



# **NASA Systems Engineering Leadership Development Program (SELDP)**

## **Program Plan**

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**NASA Office of the Chief Engineer**  
Academy of Program/Project & Engineering Leadership



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## 1.0 Background

NASA's vision and mission necessitate that its workforce is ready and able to lead the world in space exploration, scientific discovery, technology development, and managerial excellence. Systems engineering has been identified by NASA leadership as a critical core competency in enabling current and future mission success. The NASA Office of the Chief Engineer (OCE) has responsibility for implementing an effective systems engineering strategy across NASA including:

- Common Technical Processes
- Tools and Methods
- Workforce, Knowledge and Skills

The OCE has very robust program and project management and systems engineering training programs within the Academy of Program/Project & Engineering Leadership (APPEL) (<http://appel.nasa.gov>). With over 60 in-depth courses, the Academy provides an excellent foundation for NASA employees to acquire the knowledge and skills needed to improve their program/project and engineering capabilities. In addition to these courses, the OCE has determined that there is a greater need for hands-on systems engineering experience. While several NASA Centers have entry-level systems engineering development programs, SELDP has been designed to provide advanced systems engineering and leadership skills as well as a NASA-wide perspective. A core requirement of SELDP is hands-on developmental assignments at other Centers. These assignments allow participants to gain this broader understanding of NASA and expand their application of systems engineering leadership skills.

## 2.0 Program Requirements

The Systems Engineering Leadership Development Program (SELDP) requirements:

- Provide a comprehensive development program that provides for leadership and technical development, training and benchmarking, coaching, and mentoring.
- Provide opportunities for full-time, permanent civil servant GS-13 through GS-15 engineers or AST equivalents and senior systems engineers from Jet Propulsion Laboratory (JPL) to participate in a year-long developmental program.
- Provide a process that ensures the selection of high potential participants who have proven technical/discipline capability, and who have demonstrated key leadership capabilities and behaviors. Select individuals who are nominated by their Center Director and Center Engineering Director and who are expected to lead higher level or more complex efforts 18 to 24 months after selection versus employees who are merely available. The SELDP competitive process ensures that:
  - Participants have demonstrated the leadership behaviors and aptitude that NASA identifies as critical to becoming an expert systems engineer (See Table 1: NASA's SE Behavior Model/Competencies and Table 2: Systems Engineering Competencies).

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- The most qualified nominees are selected for this opportunity at the right time in their career, when this learning will have the greatest impact.
- Participants have the experience and attitude to be successful in the program.
- There is an appropriate assignment available to meet the participant's developmental needs.
- Participants have the top level Center engineering leadership support needed to be successful in the program, and to be placed in a position that quickly applies this learning upon return to the Center to ensure maximal transfer of learning and return on investment.
- Ensure that the program provides an integrated learning approach that allows participants to:
  - Gain hands-on developmental experience outside the home Center that will broaden and improve their leadership and systems engineering knowledge, skills, and abilities to lead complex Agency-wide programs and projects.
  - Obtain development and coaching needed to enhance key leadership skills and abilities, and improve or adopt behaviors that NASA has identified as critical to becoming a highly effective systems engineer.
  - Create an Agency-wide learning community and network of systems engineers across NASA.
  - Obtain mentoring by top NASA systems engineers both at his/her home Center and at developmental assignments.
  - Improve leadership effectiveness through coaching and feedback.
  - Provide interactions and learning from key NASA and outside leaders.
  - Provide technical training before the start of assignments that are critical to success.
  - Benchmark with other NASA Centers and world-class outside systems engineering organizations.
  - Ensure Centers have individual development plans (IDP) for each participant.
- Identify experienced Center systems engineering advocates to perform gap analysis for each participant and match participants with the appropriate developmental assignment.

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**Table 1. SE Behavior Model/Competencies**

<b>Top Level Themes</b>	<b>Middle Competencies</b>
<b>Leadership</b>	Appreciates/recognizes others
	Builds team cohesion
	Understands the human dynamics of a team
	Creates vision and direction
	Ensures system integrity
	Possesses influencing skills
	Sees situations objectively
	Coaches and mentors
	Delegates
	Ensures resources are available
<b>Attitudes &amp; Attributes</b>	Remains inquisitive and curious
	Seeks information and uses the art of questioning
	Advances ideas
	Gains respect credibility, and trust
	Possesses self-confidence
	Has a comprehensive view
	Possesses a positive attitude and dedication to mission success
	Is aware of personal limitations
	Adapts to change and uncertainty
	Uses Intuition/ sensing
Is able to deal with politics, financial issues, and customer needs	
<b>Communication</b>	Listens effectively and translates information
	Communicates effectively through personal interaction
	Facilitates an environment of open and honest communication
	Uses visuals to communicate complex interactions
	Communicates through storytelling and analogies
	Is comfortable with making decisions
<b>Problem Solving &amp; Systems Thinking</b>	Identifies the real problem
	Assimilates, analyzes, and synthesizes data
	Thinks systemically
	Has the ability to find connections and patterns across the system
	Sets priorities
	Keeps the focus on mission requirements
	Possesses creativity and problem solving abilities
	Validates facts, information and assumptions
	Remains open minded and objective
	Draws on past experiences
Manages risk	
<b>Technical Acumen</b>	Possesses technical competence and has comprehensive previous experience
	Learns from successes and failures

**Table 2. Systems Engineering Competencies**

<b>Systems Engineering Competencies</b>
<b>Competency Area SE1.0: System Design</b>
<b>SE1.1</b> Stakeholder Expectation Definition & Management
<b>SE1.2</b> Technical Requirements Definition
<b>SE1.3</b> Logical Decomposition
<b>SE1.4</b> Design Solution Definition
<b>Competency Area SE 2.0: Product Realization</b>
<b>SE 2.1</b> Product Implementation
<b>SE 2.2</b> Product Integration
<b>SE 2.3</b> Product Verification
<b>SE 2.4</b> Product Validation
<b>SE 2.5</b> Product Transition
<b>Competency Area SE3.0: Technical Management</b>
<b>SE3.1</b> Technical Planning
<b>SE3.2</b> Requirements Management
<b>SE3.3</b> Interface Management
<b>SE3.4</b> Technical Risk Management
<b>Competencies Common to PM&amp;SE</b>
<b>Competency Area C1.0: Internal &amp; External Environments</b>
<b>C1.1</b> Agency Structure, Mission, and Internal Goals
<b>C1.2</b> NASA Procedures and Guidelines
<b>C1.3</b> External Relationships
<b>Competency Area C2.0: Human Capital Management</b>
<b>C2.1</b> Staffing and Performance
<b>C2.2</b> Team Dynamics and Management
<b>Competency Area C3.0: Security, Safety and Mission Assurance</b>
<b>C3.1</b> Security
<b>C3.2</b> Workplace Safety
<b>C3.3</b> Safety and Mission Assurance
<b>Competency C4.0: Professional and Leadership Development</b>
<b>C4.1</b> Mentoring and Coaching
<b>C4.2</b> Communication
<b>C4.3</b> Leadership
<b>C4.4</b> Ethics
<b>Competency 5.0 Knowledge Management</b>
<b>C5.1</b> Knowledge Capture and Transfer
<b>C5.2</b> Knowledge Sharing

