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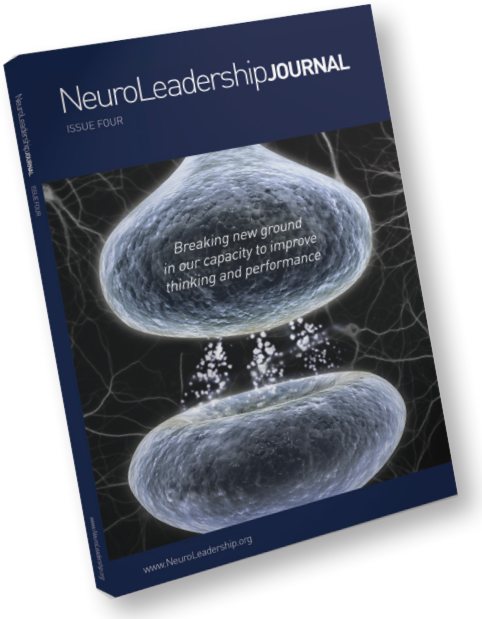

This article was published in the

NeuroLeadershipJOURNAL

ISSUE FOUR

www.NeuroLeadership.org

NeuroLeadership Journal (ISSN 2200-8535) Issue Four published in October 2012. We encourage readers to propose a paper for the next edition of this Journal. We recommend sending in a two-page proposal before submitting a finished paper and welcome pure science, as well as case studies and discussion pieces. For further information as to how to submit a paper for the next Journal go to www.NeuroLeadership.org

Mapping leadership behaviors to NeuroLeadership models: a NASA case study

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Background

The National Aeronautics and Space Administration (NASA) is a unique organization of almost 17,000 employees located on and off planet Earth. Its employees include nearly 11,000 engineers, among them systems engineers who are responsible for ensuring that hundreds of individuals and tens of thousands of parts all come together to ensure mission success.

Owing to the unique nature of the work done by each of NASA's 10 centers, systems engineers have many different and unique responsibilities. In NASA, most systems engineers tend to be experts in one or two engineering disciplines and have experience in only those parts of the engineering life cycle on which their center focuses. In most cases it is difficult for an engineer to gain the broad experience needed to become a highly effective chief engineer without going beyond his or her home center.

In 2008, NASA's leadership identified systems engineering as a critical core competency. In addition to most systems engineers not having broad experience, NASA leadership saw a number of additional factors that could have potentially adverse implications for future mission success. These factors included a large number of NASA's best systems engineers nearing retirement age; the fact that entire programs no longer resided in one culture or in a commonly understood set of processes; and underdeveloped leadership, creativity, communication, systems-thinking, and problem-solving skills in many systems engineers. It was these less tangible skills that NASA's leaders agreed were the key differentiators between good and great systems engineers.

The Office of the Chief Engineer was given responsibility for creating a program to accelerate the development of NASA's mid-level systems engineers and within six months the first 16 competitively selected systems engineers were chosen for NASA's Systems Engineering Leadership Development Program (SELDP). The goals of SELDP were to develop both the science and the art of systems engineering.

The science [i]: Provide the hands-on technical experience not available at the participant's location and expand their understanding of how systems engineering processes vary across centers.

The art [ii]: Provide cross-agency experience to learn the engineering culture of other centers and build targeted leadership skills and capabilities, including creativity, flexibility, critical thinking, and dealing with complexity.

The art of systems engineering

In order to build systems engineering knowledge, NASA had a number of technical training courses designed. The acceleration of technical expertise in SELDP was to be gained through hand-on assignments at other NASA centers that could provide the unique experience that had been missing in the individual's experience up to that point. Teaching individuals the art of systems engineering was going to be harder. Not only did many engineers not have leadership skills and capabilities, including creativity, flexibility, critical thinking, and dealing with complexity, but most did not acknowledge these skills as critical components of their jobs. For NASA engineers to accept these skills as important, they had to be shown as relevant to their work and to enabling mission success.

To accomplish this NASA conducted studies to ascertain the behaviors of highly regarded systems engineers, those whom their peers and NASA's leaders regarded as "go to" people. The NASA Systems Engineering Behavior Study involved interviewing, shadowing, and observing thirty-eight of NASA's most highly regarded systems engineers to determine the behaviors that helped to make them successful. These behaviors were sorted into groupings, or competencies. These competencies were further sorted into five prevailing themes:

- Leadership
- Attitudes and Attributes
- Communication
- Problem Solving and Systems Thinking
- Technical Acumen

Identifying and understanding these competencies and their associated behaviors allowed NASA to align all elements of the program in a single framework.

These studies of people who are respected and known to achieve mission success gave these behaviors and associated skills the relevance and connection to mission success needed to engage systems engineers in learning these skills. However, this was just the start. The second phase was to show these engineers how to specifically enable their leadership capabilities by improving individual and team performance. This included relating effective behaviors to the SCARF Model and NeuroLeadership domains in order to identify specific behaviors and needs in the moment. The neuroscience research behind this work provided an additional level of credibility to the skills we were attempting to develop in these leaders.

Introduction

The purpose of this case study is to illustrate the way NASA's leadership behaviors were mapped to current neuroscience of leadership models. The aim is to better understand the impact of what leaders do in terms of either enabling or inhibiting employee performance. The benefit of such an analysis is the identification of displayed leadership behaviors that can be used to maximize employee reward state response and improve employees' performance and organizational effectiveness.

This article reviews the NeuroLeadership domains and the SCARF model in particular, and then introduces NASA's executive leadership study from which the key leadership behaviors have been sourced. In the implementation of the program, participants were taught how these behaviors either inhibited or enabled others, using an understanding of neuroscience.

For this article these behaviors were individually assessed through the lens of the NeuroLeadership domains and the SCARF model in order to better understand how and why they were effective. The analysis uncovers some interesting insights that both reinforce the expected and provide new learning.

In this article the authors share learnings and the resulting adjustments made to the leadership development training program. Also addressed are insights into what would be done differently when conducting future large-scale leadership studies of this type. The case study concludes by asking for a consideration of the way these learnings may be applied in other organizations.

The aim is to better understand the impact of what leaders do in terms of either enabling or inhibiting employee performance.

Human resource training and organizational development business units are encouraged to look at their overall leadership development frameworks in the context of SCARF and the NeuroLeadership domains as a way to improve their overall developmental strategy and increase their return on investment.

It is also hoped that this research will inspire organizations to assess leaders' behaviors in the context of the SCARF model, or similar NeuroLeadership frameworks, which show the link between brain smart leadership development as a way to reduce the threat response and improve employee performance.

The NeuroLeadership domains

NeuroLeadership is the intersection of neuroscience and the neural basis of leadership and management practices (Ringleb & Rock, 2008). The field of NeuroLeadership has the objective of improving leadership effectiveness by evolving a science for leadership and leadership development, taking into account the physiology of the mind and the brain (Ringleb & Rock, 2008). It is, therefore, well placed as a tool for reviewing NASA's leadership behavior framework.

The neuroscience of leadership comprises four domains, which are commonly referred to as the NeuroLeadership domains (NLD):

Decision Making and Problem Solving

This domain seeks to explore the way neuroscience can support and illuminate traditional leadership research on problem-solving and decision-making.

Emotional Regulation

Staying cool under pressure and being able to be mindful as opposed to reactive.

