found in the released design drawings during work instruction/shop paper preparation or after the implementers start fabrication or installation.
INTEGRATED PRODUCT DEVELOPMENT
This Engineering Development Phase could be improved if all products (design drawings, work instructions & shop paper) were prepared concurrently as a team. The result would be a modification process with all aspects designed simultaneously, versus having to redesign or fix the product in the field.

Lockheed Martin’s process for concurrent development of products using a team, Integrated Product Development (IPD), has been implemented with success throughout the corporation. IPD promotes integration of cross-functional team members, resulting in synergy. The REMLOB Task Team, using this IPD philosophy, developed a new modification process custom-tailored for KSC. The graphic depiction of REMLOB is shown. The primary change, represented by color, is the removal of the serial disconnected engineering development phase. In the REMLOB process symbol, Design Engineering (pink), Systems Engineering (green) and the Shops (yellow) work together as a team. Product generation is concurrent with continuous team refinement.

REMLOB PROCESS
The REMLOB process implements the practice of developing products concurrently and realizes the synergy of a cross-functional team. This is a paradigm shift and cultural change from the existing process. The REMLOB modification process is shown below, each of the seven phases are labeled above the symbol, with its features below it. These features were created to eliminate the specific deficiencies of the existing modification process. All Phases are performed by a cross-functional Integrated Project Team (IPT), led by a Project Manager (PM).

REMLOB PROCESS
The Screen Phase filters out prospective projects to determine those that are worthy candidates for further assessment. Those ideas that qualify proceed to the Integrated Assessment Phase. The Integrated Assessment Phase evaluates all aspects and issues of the modification before committing valuable program resource. The project’s requirements, cost and schedule are defined before approaching the appropriate board for approval.
After project approval in the Modification Authorization Phase, the Product Definition Phase focuses on gaining team agreement to the project requirements and design solution. The Integrated Engineering Development Phase develops all of the products concurrently using a cross-functional Integrated Project Team, eliminating the serial engineering phase of the existing process. Fabrication and installation work is accomplished during the Integrated Implementation Phase. Unlike the existing process, the team continues to function; monitoring implementation and resolving field problems. The Closure Phase consists of documenting changes performed during implementation. Release of this documentation signifies the successful completion of the project and the end of team activity.

REMLOB TASK TEAM RECOMMENDATION
The REMLOB Task Team completed their charter and documented their recommendation in a report available on the Internet at http://128.159.97.239/epireeng/remlob.html. The team’s final recommendation was:

- Implementation of the REMLOB process
- Appointment of a REMLOB Process Manager and executive management champion.
- Creation of a USA Project Management Office
- A comprehensive employee training program

The team’s recommendation was approved by USA executive management in November of 1996. Implementation of the REMLOB effort was designated to the Director of the USA Kennedy Space Center Program Office, Mr. Gene Beckett, who will perform as the REMLOB executive management champion.

Mr. Mark C. Minich has been appointed as the USA REMLOB Process Manager, tasked with implementation of the REMLOB process to the KSC Modification Line of Business. The initial REMLOB effort will establish a USA Project Management Office and activate those Phases and Features of the REMLOB Process that can be implemented immediately. These topics will be discussed in further detail at the 1997 Space Congress.

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