## 3.0 Roles and Responsibilities

**Table 3. SELDP Roles and Responsibilities**

<b>Role</b>	<b>Responsibilities</b>
1. NASA Chief Engineer	Serve as the NASA Official responsible for guiding and directing the design, development, and implementation of the SELDP; chair the SELDP selection panel; coordinate with key stakeholders; fund participant's travel and leadership training.
2. Center Directors of Engineering	Nominate high potential candidates for the SELDP; serve on the Agency-wide SELDP selection panel which rates, ranks, interviews, and selects participants; maintain accountability and ownership of program to ensure its success.
3. SELDP Director	Manage the SELDP and measure participant and program effectiveness.
4. Center SELDP Advocate/Mentor	Serve as the home Center mentor for program participants; perform an individual gap analysis on each participant and match participants to the appropriate developmental assignment. Provide feedback to participants and stay engaged with them on an on-going basis throughout their SELDP year.
5. Assignment Mentors	Share knowledge, experience, insight and advice; teach technical and leadership skills and abilities.
6. Home Supervisor	Determine mid and long-term organizational goals and how SELDP development can help support these goals. Identify qualified nominees who will be needed to take on more complex and/or higher level assignments 18 to 24 months after selection. Design assignments that utilize the knowledge and experience gained in SELDP upon the participants return to their home Center.
7. Assignment Supervisors	Provide guidance and direction on the work to be performed; ensure that the SELDP participant has a meaningful and challenging assignment, is fully integrated into the organization, is included in meetings and discussions and intervene as necessary and provide additional guidance and support.
8. SELDP Program Participants	Participate in all SELDP mandatory requirements; accomplish the objectives defined in his/her developmental plan; meet with their supervisors, advocates, mentors, SELDP program managers, and engineering directors on an agreed upon basis; keep program managers aware of activities, progress and issues.
9. Center SE Training Program Managers	Serve as the SELDP training focal point for their Centers; provide advice and guidance to potential candidates; work with the SELDP Director and other training program managers to recommend policies, procedures, and processes across Center and Agency SE programs.
10. Coaches	Provide ongoing leadership development support including the identification and development of needed SE leadership behaviors; and provide continuity and transition support to participant's upon return to their home Center.

## **Roles and Responsibility Details**

### NASA Chief Engineer

The NASA Chief Engineer serves as the NASA official responsible for guiding and directing the design, development, and implementation of the SELDP. The NASA Chief Engineer also chairs the SELDP selection panel and makes final decisions regarding the number and selection of participants based on available funding and overall Agency needs.

### SELDP Director

The SELDP director is responsible for coordinating with key stakeholders in designing and implementing the SELDP, including all experiential, leadership and technical components of the program. The SELDP Director is also responsible for scheduling program activities, managing the approved budget of the SELDP and measuring participant and program success.

### Center Directors of Engineering

Center directors of engineering are responsible for nominating high potential candidates for the SELDP and for serving on the Agency-wide SELDP selection panel which rates, ranks, interviews and selects participants. Center directors of engineering are also responsible for identifying senior level system engineers to mentor program participants selected from their Center, and for ensuring that the participants are placed in appropriate next-level system engineering roles upon returning to their Centers. Center directors of engineering are also responsible for providing advice and counsel on the matching of selected participants with available developmental assignments and for appointing a senior systems engineer to serve as the Center's advocate/mentor. Engineering directors also maintain accountability and ownership of the program to ensure its success.

### Center SELDP Advocate/Mentor

The Center Director of engineering identifies an SELDP advocate who is responsible for serving as the home Center mentor for program participants. Once high potential participants are selected by the Center director's of engineering, advocates serve on an Agency-wide team responsible for performing an individual gap analysis on each participant and matching participants to the appropriate developmental assignment. After assignments are identified advocates are responsible for helping the participant connect with their developmental assignment advocate, supervisor and mentor. Advocates continue to stay engaged with the participants throughout their SELDP year to ensure their developmental plan is being effectively implemented. They are also responsible for assuring that local infrastructural services, such as IT and security, are in place when a participant arrives at their Center. Finally, advocates provide advice and mentoring to participants, and keep the Center director of engineering apprised of the progress of their Center participants.

Characteristics of mentor/Advocates include:

- Chief engineer or engineering directorate or senior systems engineer
- Experience and ability to practice systems engineering on a project
- Passion for development
- Good people/communication skills
- Extensive knowledge of the Center nominees and the Center's proposed developmental assignments

### Assignment Mentors

Individuals who thoroughly understand and have had hands-on experience with the technical and leadership development aspects of the developmental assignment are appointed as SELDP assignment mentors. Optimally, assignment mentors are individuals who have been successful in this position in the past. Mentors share knowledge, experience, and insight and have the ability to effectively teach the technical and leadership skills and abilities needed to ensure the participant's success. An effective mentor combines competence, experience, and the ability to communicate and listen. He or she provides knowledge, information and advice on his/her experience in that job. The assignment mentor may, or may not, be the same person as the SELDP assignment supervisor or Center advocate.

### Assignment Supervisors

Assignment supervisors provide guidance and direction on the work to be performed, including program goals, schedules, and administrative processes and procedures. The assignment supervisor ensures that the SELDP participant is fully integrated into the organization and is included in meetings and discussions that provide a full understanding of the organizations culture and function,. The assignment supervisor challenges the participant and ensures that he/she is given meaningful work and every opportunity to learn and succeed. The assignment supervisor quickly intervenes to ensure that the participant learns from his/her mistakes, and to provide additional support and guidance to succeed in the future.

### SELDP Program Participants

Participants are responsible for participating in all SELDP mandatory requirements, including participation in developmental assignments away from his/her home Center for 6 to 12 months, leadership workshops, and other program activities. They are also responsible for accomplishing the objectives defined in their IDP. While on assignment participants are responsible for meeting with his/her advocates, supervisors, mentors, coaches, Engineering directors and program managers on an agreed upon basis and for keeping SELDP program managers aware of what is going on to make sure assignments and mentoring relationships are supporting their development.

### Center System Engineering Training Program Managers

It is recommended that managers of Center systems engineering development programs serve as the SELDP focal point for their Centers. Program managers are responsible for helping their Engineering Management Board (EMB) member identify high potential systems engineers for the program. Program managers are also responsible for supporting the other Center participants placed in assignments at their Center, including arranging for space and equipment prior to the participant's arrival. Once a participant is placed at the Center, the program manager provides on-going support and guidance to the participants by ensuring that their assignment continues to meet his/her developmental needs and that the developmental and training goals established by the advocate/mentor continue to be accomplished. Program managers ensure that participant's assignment's, training, mentoring, and development build and enhance the participant's understanding, knowledge and skills. In addition to the responsibilities above, program managers work with the SELDP director to ensure continuity between the Center and Agency programs. Center program managers are encouraged to participate in the design of SELDP and provide advice and assistance in establishing policies, procedures, and processes across Center and Agency SE programs.