Collaborating with and Influencing Others

This refers to social interactions, that is, the way in which individuals get along with others, and how to build trust.

Facilitating Change

Understanding the way in which individuals respond to, and can navigate, change and uncertainty.

The SCARF model reviewed

The SCARF model has been discussed in this journal on many occasions. This article, however, shows a practical use of the model in helping to develop leaders by revisiting the major components of this model to better understand the biology of how social behavior is driven. This is particularly important in relation to the way individuals collaborate with one another (Rock, 2008).

The five perceptions listed in the SCARF model are:

S	Status	The interpretation of comparative position to others/self in all domains of life
C	Certainty	Feeling confident in the happenings of the future, predicting and managing expectations.
A	Autonomy	The ability to influence and embark on self-determining actions, a sense of choice/control
R	Relatedness	The nature of the social relationship, a sense of connectedness or exclusion
F	Fairness	The perceived or actual interpretation of the equality of opportunity

Table 1: The SCARF model

These same social perceptions are linked to the behaviors of effective leaders because, when activated, these elements result in threat or reward responses.

Threat response
• Reduces the resources available for executive function in the prefrontal cortex. This results in a literal reduction in visual capacity which is associated with diminished creativity when collaborating or problem solving. • Reduces the capacity to receive perceived and subtle cues, which are beneficial in gaining insight and supporting complex problem solving. • Activates the amygdala which results in a "tendency to generalise more, which increases likelihood of accidental connection" (Rock, 2008, p. 3].

Reward response
• Encourages a sense of engagement, willingness to do things, think deeply about the issue at hand and take risks. • Closely linked to positive emotions, it increases dopamine levels which are beneficial to learning and growth. • Research indicates that people who are experiencing positive emotions are more creative and therefore perceive more options in problem solving, especially in relation to non-linear problems. This research also indicates that people who experience positive emotions collaborate more successfully (Frederickson, 2009).

Table 2: Threat/reward response displays (Rock, 2008)

Research method used in NASA studies

Since October 2008, NASA has shown a commitment to investigating and identifying the characteristics and behaviors frequently observed in highly regarded technical and executive leaders. Two comprehensive studies have been undertaken; the data gathered seeks to explore answers to the question: What are the behaviors and attributes that enable individuals to become successful executives at NASA?

The two studies were:

The NASA Systems Engineering Behavior Study, which included 38 people whom agency leadership considered highly regarded systems engineers.

The Executive Leadership at NASA: A Behavioral Framework, which included 14 NASA executives whom Agency leadership identified as highly effective in their roles, and who possessed a technical background or systems orientation that contributed to their success.

The methodologies for both these studies were the same. Each study consisted of interviews, and shadowing and/or observation of each of the executive participants.

The interviews that were conducted were recorded and lasted 60 to 90 minutes. The questions posed in the interviews were vetted and approved by the NASA Chief Engineer prior to the start of the study. Participants were asked identical questions, with follow-up questions based on initial answers. Interview questions were divided into two categories: context and relation to self and personal awareness.

The shadow process included a minimum of one day of observing executives performing their day-to-day activities. In addition, study team members were invited to meetings and events that executives were either leading or attending. The events observed included, but were not limited to, staff meetings, program, project or technical reviews, one-on-one discussions, brainstorming sessions, press interviews, and strategy meetings.

The data, that is, the observable behaviors/attributes that two or more executives exhibited or reported, were subsequently aggregated.

NASA study results

The results are clustered into elements within six broad themes as follows in Table 3:

Leadership Deals with structure, organization, resourcing; including self-awareness and ability to build trust.
Attitudes and Attributes **(Sub-theme Executive Presence)** Personal characteristics that create an effective work environment and engage stakeholders in supporting the organization.
Communication Ways of verbally and non-verbally engaging others and providing information to move the organization forward.
Problem Solving and Systems Thinking Ways of seeing the larger system at work and all its inter-connected parts. Mostly applied to technical problems.
Political Savvy Ways of dealing effectively with outside stakeholders.
Strategic Thinking Maintaining the agency-wide view and the broader implications on near and long term decisions.

Table 3: NASA Leadership behavior themes

This table gives the broader themes used to categorize observable behaviors.

At the Neuroleadership Conference held in 2010, NASA reported the results of these studies and their initial efforts to align them with the SCARF model and build training and development tools and techniques that are more brain friendly and effective. That initial effort led to collaboration with the Neuroleadership Group to expand this connection beyond the initial SCARF analysis and to also include the NeuroLeadership domains.

Research method of expanded study

The methodology for this article involved cross-referencing the leadership behavior framework as developed by NASA with the SCARF model and the NeuroLeadership domains.

Both NASA and NeuroLeadership Group (NLG) contributors allocated the most appropriate domain(s) and SCARF model dimension(s) to each leadership behavior independently based on the definitions in the *NeuroLeadership Journal* (NLJ) articles on SCARF (Rock, 2008) and the emerging field of NeuroLeadership (Ringleb & Rock, NLJ 2008).

Based on field work carried out with various organizations, NLG analyzed the element(s) of both SCARF and the NLD to determine what would be expected to be triggered by a particular behavior. On the other hand, NASA posed the question as to what behavior was most likely to be triggered or not triggered in others, for example:

- Was their ego stroked? – Status
- Did the information answer a question/need they had? – Certainty
- Did the executive allow the individual to decide how to do their job? – Autonomy
- Did the executive create a feeling of belonging? Build teamwork? Get to know the person better? – Relatedness
- Did the behavior give everyone equal opportunity? – Fairness

Each contributor's allocation was then cross-referenced and finalized for agreement. The table below shows the established allocation of both the NeuroLeadership domains and the SCARF model perceptions. The abbreviations used in the NASA Representative Observable Behaviors table (Table 5) are given in Table 4. A full outline of the Broad Themes and Observed Behavior Framework is available in the appendix.

Abb	Meaning
D&P	Decision Making and Problem Solving
ER	Emotional Regulation
C&I	Collaborating with and Influencing Others
FC	Facilitating Change
S	Status
C	Certainty
A	Autonomy
R	Relatedness
F	Fairness

