
The Systems Engineering Development Process Version 1.0 Handbook “Walkthrough”

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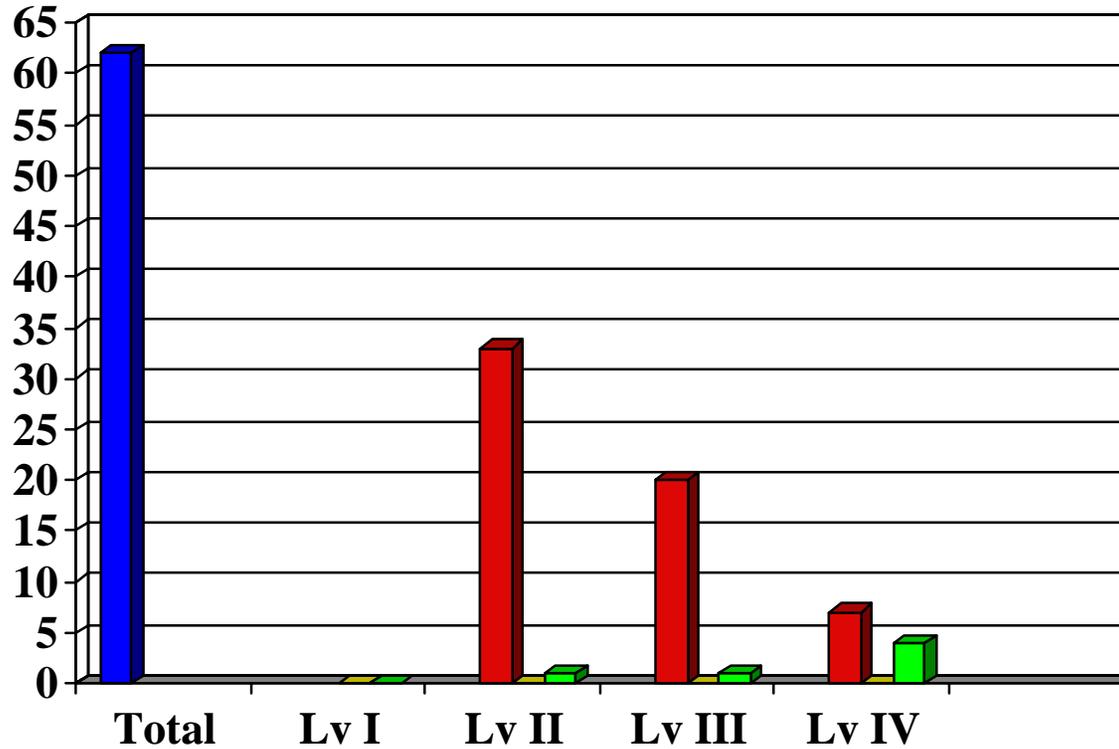


History of MSFC's SEDP

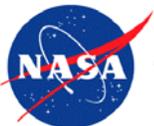
- Agency
 - Currently there is no Agency level Systems Engineering Development Process.
- MSFC
 - In 2002, the Program Management Council tasked CaER and SMO to evaluate implementing Center SE training and certification.
 - In 2003, the Project Management Board Charter was signed.
 - The Systems Engineering Development Process was put on hold until the Program/Project Development Process was implemented.
 - In 2003, the Flight Projects Directorate implemented a Systems Engineering Certification Process, which will now be superseded by the Center's SEDP.
 - Today, the first version of MSFC's SEDP is being released.



MSFC Certifications



■ Total Required ■ Require Cert ■ LSEs Certified ■ Non-LSEs Certified



MSFC (FD) Certified Systems Engineers

- Level IV
 - Jon Holladay
 - Brian Key
 - Allen Bacskay
 - Walter Schneider
- Level III
 - Dallas Clark
- Level II
 - Mike Morelan



Development of SEDP Version 1.0

- First the Project Management competencies were modified to address the Systems Engineering tasks to make sure the two work well together.
- Then the SE competencies were checked against the following documents for completeness:
 - Flight Projects Directorate's Systems Engineering Certification Process
 - SP6105 NASA Systems Engineering Handbook
 - MSFC-HDBK-3173 Project Management and Systems Engineering Hdbk
 - MSFC Systems Engineering Overview Course
 - NPG 71xx.x Systems Engineering Processes and Requirements (draft)
 - Systems Engineering Process Course taught by CSM
 - US Air Force Space & Missile Systems Center Systems Engineering Primer and Handbook