### Coaches

Professional coaches are selected by the SELDP Director to support the ongoing leadership development needs of each participant. Coaching is initiated in the development year and

continued through successful transition to the participant's new assignment upon return to their home Center. The focus of coaching is to support participants in improving or developing the SE behaviors identified in the SE Behavior Study. Coaches follow NASA guidelines for establishing and managing coaching engagements.

## 4.0 Participant Nomination and Selection

### 4.1 The SELDP Call Letter

An annual call letter will be released by the NASA Chief Engineer requesting nominations from the Center and Engineering Directors. The Center Director will be asked to appoint a single point of contact (POC) for coordinating Center nominees. This POC will be asked to coordinate with respective Center's Director of:

- Engineering
- Safety and Mission Assurance
- Program/Project Management
- Human Capital

OCE will email each of these Directors copies of the annual call letter. Regardless of the organization of the nominee, all nominees must be endorsed by the Center and Engineering Directors. The current call and all application materials can be found on NASA APPEL program website at: <http://www.nasa.gov/offices/oce/appel/seldp/index.html>.

### 4.2 Agency Selection Process

Participants are chosen using the following four-part competitive selection process. Center Directors of Engineering, or their deputies, and members of the Safety and Mission Assurance community, serve as the SELDP Selection Panel for SELDP participants.

1. Nomination and endorsement by Center Leadership/Engineering Director.
2. Rating and ranking of applicants by the Selection Panel to ensure the applicant has met the program requirements and has the appropriate background and experience to be successful in the program.
3. Interview of qualified applicants by Selection Panel to ensure they have demonstrated the leadership behaviors and aptitudes of highly successful NASA system engineering leaders.
4. Matching of selected applicants to available developmental assignment by advocates with the Center engineering director and the applicant's home supervisor's input.

If, in the view of the Selection Panel, an appropriate developmental assignment is not available for a selected participant, Centers will be requested to identify additional assignments that will meet the participant's need. If an assignment is still not currently available, the selected participant will enter the program once an assignment becomes available. This individual will not need to re-compete.

### 4.3 Selection Criteria

Candidates for the SELDP must meet the following minimum criteria:

- Full-time permanent GS-13 to GS-15 NASA civil servant or a senior systems engineer at JPL.
- Engineering Bachelors Degree or AST equivalent.
- Willingness and availability to leave their home Center and take on an assignment at another NASA Center for 6 to 12 months and willingness to accept the assignment identified for them by the SELDP advocates.
- Be available to attend all program workshops and other mandatory events.

#### 4.4 Nominee Experience

Centers need to identify nominees who meet the following criteria:

- Individuals that when presented with NASA-wide exposure and expanded systems engineering and leadership skills and experience are best positioned to take on future Center challenges versus employees who are available.
- Have graduated from their Center systems engineering program or can demonstrate through their experience, training and education that they have the knowledge and experience to be successful in SELDP.
- Have demonstrated leadership behaviors and aptitudes (See Table 1)
- Have demonstrated technical/discipline capabilities and experience applying SE competencies (See Table 2) as defined by APPEL, Level 2, Subsystems Leads, and have taken APPEL SE training including Foundations of Aerospace, Fundamentals of SE, and Project Management and Systems Engineering, or their equivalents.

#### 4.5 Nominee Considerations

Centers are advised to utilize SELDP as a strategic mid-to long-term investment. This investment is only successful when Center systems engineering needs are met, which means that upon return, the participant is placed in a position where the learning and experience they gained in the program is quickly applied to meeting essential Center needs. Before identifying nominees, Centers are encouraged to first consider the systems engineering knowledge, skills, and abilities they will need to successfully run programs and projects 18 to 24 months after participant selection.

Family obligations and current assignment requirements timing should be taken into account to also determine the optimal time to participate in this program. Participants in SELDP engage in very demanding assignments and development activities. It is impossible for an individual to be successful in this program unless they are released completely from their home Center obligations. Participants cannot do both. There is a significant amount of preparation necessary for the participants to transition to their developmental assignments. Home supervisors can best ensure project continuity and support participant assignment transition by arranging early for the transfer of responsibilities from these participants to the individuals who will be acting for them while they are away. A minimum of two weeks is recommended.

#### 4.6 Rating and Ranking Criteria

The rating and ranking criteria shown in Table 4 on the next page will be used by the SELDP Selection Panel to rate and rank nominee applications:

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**Table 4. SELDP Application Rating and Ranking Criteria**

Rating Factor	Maximum Points Awarded	Description
Experience  (Application Question 11)	40	<ul style="list-style-type: none"> <li>• Has the nominee had the requisite experience in complexity and number of years to adequately prepare him/her to be successful in SELDP?</li> <li>• Has the nominee proven to be able to effectively translate the opportunities he/she has been provided into measurable results for the Agency?</li> <li>• Nominees will be rated on:               <ul style="list-style-type: none"> <li>○ Relevant Past Experience: Type and number of years of demonstrated SE discipline knowledge and practical experience within area of expertise.</li> <li>○ Participation in and/or understanding and exposure to, phases of project life cycle development.</li> <li>○ Discipline and/or competency experience.</li> <li>○ Major accomplishments (results achieved) including awards received</li> </ul> </li> </ul>
Developmental Preparation  (Application Question 12)	30	<ul style="list-style-type: none"> <li>• Is the nominee prepared to make maximum use of the SELDP developmental opportunity?</li> <li>• Does he/she have the requisite training and development necessary to be successful in the SELDP?</li> <li>• Is this the right program for this nominee at this time in his/her career?</li> <li>• Nominees will be rated on:               <ul style="list-style-type: none"> <li>○ Degree(s) and certificate(s) obtained.</li> <li>○ Required APPEL and other relevant SE training completed – must be noted in application.</li> <li>○ Other professional development.</li> <li>○ Leadership development including Agency-wide courses as applicable.</li> </ul> </li> </ul>
Senior Management Endorsement and Mission Statement of Need  (Application Questions 13 and Endorsement Letter)	25	<ul style="list-style-type: none"> <li>• Does this Center consider this nominee an individual who is ready to take on the next level of systems engineering complexity and meet the strategic needs of the organization?</li> <li>• Does the Center have a clear strategy for this individual that will effectively use the knowledge, skills and abilities gained in the SELDP to support the achievement of the Center goals?</li> <li>• Is there a good plan to enhance NASA's return on investment?</li> <li>• Nominees will be rated on:               <ul style="list-style-type: none"> <li>○ Center's overall endorsement and assessment of the nominee's SE leadership capabilities.</li> <li>○ Alignment of individual development needs with Agency/Center program needs.</li> <li>○ Reentry strategy (How quickly and effectively will learning be applied?)</li> </ul> </li> </ul>
Discretionary	5	At the discretion of the SELDP Selection Panel member, up to 5 points can be added to the above factors, based on the information provided. This allows the panel member the latitude to recognize any exceptional strength, and/or to express a clear preference for one candidate over the others, despite the fact that the numerical weighting to that point may have been more or less equal.
<b>Maximum Points Awarded</b>	<b>100</b>	

## 4.7 Interviewing Candidates

Nominees who are highly ranked from their applications are interviewed to determine if they exhibit the SE leadership behaviors and aptitudes necessary to become leaders in the field. Interview questions are designed to identify the nominee’s abilities, aptitudes, and attitudes in some or all of the following behavioral areas. These areas may be expanded depending on the preference of the SELDP Selection Panel. The criteria in Table 5 will be used by the SELDP Selection Panel to assess nominees during the interview process.