Table 4: Abbreviations

Element	Representative Observable Behavior/Attribute
Leadership theme	
Develop employee capabilities (D&P) **(SCARF)**	• Provides resources, visible support and encouragement for employees to develop knowledge, skills and competencies. **Autonomy** • Identifies and encourages employees with talent, potential and the ability to take a system-wide view to problem-solving. **Certainty/Autonomy** • Provides employee work assignments and training opportunities that address critical developmental needs. **Certainty/Fairness** • Meets privately with employees to review performance and discuss work strategies. **Status/Relatedness** • Provides employees with constructive feedback on performance by exploring employees' thought and decision-making processes and helping them discover insights. **Autonomy** • Delivers corrective feedback on individual performance privately, and in a manner that is objective and non-judgmental. **Fairness/Relatedness**
Reduces distractions (ER) **(CR)**	• Deals personally with issues and problems that would otherwise be a source of distraction to project team members. Asks team members, "How can I help? What is getting in the way of your work?" **Certainty/Relatedness** • Negotiates time and resource issues on behalf of project team members. **Certainty**
Attitudes and Attributes theme	
Let go of current role to prepare for new one (FC)(ER) **(SA)**	• Intentionally chooses to move into leadership and to stop being technical expert. **Autonomy/Status** • Willing to relinquish familiar job functions and develop the skills and knowledge necessary to grow and advance to the next level of leadership. **Autonomy/Status**
Communication theme	
Strive for clarity and ensure understanding (C&I) **(CR)**	• Realizes that clarity is critical to providing facts in a way that ensures that understanding is reached. **Certainty** • Uses clear language to be sure everyone knows what is meant and has a shared understanding. **Certainty** • Compares and contrasts ideas, e.g. "if this then … if that then." **Certainty** • Summarizes decisions and agreements at meetings. **Certainty** • Practices active listening. Solicits feedback to check that others receive messages that were transmitted. May ask staff to repeat in their own words what was said. When person is more senior, may check with that person's staff to ensure receipt of intended message. (HQ) **Certainty/Relatedness** • Aligns verbal and non-verbal messages to ensure the meanings are clear and unambiguous. Ensures consistency between written charts and verbal communications. **Certainty** • Makes certain that meeting formats are consistent with their purpose, e.g. brainstorming, working an issue, information sharing, decision-making, etc. Ensures those in attendance know why they are there. **Certainty**
Problem Solving and Systems Thinking theme	
Find connections and patterns (D&P) **(C)**	• Examines and explores the implications of the way technical decisions will affect the larger system architecture. **Certainty** • Observes system interfaces and the ripple effect of how changing requirements or how making a change to one element will affect other elements or the system. **Certainty** • Locates and corrects subsystem 'disconnects' or 'inconsistencies' that are having a negative impact on system performance. **Certainty**

Element	Representative Observable Behavior/Attribute
Consider all options before deciding (D&P) **(CA)**	• Works to understand a problem from all perspectives. Actively seeks and weighs up different perspectives. Open and willing to listen to multiple views. **Certainty/Autonomy** • Is highly inclusive, drawing on the full knowledge, skills, and experiences of the organization. **Certainty/Autonomy** • Considers all types of cost (e.g. technical, schedule, political, human, financial). **Certainty** • Identifies what will enable or inhibit the ability to accomplish goals. Looks at all aspects of the organizational system, e.g. facilities, budgets, policies, procedures, etc. Asks: "What would happen if I did nothing?" "What is the worst thing that could happen?" **Certainty** • Understands there is always more than one solution. **Certainty/Autonomy** • Comes up with several solutions, defines the consequences of each and relates effects to managers and employees. **Certainty/Autonomy**
Political Savvy theme	
Know how the political system works (D&P) **(SR)**	• Knows who makes decisions and what they need. Keeps up to date with new Members of Congress and staff and relies on NASA's Congressional experts to represent the agency in the best light. (HQ) **Status/Relatedness** • Has a keen sense of timing when opportunities arise. Understands how some opportunities are short-lived and quick action is needed. **Relatedness** • Knows how to present a design to show near-term gains that will meet current Administration and Congressional goals, while building on a longer-term accomplishment that might be realized over a number of Administrations. **Status/Relatedness**
Strategic Thinking theme	
Maintain an organization-wide view (D&P) **(CRF)**	• Ensures that NASA has a plan moving forward to maintain both the competencies and capabilities needed to be successful. **Certainty** • Intentionally selects people with different perspectives, talents and knowledge to form a strong management team. **Certainty/Fairness** • Assimilates large amounts of information from across the agency. Makes decisions by keeping the big picture in mind. Considers all perspectives and proposed solutions before making a decision. **Certainty/Relatedness** • Decisions are balanced across programs and projects. **Fairness** • Works the larger agency-wide "trade space" to meet NASA's and the nation's highest priorities. Trades are made across missions and/or centers and may involve negotiations across federal agencies. **Fairness/Certainty**

Table 5: Example of NASA Leadership Behaviors (see appendix for complete Broad Themes and Observable Behaviors framework)

Data analysis

The SCARF model allocations depict the perceptions that certain behaviors elicit, such as a sense of autonomy. The NeuroLeadership domains indicate the leadership behavior that was displayed to produce such a response. These are the behaviors that can be learned so as to engender the most conducive performance response in peers, subordinates and the leaders themselves.

Frequency of appearance

SCARF		%
Status	15	13
Certainty	41	37
Autonomy	17	15
Relatedness	30	27
Fairness	9	8
	112	

NL DOMAINS		%
Decision Making & Problem Solving	25	40
Emotional Regulation	10	16
Collaborating with and Influencing Others	19	31
Facilitating Change	8	13
	62	

Table 6: SCARF and NeuroLeadership domains' frequency of appearance

The behavior studies targeted NASA's high performing executives with systems engineering experience. The job of a systems engineer is to ensure that everything works together and to reduce the risk of failure.

The behavior studies targeted NASA's high performing executives with systems engineering experience.

Reducing risk and ensuring safety are paramount in NASA's high risk environment; therefore, the fact that 37% of the leadership behavior in the SCARF model addresses the need for certainty is both expected and reassuring. Within NASA's leadership behavior theme of Problem Solving and Systems Thinking, close to 100% of the behaviors observed support a sense of certainty; these include:

- thinks systemically and identifies and defines core issues/problems
- actively probes for information and understanding
- validates facts, information and assumptions
- acknowledges and manages uncertainty and
- remains open-minded and objective

Behaviors within the Leadership theme, such as creates organizational structure, gauges resource needs to achieve mission objectives, acts decisively and is aware of self and values also support certainty. Within the theme of Attitudes and Attributes, behaviors such as being patient and organized also strongly influence a certainty response. In addition, within the Communication theme ensuring understanding and striving for clarity powerfully influence a sense of certainty, as do encouraging participation and leaders who link people, organizations and ideas.

The second highest SCARF perception identified in the leadership behaviors is relatedness, at 27%. All the work reflected in these studies is done in teams where relationships are essential, again an expected and encouraging outcome.

In the study, "Executive Leadership at NASA: A Behavioral Framework", Williams, Derro, Jarvis, and Morris, (2010) contend that the identified behaviors of highly effective NASA technical executives are mainly relational – an assertion that Boyatzis (2009) might agree with. In a *Journal of Management Development* special issue, he laid the theoretical groundwork for understanding competencies as a behavioral approach to emotional and social intelligence.

A large majority of the behavior identified in the Political Savvy leadership theme speaks to a perception of relatedness. This includes knowing how the political system works, having political staying power, managing multiple demands/opportunities and providing historical perspective. In addition, many of these behaviors also address need for certainty in the SCARF model.

It is interesting to observe that only 8% of observed behaviors associated with the SCARF model address the need for perceived fairness. This may perhaps be influenced by the culture of the organization or the nature of the work area observed. These results provide an opportunity for further investigation.

The majority of behaviors assigned to the NeuroLeadership domains fall under decision-making and problem-solving at 40%, with an additional 13% assigned to facilitating change. NASA's Leadership Development team sees a strong relationship between both of these areas and believes they require similar behaviors and skills. These behaviors logically fit under the themes of Leadership, Attitude and Attributes, Problem Solving and Systems Thinking in NASA's leadership framework, whereas facilitating change lands firmly in the theme of Political Savvy.

...behaviors such as being patient and organized also strongly influence a certainty response.