Introduction (SEDP Page 1)

■ Four Levels of Certification

- The affected SE's are listed on the PMC Program/Project/Activity list.
- Each program and project level has been determined by the Directorates.
- After gaining sufficient experience as the SE of a project at a given level, it is possible to become certified at the next higher level.
- All previous flight hardware project experience is applicable.
- The candidate does not have to be a current LSE to become certified.
- The PMB reserves the right to assign a lower level certification than the level applied for, based on the application and presentation.
- Training is required for most levels; however, certification is based on 10% - 20% formal training and 80% - 90% experience.



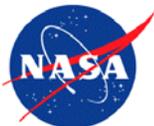
Levels of Systems Engineering

- **Level I—Technical Engineer/Project Team Member:**
 - Have a working knowledge of technical integration and SE concepts and tools
 - Have contributed to project activities and performed tasks to support a project
 - Emphasis on knowledge and understanding of technical integration, SE and PM
- **Level II—Subsystem or Small Project Systems Engineer:**
 - Have performed SE and technical integration activities, leading efforts on a subsystem or small project
 - Have participated in activities such as requirements development, systems analysis, trades studies, technical integration, design, development, or test and evaluation and provided technical inputs to program planning activities
 - Emphasis on leadership application and participation in SE



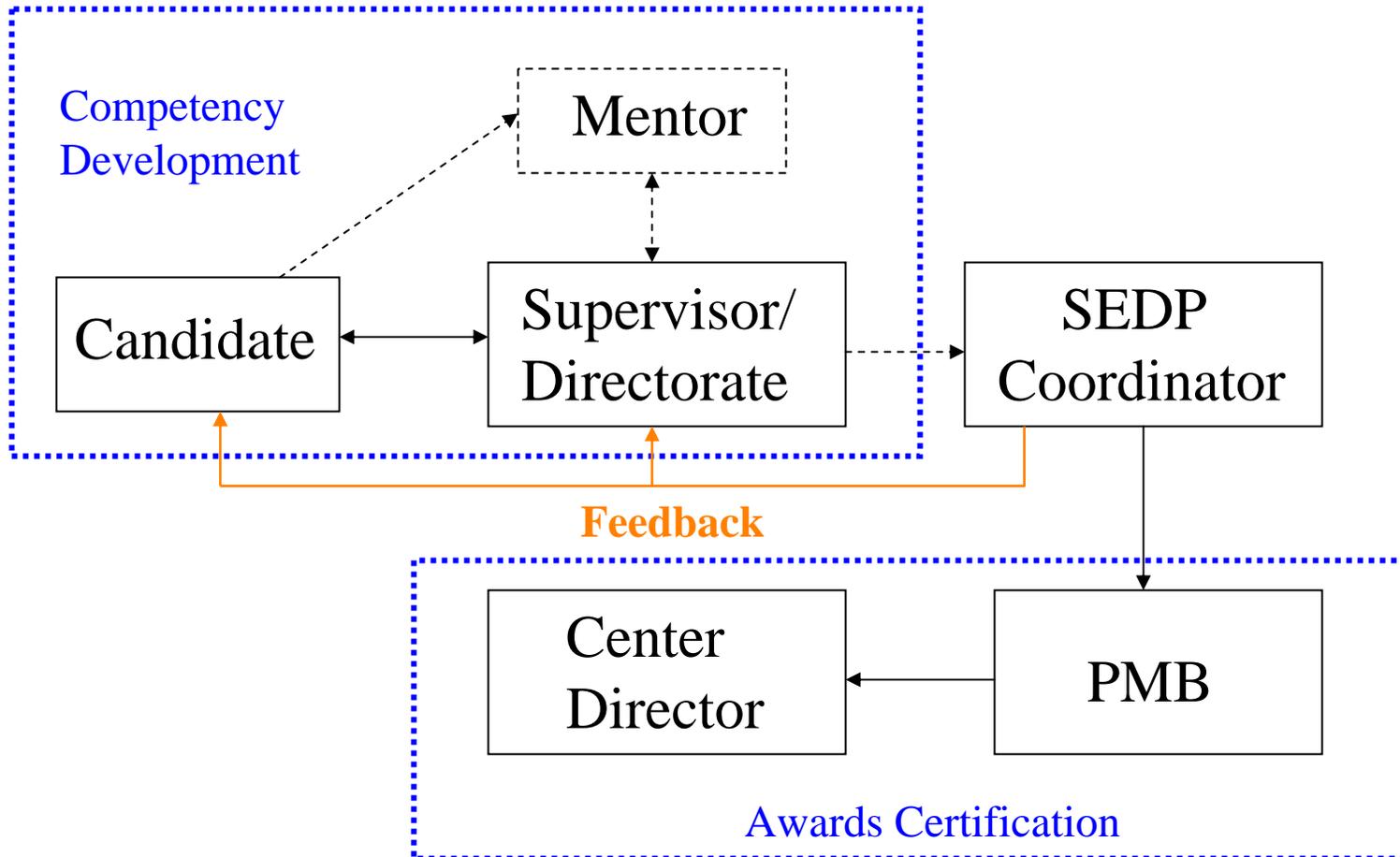
Levels of Systems Engineering

- **Level III—Major System or Project Systems Engineer:**
 - Have taken a significant leadership role in SE
 - Have experience in multiple phases of a project life cycle managing all technical integration and systems engineering functions
 - Emphasis on directing, structuring, and integration activities of SE
- **Level IV—Program or Large Systems Engineer:**
 - Have demonstrated superior competencies in aspects of formulation and implementation SE activities
 - Have contributed to Agency goals and been effective in managing technical and strategic interfaces both internal and external to the Agency
 - Emphasis on the strategy and technical management of large complex initiatives



Certification Checklist (SEDP Page 3)

Process Flow



Candidates Responsibilities