Actual questions shall be approved by the SELDP Selection Panel prior to the interview date. Questions will remain confidential and are not to be shared with nominees prior to the interview to ensure that no candidate has an advantage over another. Interviews are conducted at NASA Headquarters. Whenever possible, interviews are conducted in person with a sub-panel of the SELDP Selection Panel members. Nominees who are not available to interview in person may elect to be interviewed by phone.

Centers, including JPL, are responsible for funding nominee’s travel to NASA Headquarters to interview for the SELDP. Centers are also responsible for informing nominees of the interview date and procedures. Centers are encouraged to prepare nominees for the competitive process by ensuring they have logistics information and support, and that they understand the goals and priorities of the SELDP. Centers may not use actual interview questions as part of this preparation.

**Table 5. SELDP Assessment Criteria**

Rating Factor	Description
Leadership Skills	Nominee: <ul style="list-style-type: none"> <li>• Appreciates/recognizes others</li> <li>• Is able to build team cohesion</li> <li>• Understands the human dynamics of a team</li> <li>• Can create vision and direction and ensure system integrity</li> <li>• Possesses influencing skills</li> <li>• Sees situations objectively</li> <li>• Coaches and mentors</li> <li>• Delegates</li> <li>• Ensures resources are available</li> </ul>
Attitudes and Attributes	Nominee: <ul style="list-style-type: none"> <li>• Remains inquisitive and curious</li> <li>• Seeks information and uses the art of questioning</li> <li>• Advances ideas</li> <li>• Gains respect credibility, and trust</li> <li>• Possesses self-confidence</li> <li>• Has a comprehensive view</li> <li>• Possesses a positive attitude and dedication to mission success</li> <li>• Is aware of personal limitations</li> <li>• Adapts to change and uncertainty</li> <li>• Uses intuition/sensing</li> <li>• Is able to deal with politics, financial issues, and customer needs</li> </ul>
Communication	Nominee: <ul style="list-style-type: none"> <li>• Listens effectively and translates information</li> <li>• Communicates effectively through personal interaction</li> <li>• Facilitates an environment of open and honest communication</li> <li>• Uses visuals to communicate complex interactions</li> <li>• Communicates through story telling and analogies</li> </ul>

<p>Problem Solving and Systems Thinking</p>	<ul style="list-style-type: none"> <li>• Is comfortable with making decisions</li> </ul> <p>Nominee:</p> <ul style="list-style-type: none"> <li>• Identifies the real problem, assimilates, analyzes, and synthesizes data</li> <li>• Thinks systemically</li> <li>• Has the ability to find connections and patterns across the system</li> <li>• Sets priorities</li> <li>• Keeps the focus on mission requirements</li> <li>• Possesses creativity and problem solving abilities</li> <li>• Validates facts, information and assumptions</li> <li>• Remains open minded and objective</li> <li>• Draws on past experiences</li> <li>• Manages risk</li> </ul>
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## 5.0 Program Elements

The NASA SELDP consists of the following 13 parts, which are described in more detail in the sections below:

- 5.1 Assessments
- 5.2 Developmental Assignments
- 5.3 Technical Training
- 5.4 Leadership Development
- 5.5 Leadership Training
- 5.6 Benchmarking
- 5.7 Mentoring
- 5.8 Coaching
- 5.9 Leader Shadowing
- 5.10 Center Visits
- 5.11 Gap Analysis
- 5.12 Quarterly Home Visits
- 5.13 Agency and Center SE Leadership Participation

### 5.1 Assessments

Assessment instruments will be used to identify strengths and areas of development needed for program participants. These assessments will target leadership skills and abilities and will be used to help coach the participants during the development year to improve their effectiveness. Assessments may include:

1. A Systems Engineering 360 degree instrument based on the NASA SE Behavior Study
2. The Myers-Briggs Type Indicator (MBTI)

Other assessments determined important to the majority of current class participants.

### 5.2 Developmental Assignments

Participants engage in developmental work assignments designed to challenge them and increase their understanding of systems engineering and NASA. Participants are matched to one, or occasionally two, developmental assignments that will expand their scope of experience and understanding how systems engineering works and its impact on achieving successful program and project goals. Each participant is required to undertake developmental work assignment(s) for a minimum of six months up to one year at a location other than their home

Center and preferably in an unfamiliar technical area. Participants from JPL engaging in assignments at NASA Centers and civil servant participants engaging in assignments at JPL should refer to Appendix A for additional guidance.

### **5.2.1 Safety and Mission Assurance Component**

An understanding of the role of safety and mission assurance (S&MA) in a program or project is critical to effective SE leadership. If the advocates determine from their gap analysis of the participant that additional exposure to S&MA is needed, an appropriate S&MA component will be added to the participants SELDP developmental requirements. It is possible for this component to take place at the participant's home Center, either before or after their assignment or during their assignment at their host Center.

## **5.3 Technical Training**

Prior to the start of their assignments participants identify and engage in technical training critical to their success in the program. Training includes coursework determined necessary and recommended by the Center and recorded in the participant's IDP. Course work normally includes APPEL curriculum training and may include other training options. See Appendix B for available APPEL SE training. The hands-on assignment is the primary technical learning vehicle in SELDP. Participants should not take more than one week (every 6 months) away from their assignment to engage in training classes unless the learning is critical to the successful completion of their assignment duties.

## **5.4 Leadership Development**

Leadership development experiences such as executive forums, learning and using leadership models and theories, and/or experiential learning exercises are identified and provided to program participants during leadership workshops. These leadership elements are reviewed and redesigned annually to meet the changing needs of NASA and the unique needs of each class.

## **5.5 Leadership Training**

Leadership training is identified to meet the needs of program participants. Key leadership learning areas such as systems thinking, problem solving, communications, executive presence, strategic thinking, and other training courses are provided based on the Systems Engineering Leadership Behaviors/Competencies defined in Table 1.

## **5.6 Benchmarking**

Participants attend benchmarking opportunities at NASA and at leading system engineering industry and/or Federal government locations. These benchmarking site visits are focused on helping participants learn best practices from other world-class systems engineering organizations.

## **5.7 Mentoring**

Once a participant is accepted into the SELDP, they are assigned a senior systems engineer mentor from their home Center. The mentor may or may not be the Center advocate. This mentor helps the participant prepare for the program and provide guidance on developing his or her learning needs and strategy for the year. Participants are also assigned a developmental assignment program mentor at their assignment location who helps guide and direct their learning while on assignment.

## **5.8 Coaching**

At some SELDP workshops, as well as in individual sessions during the year, participants have access to leadership coaching and feedback from program leaders and coaches supporting the program. Along with the assessment process, leadership coaching is used to assess gaps in systems engineering leadership aptitudes and behaviors and to develop strategies and learning to close those gaps. This gap analysis focuses on the SE behaviors identified in the *NASA Systems Engineering Behavior Study* and the personal attributes identified in *The Art and Science of Systems Engineering*. This resource is intended to allow highly individualized input on assessing leadership strengths and areas needing development. Coaching continues to support the successful transition of the participant back to their home Center or next assignment after the conclusion of the SELDP.