There is also a connection between the NeuroLeadership domains and the SCARF model in that 31% of behaviors fall within Collaborating and Influencing Others in the NeuroLeadership domains and 27% in the SCARF model's building relatedness. Again NASA's Leadership Development team confirms these learnings as a trend it has observed in leaders and it is promising to see this confirmed by applying the NeuroLeadership domains and SCARF models to a live case study.

In this instance (and we are unsure if this is always the case), all leadership behaviors could be mapped across to at least one of the SCARF elements and a NeuroLeadership

domain. The nature of NASA as an organization is such that there is an overriding requirement for certainty and, as this is so essential, it may be a reason for the dominance of this SCARF area. Similarly, sound decision-making and problem-solving is essential. It would be interesting to note the weighting of the SCARF elements in different types of organization.

Chart 1: NeuroLeadership domain percentages

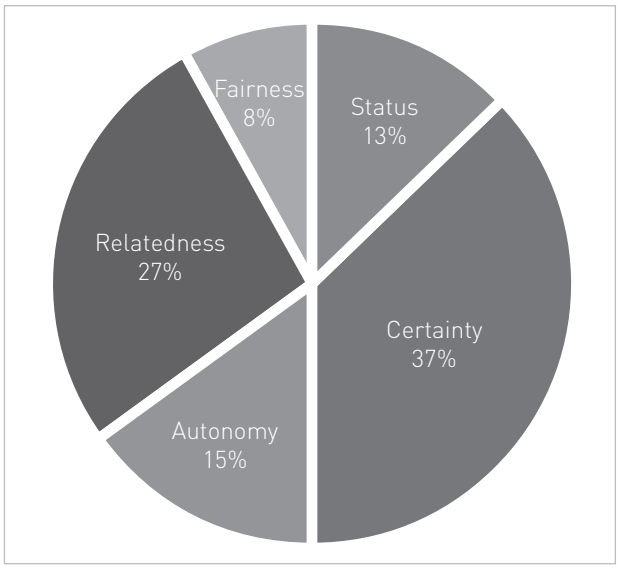

Chart 2: SCARF Percentages

Discussion: The information harvested has aided in the development of leadership training initiatives that encourage the accelerated learning of these targeted and highly desirable skills and behaviors, creating proven future leaders for the organization. This framework provides a development and performance management tool by means of which an individual's performance can be planned and tracked.

The behaviors cited in this study were seen to be effective in the NASA culture. These behaviors can be taught and used effectively in training situations, coaching and mentoring and have been incorporated into the NASA Systems Engineering Leadership Development Program (SELDP).

Taking a defined skill such as communication, and breaking it down to what it specifically looks like when displayed well, has been very effective. Seeing an actual behavior takes the guesswork out of the process. In the past leaders might have been told "you need to communicate more" and they would consequently have done more of what they already did, which may or may not be what was needed. Now leaders can be taught how to communicate. As many of these behaviors are not what they do naturally, coaching and mentoring is helpful in providing practice and getting leaders comfortable with the new behavior.

The NASA Systems Engineering Behaviors Study formed the basis for a 360-degree assessment instrument that is used at the start of each program year. This assessment helps participants to understand how extensively they are applying these effective systems engineering behaviors. They then use the results of this assessment to identify areas for improvement, incorporating these into their coaching goals for the year.

...coaching and mentoring is helpful in providing practice and getting leaders comfortable with the new behavior.

Participants are also asked to take the SCARF assessment online to better understand what drives them personally, increasing awareness of any bias or blind spots. In the debrief of their SCARF results the participants discuss the systems engineering behaviors in relation to the SCARF model to better understand those behaviors that motivate themselves and others. The participants also review behaviors that evoke the threat response and discuss the impact of that on productivity and creativity.

This brain smart technique is only one of the many that the NASA SELDP has implemented. The idea was to change the way NASA provided information in order to help employees absorb and adopt it quickly. The goal was to work with, rather than against, people's biology.

Implications for practice in designing learning activities

The NASA SELDP has not changed the "what" but the "how" leaders are trained and developed.

In addition to the focus on behaviors, NASA made other changes in the way they designed leadership development so as to align it to more recent NeuroLeadership learnings:

Creating and reinforcing a path by training participants in a number of skills but using only a few core model

In each element of the training NASA explicitly connects the learning to what it has learned from the models; thus explaining how each piece is an extension of what was previously learned and how it fits together to create a learning system "picture" from a number of disconnected parts. Seeing the system has made it easier for participants to retain and use the information because they are not using cognitive short-term energy to learn something new each time. Using a systems approach that engineers are familiar with therefore makes for more effective retention and recall.

Practice is paramount. NASA has participants read information (that would normally be provided in a lecture) ahead of time. The time with the participants is then used to reintroduce the ideas and models and practice using the information or tools together. The idea is to push the information into long-term memory as quickly as possible through practice and in the process build relationships with their classmates through the shared learning experience.

At the start of the program each participant is provided with a journal. Then, after a learning element has been completed, participants are given time to reflect and capture their ideas (insights) and identify their next steps.

Sessions have been shortened, breaking elements down so they fit into 60 to 120-minute segments. This adds to participants' physical and mental comfort, thus relieving stress and enabling them to focus.

Trainers facilitate solution-focused discussions, using coaching questions to shift the discussion from the problem to what could be. This change is intended to start focusing on capturing insights and designing a way forward versus allowing the participants to get stuck in the problem.

Relatedness is a central theme in the groundwork for each program, with significant time being invested in participants getting to know each other. Discussions are focused on reinforcing the message that this is a practice field, a place to make all their mistakes and learn to improve (not a place where ego/status has a role). Participants are coached publicly to enhance trust in each other and reduce threat, which results in participants taking more chances and learning more quickly.

Unsurprisingly the threat response most common to engineers is the lack of certainty. This makes sense when appreciating that an engineer's world is focused on eliminating the unknown and thus reducing risk. As a result an area that the program designers focus on is providing details, including schedules, processes and program parameters. This has been found to help the participants focus on the learning rather than worry about program logistics.

Trainers facilitate solution-focused discussions, using coaching questions to shift the discussion from the problem to what could be.

The program has a number of elements that are common to everyone but there are two areas – developmental assignments and coaching – where participants' individuality and unique needs are the primary focus. This is where their need for autonomy is addressed and participants have a significant say in how these two elements are designed and executed. Coaching is based on a 360-degree assessment instrument that has been created from the effective behaviors identified in this article.

NASA also focuses on the actual physical learning environment. This includes a number of environmental factors, but the two that have shown to affect individuals' ability to focus are learning spaces with natural light (windows) and food that is "brain" friendly, including more protein, less carbohydrates, more water, and less coffee.

Lessons learned

The initial behavior study involved just 14 executives in one organization, NASA. Observation time with executives was limited and observers were unable to see how all executives behaved in all relevant work situations. Accordingly, only those behaviors noted by all observers were included in the final report. Recently, a validation study of several hundred executives across the aerospace sector has been completed. This study, along with the other behavior studies noted above, can be found on the NASA website at: http://www.nasa.gov/offices/oce/appel/seldp/resources/index.html

Preliminary results from the validation study found that 80% or more of international technical leaders (including government, industry and non-profit organizations) surveyed reported that the following seven behaviors were deemed important or very important (these behaviors are also highlighted in the appendix):

8. Develop employee capabilities (SCARF)(D&P)
21a. Strive for clarity (CR)(C&I)
38. Validate facts, information and assumptions (C)(D&P)
41. Acknowledge and manage uncertainty (SC)(ER)
42. Remain open-minded and objective (CR)(ER)
50. Maintain organization-wide view (CRF)(D&P)
51. Manage near-term and long-term goals (CR)(D&P)

This would be a useful study to analyze further.