- Determine Level for Certification
- Identify gaps in required training and experience
- Contact SEDP Coordinator
- Work with Management and/or Mentor to gain training and experience needed
- Get current Training Record from Customer and Employee Relations Directorate (EODD) and fill out training form (*web template*)
- Prepare Record of Accomplishments (*web template*)



Candidates Responsibilities (cont.)

- Provide current IDP
- Provide current Resume (*web template*)
- Prepare Candidate Information Sheet (*web template*)
- Obtain signature and recommendation from Management (*web template*)
- Complete and sign Application Checklist (*web template*)
- Provide application to SEDP Coordinator
- Prepare and present presentation to PMB (Level II-IV, 15 minute presentation to PMB with 30 minute questions and answers)



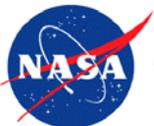
Management's Responsibilities

- Help candidate determine course of action to obtain training and/or experience needed for achieving requested level of certification
- Make sure this course of action is documented in the candidates IDP
- Make sure the candidates application is complete and accurate
- Provide recommendation and signature on the Management Recommendation Sheet
- Prioritize training among candidates



SEDP Coordinator Responsibilities

- Provide guidance to candidate during application preparation
- Review candidate's completed application
- Obtain from candidate clarifications/recommended changes, if necessary
- Schedule Level II-IV briefings to PMB
- Distribute candidate applications to PMB
- Introduce candidates to PMB
- Maintain all candidate files



PMB Responsibilities

- Review candidate applications
- Question Level II-IV candidates during briefings
- Approve, change or decline candidate's requested certification
- Make recommendation to Center Director for final approval

The PMB is co-chaired by the Manager of CaER and the Manager of the SMO and consists of a number of Deputy Direct reports to the MSFC Center Director.



SEDP Level Descriptions/Definitions (SEDP Page 5)

- Page 4 gives a general description of each level.
- Levels increase with increasing responsibility (note Key Words in the table).
- The Required Courses for each level are listed.
- After sufficient study of the SEDP Level Descriptions and the Competency Worksheet Requirements, the candidate should be able to determine the appropriate level for application.