## **5.9 Leadership Shadowing**

Leadership shadowing is an activity that allows an individual to spend time observing a top systems engineer on the job. Leadership shadowing allows a participant to better understand how his or her textbook learning can effectively be applied in the real world of NASA programs and projects. Participants are encouraged to shadow leading Agency system engineers to observe their actions and interactions and the behaviors they exhibit which make them effective. These short shadowing opportunities also serve as an opportunity to gain additional mentoring and advice from these Agency leaders. The main focus of SELDP is on the hands-on developmental assignment learning, participants should spend no more than a few days in shadowing activities during their assignment.

## **5.10 Center Visits**

When practical, SELDP workshops are held near NASA Centers to allow participants to visit various system engineering offices and programs. The goal of these visits is to gain a greater understanding of NASA's complex systems engineering activities through observation and briefings by Center and engineering directors.

## **5.11 Gap Analysis**

Each participant is evaluated against Agency systems engineering and leadership competencies to identify gaps in their experience. This gap analysis focuses on the art and science of systems engineering leadership and the technical policies, procedures and processes and leadership behaviors defined by the OCE.

## **5.12 Quarterly Home Center Visits**

Quarterly home Center visits will be individually scheduled to provide each participant an on-going opportunity to visit with their Center leadership and/or supervisors to discuss progress and gain advice on next steps.

## **5.13 Agency & Center Systems Engineering Leadership Participation**

Opportunities are designed throughout the SELDP year to ensure ongoing communication between SELDP participants and Agency and Center Engineering Directors.

## Appendices

### Appendix A. SELDP Assignments to the Jet Propulsion Laboratory

The NASA Jet Propulsion Laboratory (JPL) is a Federally Funded Research and Development Center (FFRDC) operated for NASA by the California Institute of Technology (Caltech). Because of its special status, JPL may have access to proprietary information to which NASA has no right of access. JPL has privacy rights similar to those of any contractor. Because of the possible ethics issues that might arise in the course of an assignment of a NASA civil servant to JPL, special arrangements have been made by the SELDP. These arrangements were created through the work of the NASA office of the General Counsel at NASA headquarters, the chief counsel of the NASA management office (NMO), and attorneys for Caltech. While the nature of the ethical issues themselves is beyond the scope of this paragraph, it forms the basis of a special written agreement between NASA and Caltech and of a special ethics briefing that each SELDP participant who is detailed to the NASA JPL must obtain. Questions about specific ethical issues should be brought to an ethics officer (attorney) at any of the NASA centers, the JPL NMO, or the office of the General Counsel at NASA Headquarters. Specific procedures for SELDP participants assigned to the NASA JPL are outlined below. There are no special requirements, except for the normal SELDP program requirements, for JPL employees who are assigned by the SELDP to NASA Centers.

NASA civil servants who are assigned to JPL by the SELDP must prepare two documents in addition to the documentation that is required of all participants:

1. The SELDP participants assigned to JPL, must complete the document entitled *Memorandum of Understanding for Temporary Assignment at the Jet Propulsion Laboratory of NASA Employee under NASA's Systems Engineering Leadership Development Program*. Completion of this document entails filling in the blanks labeled in all-caps according to the specific details of the temporary assignment. After this document is returned to the SELDP staff, the document will be signed by officials from NASA and Caltech. The participant does not sign this document. While the preparation of the document is very straightforward, please refer to the "frequently asked questions" (FAQ) maintained on the SELDP website to see questions that have been raised by previous participants.
2. The second document is entitled *NASA SELDP Ethics Statement*, and must be signed by the participant. The ethics statement is a promise by the participant to obtain an ethics briefing from an ethics officer at the participant's home Center with participation from the Chief Counsel's office at the JPL NMO. Both documents should be returned to SELDP staff when complete.

## A.1 Instructions for Completing the JPL MOU

Instructions for completing the form entitled “Memorandum of Understanding for Temporary Assignment at the Jet Propulsion Laboratory of NASA Employee Under NASA’s Systems Engineering Leadership Development Program” are given below. The MOU form has been designed to allow you to “fill in the blanks” in a simple, intuitive manner. Questions that were asked by previous SELDP program participants were recorded as a set of Frequently Asked Questions (FAQs) and are listed below. The FAQs are expected to be updated each year as a result of new inputs.

### Frequently Asked Questions (FAQs)

- 1 **Q.** Does “**LENGTH OF ASSIGNMENT**” include the time needed for travel and transportation of personal belongings and family members to and from the duty station?  
**A.** Yes. The length of assignment should be designed to encompass all SELDP program activities that are directly related to the new work assignment.
- 2 **Q.** Does “**LOCATION WHERE THE NASA EMPLOYEE WILL WORK**” always mean “NASA JPL, Pasadena, CA?”  
**A.** No. In cases where the job assignment requires one or more duty stations instead of, or in addition to, the JPL, list each of the duty stations.
- 3 **Q.** What level of detail is expected for “**NAME OF INTERNAL ORGANIZATION WITHIN JPL WHERE THE NASA EMPLOYEE WILL WORK AND A DETAILED DESCRIPTION OF THE NASA EMPLOYEE’S JOB ASSIGNMENT**”?  
**A.** You should write a paragraph that includes the name of the project, the name of the JPL project organization, the job title(s), and a reference to any known products.
- 4 **Q.** What are the “important” parts of this MOU, or to what should I give the most attention?  
**A.** These questions will be answered during an ethics briefing that you will schedule with the ethics official from your home center. That ethics officer, in cooperation with the JPL NMO Chief Counsel, will explain the agreement and answer all your questions prior to your beginning the assignment at JPL.
- 5 **Q.** Is there anyone that I need to contact when I arrive at JPL to begin the assignment?  
**A.** In addition to meeting with the JPL SELDP advocate, you should visit the NMO Chief Counsel’s office and meet the staff. You should ask the staff how to obtain your copy of the “rules and policies that govern the internal operations and management of Caltech/JPL” that is referenced in the MOU.
- 6 **Q.** What if I have other questions?  
**A.** Feel free to contact the SELDP staff with any questions.

## A.2 Copy of JPL Memorandum of Understanding

### Memorandum of Understanding for Temporary Assignment at the Jet Propulsion Laboratory of NASA Employee Under NASA's Systems Engineering Leadership Development Program

#### I. Purpose

This Memorandum of Understanding ("MOU") is entered into by the National Aeronautics and Space Administration ("NASA") and the California Institute of Technology ("Caltech"). The MOU establishes the terms and conditions for the temporary assignment of NASA employee (**NAME OF NASA EMPLOYEE**) to the Jet Propulsion Laboratory ("JPL") for a period of (**LENGTH OF ASSIGNMENT**). Actual work experience will not exceed (**LENGTH OF ASSIGNMENT**). The authority for this MOU is 5 U.S.C. § 4101 et seq., the Government Employees Training Act of 1958, as amended and 42 U.S.C. § 2473 et seq., the National Aeronautics and Space Act of 1958, as amended.