Implications for future research

Some key learnings from this study included the high need for certainty within NASA, and the constant elimination of uncertainty – even more than was expected. It was also interesting to note that some behaviors crossed over multiple SCARF elements and NLDs. Moreover, areas like innovation and creativity seemed to be more complex to categorize. Questions to consider further include:

Will different types of organization emphasize different elements of SCARF?

Will outcomes be similar for any organization?

Are SCARF and the NLDs so generic that any leadership behavior could be linked to them?

Could organizations use SCARF and the NLDs to prepare their leadership development frameworks?

Will different types of organization emphasize different elements of SCARF?

Conclusion

This case study has displayed how leadership behaviors can be successfully mapped to current neuroscience leadership models. The aim of this paper has been to create a better understanding of the way leaders enable or inhibit employee performance and how these learnings can be incorporated into corporate training development initiatives.

This purpose has been achieved by using the NASA Executive Leadership Behavior Framework as the focal point for comparison with both the SCARF model and the NeuroLeadership domains.

The benefit of such an analysis is the identification of displayed leadership behaviors. The results of this analysis can be used to maximize employee reward state response and improve productivity and organizational performance. Through training around models, for example SCARF, and coaching and mentoring, more productive behaviors and greater organizational effectiveness can be achieved.

Acknowledgements

Thank you to the NASA executives and leadership team for being part of this case study and giving permission for the use of this data. In particular we would like to thank Dr. Michael Ryschkewitsch, NASA Chief Engineer and Dr. Edward Hoffman, Director of the NASA Academy of Program, Project and Engineering Leadership. Also, thank you to David Rock for the creation of NeuroLeadership and SCARF and to Annalise Roache for collaboration on the documentation of this initiative.

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Appendix

Element		Representative Observable Behavior/Attribute
		Leadership theme
1.	Creates organizational infrastructure (D&P) **(SCF)**	• Identifies the specific combination of skills, talents and technical competencies required to achieve mission success. **Certainty** • Defines the roles and responsibilities of team members. **Status/Certainty** • Assigns roles and responsibilities and evaluates performance based on team members' current capabilities and prior work experiences. **Fairness** • Designs and implements standard operating procedures that enable a smooth, consistent and coordinated workflow. **Certainty**
2.	Gauges resource needs to achieve mission objectives (D&P) **(SC)**	• Identifies human, financial and material resource requirements in consultation with subject matter experts and project owners. **Certainty/Status** • Ensures that mission goals and outcomes are achievable given available resources. **Certainty**
3.	Manages at the appropriate level (D&P) (C&I) (FC) **(SCAF)**	• Makes executive-level decisions, but delegates problem-solving to the appropriate functional teams and system owners. **Autonomy/Status** • Enables others to get work done. **Autonomy** • Holds others accountable for their assigned deliverables. **Autonomy/Fairness** • Gathers information from stakeholders and experts at all levels when making decisions that can only be made at the executive level. **Autonomy** • Sets the context for decisions—the "what" and the "how". **Certainty**
4.	Accepts change and is resilient (MC) **(CA)**	• Demonstrates flexibility and responsiveness to changing priorities and critical needs. **Autonomy** • Monitors the environment for changes in required outcomes, critical assumptions, available resources, or other factors that could necessitate a change in strategy. **Certainty/Autonomy** • Adjusts direction, strategy, roles, responsibilities and/or schedule to ensure critical organizational needs are met. **Certainty/Autonomy**
5.	Acts decisively (D&P) **(CA)**	• Identifies decisions that are critical, non-critical, and important to avoid. **Certainty/Autonomy** • Identifies and puts parameters around the amount of information needed to make a given decision. **Certainty/Autonomy** • Makes timely decisions based on experience, resource constraints and available information. **Certainty**
6.	Inspires and motivates team Inspires and motivates team members to perform at peak performance (C&I) **(SCARF)**	• Encourages team members to accept new challenges and perform to the best of ability in finding solutions to seemingly insurmountable problems. **Autonomy/Relatedness** • Promotes creativity and intelligent risk-taking. **Autonomy** • Challenges others to ask questions and think "outside the box". **Autonomy** • Helps team members maintain a positive attitude and progress toward goals and outcomes when facing adversity while acknowledging threats and challenges. **Relatedness** • Monitors, tracks and communicates progress. **Certainty** • Evaluates strategies on the basis of outcomes. **Fairness** • Publicly acknowledges team members' accomplishments and areas of expertise. **Status** • Provides informal praise (verbal, email, thank you card, etc.) for individual and group accomplishments. **Status/Relatedness** • Provides appropriate formal rewards and recognition for good performance. **Fairness/Status**

Element		Representative Observable Behavior/Attribute
7.	Builds Trust and Respects Confidentiality (C&I) **(SCARF]**	• Trusts others' expertise and judgment. **Autonomy/Relatedness** • Re-evaluates assumptions, judgments, and strategies based on input from subject matter experts and stakeholders. **Fairness /Status** • Designs and implements communication processes that ensure the fair and objective evaluation of ideas and opinions. **Fairness /Certainty** • During individual and group discussions, identifies proprietary information and reaches agreement with participants on how the information should be managed. **Certainty/Relatedness**
8.	Develop Employee Capabilities (D&P) **(SCARF)**	• Provides resources, visible support and encouragement to employees to develop knowledge, skills and competencies. **Autonomy** • Identifies and encourages employees with talent, potential and the ability to take a system-wide view of problem-solving. **Certainty/Autonomy** • Provides employee work assignments and training opportunities that address critical developmental needs. **Certainty/Fairness** • Meets privately with employees to review performance and discuss work strategies. **Status/Relatedness** • Provides employees with constructive feedback on performance by exploring employees' thought and decision-making processes and helping them discover insights. **Autonomy** • Delivers corrective feedback on individual performance privately, and in a manner that is objective and non-judgmental. **Fairness/Relatedness**
9.	Reduces distractions (ER) **(CR)**	• Deals personally with issues and problems that would otherwise be a source of distraction to project team members. Asks team members, "How can I help? What is getting in the way of your work?" **Certainty/Relatedness** • Negotiates on time and resource issues on behalf of project team members. **Certainty**
10.	/s aware of self and values (ER) **(SCR)**	• Knows personal strengths, limitations and motivations. **Status** (because they rely on other's expertise where they are weak) • Knows when others need to be consulted. Understands that "getting it right" is always more important than "being right". **Certainty/Status** • Is aware that blind spots or biases might exist in own thinking and asks others to keep him aware of other perspectives. **Certainty/Status** • Adheres to a strong set of values that align with agency's mission and purpose. **Certainty/Relatedness** (Know where he/she stands and engages others with shared values) • Articulates values so others understand one's perspectives and positions. **Certainty/Relatedness**
11.	Develops self (D&P) **(SCAR)**	• Maintains basic working knowledge of technical disciplines. **Autonomy** • Maintains contact with current engineers and engineering projects. Seeks opportunities to interact with them and perform limited 'hands-on' work. **Autonomy/Relatedness/Status** • Conducts benchmarking of engineering organizations performing cutting-edge engineering work and asks, "How do they do that?" **Autonomy/Certainty** (creating a way forward for the future) • Judiciously learns what is required in each new position and what it takes to be a successful government executive. Talks to and observes those who do the job best. **Certainty** • Develops a learning plan to gain the knowledge, skills and abilities needed to be successful at each new level. **Certainty**
12.	Lets go of current role to prepare for new one (FC)(ER) **(SA)**	• Intentionally chooses to move into leadership and stop being a technical expert. **Autonomy/Status** • Willing to relinquish familiar job functions and develop the skills and knowledge necessary to grow and advance to the next level of leadership. **Autonomy/Status**