Competency Worksheet Requirements (SEDP Page 7)

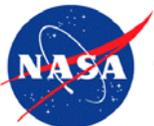
- 1.0 Program/ Project Conceptualization and Planning
- 2.0 Continuous Risk Management
- 3.0 Budget Management
- 4.0 Project Implementation
- 5.0 Program/Project Management and Control
- 6.0 Safety and Mission Assurance
- 7.0 NASA and External Environment
- 8.0 Human Capital Management
- 9.0 Professional and Leadership Development
- 10.0 Knowledge Management



Example Competency

	Level I	Level II	Level III	Level IV
3.1 Project Budget	Understanding of the project budget development process and balancing of cost, schedule, and technical aspects of the project.	Provided technical inputs and identified associated cost drivers for project budget development process.	Led activity to provide technical inputs and identified associated cost drivers for budget development and iterations for a small project, subsystem, or equivalent entity.	Managed technical aspects and identified associated cost drivers for budget development and iterations for a large project, major system, or equivalent entity.

The increasing responsibility and duties for each level may be obtained by reading “horizontally” within a given competency.



Required Courses (SEDP Page 20)

- Foundations of Project Management - APPL course
- Systems Engineering - MSFC course
- Systems Requirements - NET course
- Trade Studies - new MSFC course
- Verification, Validation and Test - NET course
- Continuous Risk Management - MSFC course
- Lessons Learned - new MSFC course
- System Safety Fundamentals – JSC / MSFC course
- COTR - MSFC course
- Advanced Systems Engineering and Integration- new NET course



Additional Information

- SEDP Document
 - Sample responses to a competency (Page 25)
 - Glossary (Page 27)
 - Acronym List (Page 31)
- Website: <http://mi.msfc.nasa.gov/sedp/index.shtml>
 - Electronic templates for all required parts of the application except IDP
 - Frequently asked questions
 - Electronic version of SEDP document



Sample Response - Not Acceptable

Level III Competency	Candidate Response	Evaluation
<p>5.2 Project Monitoring and Control Leadership role in project tracking, reporting, and evaluation of technical performance metrics. Utilized earned value analysis, risk analysis, and technical reserve management. Leadership in developing, evaluating, and implementing mitigation efforts to address performance variances. Utilized continual technical monitoring and formal reviews.</p>	<p>Led a “tabletop” Critical Design Review for the OPGCA (protein crystal growth experiment) that flew on STS–88 in 1997.</p> <p>Established and allocated weight, power and volume requirements to the various OPGCA components.</p>	<p>Not Acceptable - Candidate has acquired the skill of leading a key design review, but has only demonstrated it on a small project, using a tailored review process. Technical metrics were established, but there was no mention of monitoring or control of these metrics. This is a weak response and only partially demonstrates having met this competency.</p>



Sample Response - Acceptable

Level III Comp.	Candidate Response	Evaluation
<p>5.2 Project Monitoring and Control Leadership role in project tracking, reporting, and evaluation of technical performance metrics. Utilized earned value analysis, risk analysis, and technical reserve management. Leadership in developing, evaluating, and implementing mitigation efforts to address performance variances. Utilized continual technical monitoring and formal reviews.</p>	<p>As the ELCSS Chief Engineer from 1997 - 1999, I led a PRR (1998) and PDR (1999). I defined and quantified RID issues and made presentations to the preboard and board. I signed RID closures along with the board chairman. I established ten key, system-level technical performance metrics that were stasured at each review. I broke these metrics into subsystem allocations and maintained a chief engineer's reserve. I led the evaluation of a number of technical risks so that their mitigation impacts could be included in the project schedule and budget prior to contract baselining. I reviewed the contractor's earned value variance reports and mitigation plans and reviewed the MSFC technical insight staffing at regular intervals to insure consistent staffing with project risks. All metrics were summarized and reported to the project manager at monthly status meetings. (The ECLSS project budget was in excess of \$100 million.)</p>	<p>Acceptable Response The candidate has demonstrated accountability and responsibility for multiple reviews. Specific project and dates are listed, and the candidate's role in various activities is included. Various project monitoring tools are mentioned and the associated leadership roles in the utilization of these metrics. Note: This is a critical competency, and while the candidate provided a strong response, the PMB may ask additional questions associated with this subject.</p>



Questions?

As questions arise, they will be documented (along with answers) on the EODD web page <http://mi.msfc.nasa.gov/sedp/index.shtml> (“SEDP / Frequently Asked Questions”)