The Jet Propulsion Laboratory, run by a division of Caltech, is located at 4800 Oak Grove Drive, Pasadena, CA 91109. National Aeronautics and Space Administration Headquarters is located at 300 E Street, S.W., Washington, DC, 20546.

#### II. Background

As part of NASA's Systems Engineering Leadership Development Program ("SELDP"), participants engage in outside temporary work assignments in order to broaden their knowledge and increase their leadership skills. A temporary assignment to Caltech/JPL has been identified as a valuable developmental opportunity for (**NAME OF NASA EMPLOYEE**). This position will enable the participant to gain new perspectives in the field of systems engineering and, at the same time, will benefit NASA by building and retaining a skilled and effective workforce. (**See NPD 3410.1 for benefits to NASA**).

The scope of JPL's work is defined in section C of Contract NAS7-03001 between NASA and Caltech (the "Prime Contract"). Caltech operates JPL as a NASA Federally Funded Research and Development Center to meet Government research and development needs which cannot be met as effectively by existing Government resources or normal contractor relationships. JPL has a dual character; it is a NASA-owned facility as well as an operating division of Caltech staffed with Caltech employees. JPL as an institution encompasses a full spectrum of activities from basic research through the conduct and management of space flight missions.

The NASA employee will work at Caltech/JPL at (**LOCATION WHERE THE NASA EMPLOYEE WILL WORK**) where he/she will (**NAME OF INTERNAL ORGANIZATION WITHIN JPL WHERE THE NASA EMPLOYEE WILL WORK AND A DETAILED DESCRIPTION OF THE NASA EMPLOYEE'S JOB ASSIGNMENT**). This assignment will serve as a broadening experience to enhance the employee's perspective and meet his/her developmental needs.

Caltech/JPL will serve as the sponsor for **(NAME OF NASA EMPLOYEE)** for the duration of the assignment. The sponsor will assign daily tasks to **(NAME OF NASA EMPLOYEE)** to ensure that **(NAME OF NASA EMPLOYEE)** has the opportunity to work on projects related to program goals and his/her developmental needs.

**(NAME OF NASA EMPLOYEE)** will interact with Caltech/JPL organizational staff at all levels. At the conclusion of the assignment, **(NAME OF NASA EMPLOYEE)** will prepare an SELDP Final Program Report.

### III. Responsibilities

Nothing in this MOU is intended to affect, alter, or change any terms or conditions of the Prime Contract between the parties nor is this MOU intended to, in any way, affect the respective rights and obligations between the parties as set forth in the Prime Contract. To the extent there is any inconsistency between this MOU and the Prime Contract, the terms of the Prime Contract shall govern. Any effort performed by Caltech/JPL in connection with this MOU shall be performed under the Prime Contract.

It is the intent of the parties in entering into this MOU that the following efforts will be undertaken, consistent with the Prime Contract:

NASA will use reasonable efforts to accomplish the following:

1. Assign **(NAME OF NASA EMPLOYEE)** to Caltech/JPL. While assigned to Caltech/JPL and performing services pursuant to this agreement **(NAME OF NASA EMPLOYEE)**, will remain an employee of NASA.
2. Retain sole responsibility for the payment of all salary, allowances, and benefits under applicable Federal law and regulations. **(NAME OF NASA EMPLOYEE)** is prohibited from receiving any payment or other compensation from Caltech/JPL, including (but not limited to) such forms of compensation as meals, housing, personal laundry, time off, etc.
3. Retain responsibility for **(NAME OF NASA EMPLOYEE)** workers' compensation benefits available for injuries arising out of the performance of his duties within the scope of this assignment. Caltech/JPL will not include **(NAME OF NASA EMPLOYEE)** under its workers' compensation program.

Caltech/JPL will use reasonable efforts to accomplish the following:

1. Provide on-the-job training to **(NAME OF NASA EMPLOYEE)** during the term of this agreement.
2. Assign **(NAME OF NASA EMPLOYEE)** to various projects, as described in the Background Section above, during the assignment.
3. Provide **(NAME OF NASA EMPLOYEE)** with a sponsor for the duration of the assignment. The sponsor will work with **(NAME OF NASA EMPLOYEE)** to develop a general plan for the duration of the assignment which will ensure that **(NAME OF NASA EMPLOYEE)** has the opportunity to work on projects related to SELDP goals and that meet his/her developmental needs.
4. Comply with the attached "Time-Keeping, Administration and Evaluation Procedures."
5. Provide appropriate office space, administrative, and logistical support for **(NAME OF NASA EMPLOYEE)**, including communications access, normal and proprietary materials, storage, clerical support, office equipment, and supplies.

Both parties will be responsible for avoiding any conflicts of interest situations and to so instruct their respective employees.

#### IV. Schedule and Milestones

Caltech/JPL understands that **(NAME OF NASA EMPLOYEE)** is unavailable for work assignments on the certain days due to required developmental program activities that will be specified by the SELDP Director.

#### V. Financial Obligations

Financial obligations are governed by the Prime Contract.

#### VI. Liability and Risk of Loss

Liability and Risk of Loss are governed by the Prime Contract.

#### VII. Intellectual Property and Export-Controlled Data

The parties do not intend that the activities performed under this MOU will result in inventions or the creation of new intellectual property, but if any result, the following will apply:

- Under Federal law, **(NAME OF NASA EMPLOYEE)** remains a Government employee during the developmental training assignment. Any intellectual property developed by the Government employee pursuant to this MOU is governed by applicable federal statutes, regulations, rules, and policies.
- Subject to the U.S. Government's rights and interests, Caltech shall retain exclusive title and all rights to inventions, copyright and other intellectual property arising from conceptions or efforts of JPL employees or consultants in performing this MOU. The U.S. Government retains a right to use such inventions, copyrighted materials, or other intellectual property, royalty-free, for authorized government purposes.
- Subject to U.S. Government rights and interests, NASA and Caltech shall hold joint title and rights in inventions, copyrights, and other intellectual property arising from the joint conceptions or efforts of both parties' employees or consultants in performing under this MOU.

In the performance of this MOU, JPL and NASA may exchange or develop data, information, software or other technology which may be subject to the export control laws and regulations of the United States, including the International Traffic in Arms Regulations (ITAR), 22 C.F.R. 120-130 and the Export Administration Act Regulations (EAR), 15 C.F.R. 730-774). The parties agree to fully comply with all such laws and regulations in the performance of this MOU and each party will be responsible for obtaining export licenses or other export authority as may be required before exporting

controlled data, information, software or other technology to foreign countries or providing access to foreign persons (as defined in 22 C.F.R. 120.16 ).

In the event that JPL is requested by NASA to provide remote access accounts for its employees authorizing access to any JPL electronic library or server, JPL will require NASA's Export Administrator to certify that its employees requesting access are U.S. persons (as defined in 22 C.F.R. 120.15). During assignment under this MOU and while on the JPL premises and/or JPL's computing network and resources, **(NAME OF NASA EMPLOYEE)** may have access to or otherwise be provided exposure to third party proprietary and/or otherwise protected data that may not normally be available to NASA under the Prime Contract, such information and/or data shall be subject to and treated by **(NAME OF NASA EMPLOYEE)** in accordance with 18 USC 1905.