Element		Representative Observable Behavior/Attribute
		Attitudes and Attributes theme
13.	Remains inquisitive and curious (D&P) (C&I) **(A)**	• Has an ongoing passion for learning, enhancing knowledge, skills and experience in both technical and non-technical subjects. **Autonomy** (Designing their own future) • Participates in a wide variety of formal and informal learning opportunities. **Autonomy** • Continually asks questions and probes for information. **Autonomy**
14.	Is patient (ER) **(SCA)**	• Understands that high-performing social and technical systems take time to develop. **Certainty** (managing expectations) • Manages and oversees key system functions, but allows other elements of the system to evolve and stabilize over time. **Autonomy** • Maintains commitment to chosen path or strategy, even when long-term results are not yet evident. **Certainty** • Is patient and open-minded when presented with new approaches or problem-solving strategies. **Status**
15.	Is organized (D&P) **(C)**	• Can manage large and complex systems, process extensive amounts of data, and rapidly explore the costs and benefits of a number of alternative strategies. **Certainty** • Effectively compartmentalizes, prioritizes, schedules, delegates, completes and evaluates the outcome of activities associated with the executive role. **Certainty** • Makes full use of IT tools and technologies to help organize calendar and decisions. **Certainty**
		Executive Presence (sub theme)
16.	Displays self-confidence and courage (C&I) **(SCARF)**	• Exhibits confidence in technical knowledge, skills, and ability to lead and achieve goals. **Status** • Identifies the difficult issues, e.g. "the elephant in the room". **Certainty/Relatedness** • Willing to be controversial. Fearlessly questions decisions even when in the minority or standing alone. Willing to disagree or push back on senior leadership. **Autonomy/Relatedness Status** • Willing to make difficult decisions by listening to others and then acting as final arbiter. **Fairness**
17.	Remains Calm under Pressure (ER) **(CR)**	• Manages organizational pressures while maintaining team and organizational momentum by identifying the difficult issues and focusing on the solution. • Maintains perspective and a positive attitude in the face of adversity and avoids being defeated by setbacks by focusing on solutions. Holds the belief that "we will get past the problem, in the best way possible, to achieve the greater good." **Certainty/Relatedness**
18.	Aware of How Personal Presence and Behavior Affects Others (ER)(C&I) **(SAR)**	• Maintains a high degree of physical energy throughout the day. **Status/Relatedness** • Walks in with a no-nonsense style, e.g. "We have a job to do. Let's not waste time". Friendly, but to the point. **Status** • Is aware that others will tend to defer based on executive's position. Encourages others to state opinions in order to get the best solution. **Autonomy/Relatedness/Status** • Creates a safe environment that helps others feel comfortable by, for example, shaking hands, smiling, addressing people by their first names, referring to their previous work, showing humility, letting others take the lead, and engaging others by asking questions. **Relatedness**

Element		Representative Observable Behavior/Attribute
		Communication theme
19.	Communicates throughout the organization (C&I) **(SCA)**	Ensures important information is communicated to stakeholders throughout organization. **Certainty** • Communicates downward and laterally by disseminating information on priorities, interdependencies, impacts and lessons learned. **Certainty/Autonomy** • Communicates appropriate amount and type of information upward. **Status** • Where appropriate, helps individuals and organizations gain access to information needed to perform their work effectively. **Autonomy**
20.	Tailors messages (C&I) **(SR)**	• Understands how different audiences interpret information. **Relatedness** • Expertly tailors and delivers messages to meet the needs of specific audiences such as the media, Capitol Hill, or other key stakeholders. **Relatedness/Status** • Can speak the language of multiple disciplines, i.e. finance, personnel, legal, etc. Consciously and continually learns to communicate with representatives from all functional areas. (HQ) **Relatedness** • Knows how to translate information on complex technical programs into non-technical language. Talks to a congressional staffer in the language of Congress; talks to OMB staff in the language of the budget, etc. (HQ) **Relatedness** • Uses audience-appropriate analogies from discipline when speaking to engineers and analogies from home and office when communicating with non-technical people. **Relatedness**
21.	a. Strives for clarity (C&I) **(CR)** b. Ensures understanding	• Realizes that clarity is critical to providing facts in a way that ensures that understanding is reached. **Certainty** • Uses clear language to be sure everyone knows what is meant and has a shared understanding. • Compares and contrasts ideas, e.g. "if this then … if that then". **Certainty** • Summarizes decisions and agreements at meetings. **Certainty** • Practices active listening. Solicits feedback to check that others receive the messages that were transmitted. May ask staff to repeat in their own words what was said. When person is more senior, may check with that person's staff to ensure receipt of intended message. (HQ) **Certainty/Relatedness** • Aligns verbal and non-verbal messages to ensure the meanings are clear and unambiguous. Ensures consistency between written charts and verbal communications. **Certainty** • Makes certain that meeting formats are consistent in their purpose, e.g. brainstorming, working an issue, information sharing, decision-making, etc. Ensures those in attendance know why they are there. **Certainty**
22.	Assesses context (ER) **(AR)**	• Knows when and how often to communicate. Assesses the context before speaking. Senses others' needs to argue a point, vent a frustration, solicit feedback, etc. and responds accordingly. **Relatedness/Autonomy** • Knows what the right level of communication is for each situation. Strikes the right balance in communicating what is needed, but not more. **Relatedness**
23.	Uses humor (C&I) **(R)**	• Uses humor to build rapport with individuals and groups and to reduce fear and anxiety among team members. **Relatedness** • Keeps the atmosphere light as appropriate when dealing with difficult or challenging issues. **Relatedness** • May joke, share personal or humorous anecdotes or make self-effacing comments during or starting meetings. **Relatedness** • Smiles and remains energetic, animated and attentive during discussions. **Relatedness**