VIII. Key Personnel

The following personnel are designated the principal points of contact between the parties in the performance of this agreement:

<p><b>NASA:</b> Christine R. Williams, Director Systems Engineering Leadership Development Program Tel.: (202) 358-2146 Address: NASA Headquarters Suite 4082 300 E. St. SW Washington, D.C. 20546 E-Mail: <a href="mailto:Christine.R.Williams-1@nasa.gov">Christine.R.Williams-1@nasa.gov</a></p>	<p><b>Caltech:</b> (name of current assoc. director) Associate Director for Flight Projects and Mission Success Tel.: (818) 354-5037 Address: NASA Jet Propulsion Laboratory, California Institute of Technology 4800 Oak Grove Drive Pasadena, California 91109 E-Mail: <a href="mailto:(current email)@jpl.nasa.gov">(current email)@jpl.nasa.gov</a></p>
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IX. Term of Agreement and Modifications

This MOU becomes effective as of the date of the last signature below. The term of this agreement is **(ACTUAL DATE OF BEGINNING ASSIGNMENT)**, through **(ACTUAL ENDING DATE OF ASSIGNMENT)**, or until canceled by either party. Any modification to this agreement shall be executed, in writing, and signed by an authorized representative of each party.

X. Right to Terminate

Either party may terminate this agreement at any time. One week's notice is preferred.

XII. Anti-Deficiency Act

All activities under or pursuant to this agreement are subject to the availability of appropriated funds, and no provision shall be interpreted to require obligation or provision of funds in violation of the Anti-Deficiency Act, 31 U.S.C. §1341.

XIII. Execution

The following individuals execute this agreement on behalf of Caltech and the Government, respectively.

<p><b>(Name of Current Assoc. Director)</b>                  Associate Director for Flight Projects and Mission Success, NASA Jet Propulsion Laboratory, California Institute of Technology</p> <p>Date: _____</p>	<p><b>Christine R. Williams</b>                  Director, Systems Engineering Leadership Development Program, Office of the Chief Engineer, NASA Headquarters</p> <p>Date: _____</p>

### A.3 NASA SELDP Ethics Statement

The following SELDP Ethics Statement is required of NASA employees for SELDP assignments at JPL.

I understand that as a condition of participation in the NASA SELDP, I will consult with an ethics official in the Chief Counsel's Office of my home Center prior to beginning my assignment with JPL. I furthermore understand that upon arrival, I will consult with an ethics official located in the Chief Counsel's Office for the NASA-JPL Management Office. If any question regarding my compliance regarding the Federal ethics laws or other Federal or NASA ethics requirements arises during my assignment, I will contact an ethics official located in the Chief Counsel's Office for the NASA-JPL NMO unless the issues relates to my official duties or other aspects or my relationship with my home Center, in which case I will contact a NASA ethics official for my home Center in coordination with an ethics official at the NASA-JPL NMO.

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SELDP Participant

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Printed Name

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Date

## Appendix B. NASA Systems Engineering Training

The emphasis of the SELDP is hands-on technical assignments at NASA field Centers with various programs and projects. Prior to, and during the participation in the program, participants are expected to conduct objective analysis of their core systems engineering knowledge, understanding, and practice. The SE APPEL coordinator can help participants undertake this assessment. Should a deficiency be identified in any major SE concept, processes, policy etc., it is recommended that the participants obtain the necessary training through APPEL or a credible provider.

The APPEL Systems Engineering Curriculum is based on a development model or framework and defined SE competencies. Course offering dates and locations are available on the Agency-wide Master Calendar.

### B.1 APPEL Systems Engineering Curriculum

1. Foundations of Aerospace at NASA\*
2. Project Management and Systems Engineering\*
3. Fundamentals of Systems Engineering\*
4. Advanced Project Management and Advanced Systems Engineering\*
5. Lifecycle Processes and Systems Engineering
6. Concept Exploration and Systems Architecting
7. Requirements Development and Management
8. Developing and Implementing a SEMP
9. Transition, Product Delivery and Mission Operations
10. Space System Verification and Validation
11. Decision Analysis

\* *SELDP pre-requisites courses or their equivalents.*

### B.2 Other Recommended Courses:

1. Seven Axioms of Good Engineering – Learning from Failure
2. Risk Management

The following required leadership and communications courses will be provided to participants at Leadership Workshops during their SELDP year:

- Systems Thinking
- APM/ASE (<http://www.nasa.gov/offices/oc/appe/curriculum/core/475.html>)
- Crucial Conversations

The SELDP baseline set may be modified as influenced by strategic activities of the Agency or newly established best practices.

**B.3 OCE/APPEL Selected SE Curriculum for SELDP**

**Table 6. What Courses to Take and When for SELDP**

<b>Development Planning Matrix</b>				
	<b>Level 1</b>	<b>Level 2</b>	<b>Level 3</b>	<b>Level 4</b>
<b>LEVELS OF PROJECT LEADERSHIP</b>	<b>Team Practitioners/ Technical Engineers</b>	<b>Subsystem Leads</b>	<b>Project Managers/Project Systems Engineers</b>	<b>Program Managers/Project Systems or Chief Engineer</b>
<b>APPEL CORE COURSES</b>	<b>Foundations of Aerospace at NASA</b>	<b>Project Management and Systems Engineering</b>	<b>Advanced Project Management and Advanced Systems Engineering</b>	<b>Executive*</b>
<b>IN-DEPTH COURSES</b> are offered in various topic areas. These are guidelines as to when in an individual's career a course can be taken. individuals should attend courses to enhance competencies in current positions or for future development requirements.	<b>Systems Engineering</b>			
	<ul style="list-style-type: none"> <li>• Fundamentals of Systems Engineering</li> <li>• Life Cycle, Processes, and Systems Engineering</li> <li>• Requirements Development and Management</li> </ul>	<ul style="list-style-type: none"> <li>• Concept Exploration and Systems Architecture</li> <li>• Decision Analysis</li> <li>• Developing and Implementing SEMP</li> <li>• Space Systems V&amp;V</li> <li>• Transition, Product Delivery, and Mission Ops</li> </ul>		
	<b>Design and Innovation</b>			
		<ul style="list-style-type: none"> <li>• Innovative Design for Engineering Applications</li> <li>• Seven Axioms of Good Engineering</li> <li>• Space Systems Development: Lessons Learned</li> </ul>		
	<b>Technical—General</b>			
	<ul style="list-style-type: none"> <li>• Mars Mission System Design</li> <li>• Mars Mission System Design /Lab</li> </ul>			
<b>Developmental Work Assignments: (To Be Determined by Centers)</b>				
<b>Examples of Knowledge-Sharing Activities</b>				
These are only examples. Each Center/Individual should identify those experiences specific to Center needs.	<ul style="list-style-type: none"> <li>• Obtain a mentor</li> <li>• Attend a technical conference</li> <li>• Demonstrate working knowledge of Agency policy documents</li> <li>• Join national &amp; international affiliations or technical bodies (i.e., INCOSE, PMI)</li> </ul>	<ul style="list-style-type: none"> <li>• Write and present a technical paper</li> <li>• Attend the Masters Forum, PM Challenge, or other non-NASA conferences</li> </ul>	<ul style="list-style-type: none"> <li>• Write a technical paper and present it at the Master's Forum, PM Challenge or external NASA conference</li> <li>• Study case studies</li> </ul>	<ul style="list-style-type: none"> <li>• Become a mentor</li> <li>• Conduct storytelling sessions</li> <li>• Instruct or become a guest speaker at APPEL courses</li> <li>• Write an article in <i>ASK Magazine</i></li> </ul>