Element		Representative Observable Behavior/Attribute
24.	Practices effective speaking and listening skills (C&I) **(SCAR)**	• Continually demonstrates effective speaking and listening skills (e.g. turn-taking, paraphrasing, asking questions, etc.) to ensure a productive exchange of information and ideas. **Relatedness** • Listens effectively and gives individuals full attention. Ends conversations with a summary of actions, due dates, and who is responsible. **Relatedness/Certainty** • Sits back and lets the debate happen. Listens to all the various perspectives and then takes action. **Relatedness/Status/Autonomy** • Mentors others to help them become better communicators. Explains how others could potentially misinterpret an imprecise statement. **Relatedness/Status**
25.	Communicates through storytelling and analogies (C&I) **(R)**	• Uses personal experience, organizational stories and analogies to explain challenges, issues and situations. **Relatedness** • Uses historical references (e.g. Lewis and Clark and their scientific and research goals). **Relatedness** • Discusses the history of NASA (e.g. how the field centers came into being) to illustrate the importance of cultural differences and approaches. **Relatedness**
26.	Links people, organizations and ideas (C&I) **(SC)**	• Makes transition from a program- or project-level systems engineer who concentrates on how technical systems interface to an executive who focuses primarily on how to get people to connect and work effectively together. **Status** of self • Establishes a common infrastructure and provides necessary resources. **Certainty** • Conducts effective meetings. Knows who should be at meetings (individuals/groups) and inquires about those who are missing. Avoids making final decisions until key stakeholders are available. **Certainty/Status** of others • Uses a variety of communication channels to maintain contact with individuals/groups throughout the day. Will track down experts mentioned in meetings to get their opinion on an issue. **Certainty/Status** of others • For important decisions requiring consensus, asks each stakeholder to confirm support and/or present objections until consensus is reached. **Certainty/Status** of others
27.	Encourages participation (C&I) **(SCARF)**	• Uses facilitation, coaching, and dialogue skills to ensure all opinions are solicited, points of view are shared and everyone has the opportunity to participate. **Certainty/Fairness** • Asks open-ended questions, e.g. "What do you think?" vs. "Do you agree or disagree?" **Certainty/Status /Autonomy** • Uses authority (positional, expert, etc.) to facilitate the structure and flow of meetings to provide opportunities for all to participate. **Certainty/Fairness** • Senses when opinions are being suppressed; takes steps to solicit that input. **Certainty/Relatedness** • Avoids overusing email or any one mode of communication. **Certainty/Relatedness**
28.	Seeks expert opinion (D&P) **(SAR)**	• Willing to admit what one does not know and seek out technical experts for their opinion. Openly says, "I don't know". **Status** • Intentionally identifies and builds networks of experts to call on. Takes time to determine the best expert for a particular problem. **Relatedness/Status** • Provides approaches, ideas and strategies to help others reach their goal but leaves the decision to those responsible. Does not dictate solutions. **Autonomy**

Element		Representative Observable Behavior/Attribute
29.	Builds consensus (C&I) **(CR)**	• Connects people, organizations and ideas to build shared understanding and consensus by ensuring participation and buy-in. Ensures all stakeholders participate. **Relatedness** • Facilitates discussion. Listens to different perspectives and ensures everyone is heard. Will restate or rephrase a point someone has made to ensure that everyone understands what was said. **Relatedness/Certainty** • Keeps the conversation going until there is a convergence of ideas. **Relatedness** • Does not assume understanding. Summarizes agreements and ensures they are communicated. **Certainty** • Looks for common, unifying goals. Integrates perspectives into the big picture. Openly and honestly explains the rationale for moving in a given direction. **Relatedness** • Strategically builds and utilizes formal and informal networks. **Relatedness**
30.	Builds relationships through interaction (C&I) **(R)**	• Enjoys interacting and working with other people. Has very good interpersonal skills. **Relatedness** • Uses "We need to ..." to correct someone rather than "You need to..." (HQ) **Relatedness** • Devotes a portion of conversations to non-work issues. **Relatedness** • Stays focused on the individual/speaker and shows genuine interest. **Relatedness** • Rarely holds side conversations or lets Blackberry be distractive. **Relatedness** • Strives to end meetings and conversations on an upbeat/positive note. **Relatedness**
31.	Demonstrates accessibility (ER)(C&I **(SCARF)**	• Expresses availability to discuss issues, questions and concerns. **Relatedness** • Has a strong focus on schedule and being available for important events. (HQ) **Status** of self • Gives people the time they need to explain the issue, tell their story, etc. Does not rush others. Does not show impatience. Willing to engage in hallway or parking lot conversations. **Relatedness** • Includes staff in meetings. Ensures anyone who wants to be included is included. **Fairness** • When issues are brought up, ensures actions are taken to address them. **Certainty** • Makes room on calendar to meet with others. Finds "15 minutes on calendar" for same day meetings. Allows for drop-ins and responds positively. Creates a climate where people feel they are allowed to "drop by." **Relatedness/Status/Autonomy**
Problem Solving and Systems Thinking theme		
32.	Uses a systems perspective (D&P) **(C)**	• Uses systems thinking in strategy development and to see entire agency-wide system. **Certainty** • Applies systems engineering principles to mission/programs that have significant political, social and economic implications. **Certainty** • Applies a systems perspective in the performance of executive roles and responsibilities. **Certainty**

Element		Representative Observable Behavior/Attribute
33.	Thinks systemically (D&P) **(C)**	• Can look at a problem within multiple frameworks (e.g. 'change of variables'). **Certainty** • Able to look deeply into a problem while remaining focused on the big picture. Sees the big-picture while demonstrating an overall awareness of the details. **Certainty** • Able to look at all the pieces individually and collectively to meet program, mission and agency-wide needs, and to identify gaps and overlaps/duplications. **Certainty** • Sees multi-view representations of systems to understand how the pieces fit together and interact. Visualizes systems in 3-D. Draws a picture in the mind or on paper. **Certainty** • Focused on developing a system that meets end-item product objectives and successfully integrates the system's parts into the whole. **Certainty** • Understands how the system works, what it was designed to do, its functions and requirements. **Certainty** • Looks across the entire system and facilitates trades and compromises to get a balanced design. **Certainty** • Recognizes what is technically right among many good ideas by viewing a problem across system boundaries and comparing each design to others. **Certainty** • Thinks about how components were designed to interact and what other interactions could occur that were not considered in the design. **Certainty** • Is able to analyze the system's data. Traces implications of a problem in a step-by-step manner across the system. **Certainty** • If having difficulty understanding a scenario, finds a different vantage point that offers a fresh perspective. **Certainty**
34.	Identifies and defines core issues/problems (D&P) **(C)**	• Spends time up front to ensure that he and others understand, frame and define the problem. **Certainty** • Identifies the real issue/problem (whether technical, infrastructure, administrative, executive resource or other) by asking questions and identifying the key requirements. **Certainty** • Confirms that the problem is identified. (For example, asks: "Are we solving the right problem?" "Has the correct problem been identified?" "Have we defined the problem properly?" "Do we understand the problem?" "Do we understand the constraints?") **Certainty**
35.	Actively probes for information and understanding (D&P) **(C)**	• Seeks to understand all aspects of a challenge. **Certainty** • Probes for crucial and critical information that may be missing. **Certainty** • Considers all proposed solutions/perspectives before making a decision. **Certainty** • Continues to question thinking and extract data until all issues have been addressed and there is shared understanding. Asks questions such as: "What is the measure of goodness?" "What has not been looked at?" "Why?" "Does it still make sense?" **Certainty**
36.	Finds connections and patterns (D&P) **(C)**	• Examines and explores the implications of how technical decisions will affect the larger system architecture. **Certainty** • Observes system interfaces and the ripple effect of how changing requirements or how making changes to one element will affect other elements or the system. **Certainty** • Locates and corrects subsystem 'disconnects' or 'inconsistencies' that are having a negative impact on system performance. **Certainty**