NASA SELDP Program Plan

**Table 7. APPEL SE Courses**

<b>APPEL SE Courses*</b>	
<b>Recommended SELDP Prerequisites</b>	
<b>Foundations of Aerospace At NASA (FOU)</b>	Addresses the meaning of working at NASA and the principles of technical excellence. Focuses on providing participants with a “big picture” overview of NASA, its history, mission, its Governance model and Agency operations. Focuses on communication and team participation skills.
<b>Project Management &amp; Systems Engineering (PM&amp;SE)</b>	Enhances proficiency in applying PM and SE processes/practices over the project life cycle. Focuses on defining and implementing system projects and provides valuable insight for managing and leading project and technical teams.
<b>Fundamentals of Systems Engineering (FSE)</b>	Introduces methods and techniques for a structured systems development process that proceeds from requirements to concept to production to operation is based on NPR 7123.1A and 7120.5D. Focuses on the interfaces between the people, processes, and products. Equips teams with knowledge necessary to realize successful solutions.
<b>Recommended SELDP Courses</b>	
<b>Advanced Project Management &amp; Systems Engineering (APM&amp;ASE)</b>	Focuses on advanced concepts of PM and SE and their integration in the management of all phases and facets of the project life cycle. Uses case studies to examine topics such as system architecting, performance, risk, cost, schedule, reliability and operability, stakeholder management and acquisition strategies. Provides knowledge to realize project solutions and leverage PM & SE roles and responsibilities defined in 7120.5D and 7123.1A.
<b>Additional APPEL SE Courses</b>	
<b>Concept Exploration &amp; System Architecting (CESA)</b>	Processes and tools for successfully performing up-front system engineering analysis. Includes defining system scope, acceptance criteria, creating context diagrams and developing case scenarios, and work on the synthesis of the first level architecture to meet customer objectives, requirements and constraints.
<b>Decision Analysis (DA)</b>	Designed to provide the tools necessary to improve the quality of a factually based decision-making process for resolving technical issues at NASA.
<b>Developing &amp; Implementing an SE Management Plan (SEMP)</b>	Introduces the processes that support planning, development and execution of a SE Management Plan (SEMP). Includes how SE deliverables are planned and managed. Participants experience SE technical reviews and appreciate the value of these “gates.”
<b>Earth, Moon, &amp; Mars (EMM)</b>	Introduces the remarkable discoveries of how these planetary bodies formed and the kinds of geologic processes that continue to operate on them today. Participants will also learn of the unique geologic challenges that the Moon and Mars pose to future exploration.
<b>Life Cycle, Processes and SE (LPSE)</b>	Introduces SE processes, NASA life-cycle phases, key technical reviews, and SE management techniques. Helps participants realize the value of well-established SE processes and deliverables.
<b>Design Lab (MMSD)</b>	Provides experience of conceptualizing and designing space missions to Mars or the Moon. Provides an integrated view of space mission design and operations.
<b>Requirements Development and Management (REQ)</b>	Provides a foundation for the development and management of project’s product requirements. Includes requirement best practices that help project team develop a product that delivers what is needed, on-time and within cost and expected quality.
<b>Seven Axioms of Good Engineering (SAGE) Case Study: Learning From Failure</b>	Promotes good engineering design and PM decision making via case studies and discussion. Promotes critical thinking and improves decision making among engineers, technologists, PM’s, and scientists.
<b>Space System Verification and Validation (SSVV)</b>	Demonstrates the processes, information, and tools necessary to implement a credible verification, integration and test program. Provides exposure to NASA and DoD standards, lessons learned, tools and experiences in validation and verification.
<b>Transition, Product Delivery and Mission Operations (TPDMO)</b>	Demonstrates the processes, procedures, and strategies necessary to implement effective product development, transition, delivery and operations.

\* Visit <http://www.nasa.gov/offices/oce/appe/curriculum/courses/329.html> for course descriptions

## **B.4 How to Register FOR APPEL-Sponsored Programs**

Complete self-registration for the Academy of Program/Project and Engineering Leadership (APPEL) courses through the SATERN online approval process. This can be found by using the link: <http://www.nasa.gov/offices/oce/appel/curriculum/core/17.html>

An estimate of travel and per diem expenses must be provided by the learner when registering for APPEL courses. Travel and per diem information is required for reporting to the Office of Personnel Management and it should be included in the Comments section for review. If this information is not included, the request will be denied and the employee will be required to re-register. SELDP does not pay for travel and per diem associated with APPEL courses.

**TO REGISTER FOLLOW THE INSTRUCTIONS AT:**

[http://appel.nasa.gov/items/satern\\_appel-lmd.pdf](http://appel.nasa.gov/items/satern_appel-lmd.pdf)

## **B.5 Developing Competencies for Success**

Competencies are the combination of knowledge, skills and abilities that contribute to individual and organizational performance. The APPEL developmental framework is based on a rigorous set of competencies that practitioners should have in order to perform their jobs. These competencies define the breadth and scope of the discipline and facilitate personnel development and assessment of individual knowledge and capabilities.

These competencies were derived from many sources including extensive interviews with several hundred highly successful project managers and system engineers at NASA. The resulting competencies were vetted with both internal and external organizations to ensure completeness and accuracy. Since the competencies form the foundation of the development program, they are under configuration control and are reviewed and updated as appropriate.

A key step for the NASA's technical practitioners is to understand the requirements of their roles and the related competencies. APPEL seeks to help practitioners refine their competencies in order to reach the highest level of performance.

Performance-level descriptions for each competency have been created to guide the overall development of individuals within the program/project and engineering disciplines. Visit the link below on the APPEL website's PM&SE Development Gateway to view the competency framework:

[http://www.nasa.gov/offices/oce/appel/pm-development/pm\\_se\\_competency\\_framework.html](http://www.nasa.gov/offices/oce/appel/pm-development/pm_se_competency_framework.html)

To further support individuals as they work to identify their appropriate development activities, APPEL provides the Course Competency Matrix in the 2010 APPEL Course Catalog on-line: [http://www.nasa.gov/pdf/390149main\\_2010\\_APPEL\\_Course\\_Catalog.pdf](http://www.nasa.gov/pdf/390149main_2010_APPEL_Course_Catalog.pdf)

This catalog can be used as a guide in the selection of courses based on competency development and individual learning needs. In addition to competencies, the matrix includes other course elements that may be of interest to individuals considering attending a particular course. The table represents a snapshot of all APPEL courses including the course duration, audience, and goal for each APPEL course.