Element		Representative Observable Behavior/Attribute
37.	Assimilates, analyzes, and synthesizes data and information (D&P) **(C)**	• Approaches and solves problems in a systematic manner by using tools, processes and procedures in order to find solutions. **Certainty** • Ensures decisions made are supported with data. Assimilates and distills large quantities of data from across the organization and ensures all of the data is on the table to solve a problem or make a decision. **Certainty** • Breaks data into smaller pieces or parameters, prioritizes, then synthesizes to reach an answer or solution. **Certainty** • Determines how to put together all available information in a way to rigorously test mathematically or physically that the problem is adequately understood. **Certainty**
38.	Validates facts, information and assumptions (D&P) **(C)**	• Questions all assumptions that go into a design. **Certainty** • Anticipates and looks for problems or issues in the system. Knows where data is missing/needed. **Certainty** • Recognizes that seemingly minor miscalculations can lead to significant problems in system performance. **Certainty** • Identifies system elements that lack metrics or have metrics that are misleading. **Certainty** • Recognizes that data has limitations and does not rely on it as the only source of information. **Certainty**
39.	Considers all options before deciding (D&P) **(CA)**	• Works to understand a problem from all perspectives. Actively seeks and weighs up different perspectives. Open and willing to listen to multiple views. **Certainty/Autonomy** • Is highly inclusive, drawing on the full knowledge, skills and experiences of the organization. **Certainty/Autonomy** • Considers all types of costs (e.g. technical, schedule, political, human, financial). **Certainty** • Identifies what will enable or inhibit the ability to accomplish goals. Looks at all aspects of the organizational system, e.g. facilities, budgets, policies, procedures, etc. Asks: "What would happen if I did nothing?" "What is the worst thing that could happen?" **Certainty** • Understands there is always more than one solution. **Certainty/Autonomy** • Comes up with several solutions, defines consequences of each and relates impacts to managers and employees. **Certainty/Autonomy**
40.	Identifies, assesses and manages risk (D&P) **(C)**	• Understands that managing risk is an ongoing process. Asks probing questions to ensure risks have been adequately explored. **Certainty** • Uses past experiences to anticipate potential problems that may affect the system. Identifies worst-case scenario and works from that point back. **Certainty** • Focuses on identifying and assessing risks by creating plans for dealing with those risks effectively. Identifies key indicators and methods of testing for each type of problem. **Certainty** • Applies and demands sufficient rigor in the application of analytical processes. **Certainty** • Develops mitigation strategies for addressing problems, should they arise. **Certainty**
41.	Acknowledges and manages uncertainty (ER) **(SC)**	• Works to remove as much uncertainty as possible by questioning everything. **Certainty** • Analyzes failures (what went wrong) and successes (what went right). **Certainty** • Ensures lessons learned are captured. **Certainty** • Lets others know of own willingness to be comfortable with uncertainty. **Certainty** • Openly and honestly discusses personal and programmatic successes, failures, and lessons learned. **Certainty/Status**

Element		Representative Observable Behavior/Attribute
42.	Remains open-minded and objective (ER) **(CR)**	• Receptive to hearing diverse and dissenting opinions. Is willing to re-think/re-work an issue or to change direction when new information or a better idea is presented. **Certainty/Relatedness** • Evaluates decisions objectively. Maintains flexibility by avoiding attachment to a particular strategy or point of view. **Certainty**
43.	Uses creativity in solving problems (D&P) **(CA)**	• Possesses passion for problem-solving and takes initiative to solve problems. Enjoys and is energized by fully concentrating on a problem for long stretches, until solutions are formed and implemented. **Certainty/Autonomy** • Does not adhere to rigid rules or formulas for system design, but may create new ideas and approaches that are necessary to deal successfully with system constraints. **Autonomy** • May use intuition and past experiences to solve problems. Supplements traditional problem-solving strategies with those that are creative and non-linear. **Certainty**
44.	Draws on past experience (D&P) (C&I) **(CA)**	• Knows good intuition is based on experience and works to expand that experience. **Certainty** • Uses experience, history, intuition, and sensing to assess situations and develop solutions. **Autonomy/Certainty** • Draws on past successes and failures to develop the proper approach. Knows when something looks right. **Autonomy** • Solves problems with a balance of innovative developments and proven heritage products. May rely on experience and existing design as guides, but sees each opportunity as a canvas to design new solutions. **Autonomy**
	Political Savvy theme	
45.	Knows how the political system works (D&P) **(SR)**	• Knows who makes decisions and what they need. Keeps up to date with new Members of Congress and staff and relies on NASA's Congressional experts to represent the agency in the best light. (HQ) **Status/Relatedness** • Has a keen sense of timing when opportunities arise. Understands how some opportunities are short lived and quick action is needed. **Relatedness** • Knows how to present a design to show near-term gains that will meet current Administration and Congressional goals, while building on a longer-term accomplishment that might be realized over a number of Administrations. **Status/Relatedness**
46.	Has political staying power (FC) **(R)**	• Able to maintain momentum over many years and several Administrations. Quickly learns the priorities of new Administrations and effectively communicates how NASA is meeting those needs. **Relatedness** • Assesses the current political agenda to determine the likelihood of obtaining the budget needed. Assesses the political and budget realities in context of the design, requirements and potential trades. **Relatedness**

Element		Representative Observable Behavior/Attribute
47.	Represents/promotes organization's programs across the political spectrum (FC) **(CR)**	• Understands and effectively communicates with government leadership on how programs meet agency and national needs. (HQ) **Relatedness** • Explains consequences and implications of NASA decisions and how the Administration and Capitol Hill may interpret the agency's actions. Helps others understand what the Administration is looking for so they can work more effectively within those constraints. (HQ) **Relatedness** • Explains the probable reactions of NASA's stakeholders to decisions that are made or put on hold. **Relatedness** • Responsive to upper management's needs. Sends notes, calls and updates as activities occur and issues emerge. **Relatedness** • Meets commitments in order to gain credibility and trust. Only makes commitments that NASA can meet. **Relatedness** • Lets Administration/Congress know when problems arise; notifies them early. (HQ) **Relatedness/Certainty**
48.	Manages multiple demands/opportunities (FC) **(CR)**	• Balances the needs and political interests of internal and external stakeholders, weighing what is best for the program against what is best for the agency. Makes decisions based on what is best for both. **Certainty/Relatedness** • Considers effects of executive decisions and actions on organizations inside and outside NASA before taking action. **Certainty/Relatedness** • Continually monitors these decisions and makes course corrections to meet high priority goals and objectives. **Certainty** • Asks, "What is my boss and what is the Administration worried about?" **Relatedness** • Is aware of what is important to the NASA administrator and other key players, and keeps them informed. **Relatedness**
49.	Provides historical perspective (FC) **(CR)**	• Knows it is important for those inside and outside the agency to know NASA's history. **Relatedness/Certainty** • Helps others see and understand the historical progression of strategies and decisions. Is mindful that NASA has a wealth of lessons learned and is always working to ensure that the agency does not repeat mistakes. **Relatedness/Certainty**
Strategic Thinking theme		
50.	Maintains an agency-wide view (D&P) **(CRF)**	• Ensures that NASA has a plan moving forward to maintain both the competencies and capabilities needed to be successful. **Certainty** • Intentionally selects people with different perspectives, talents and knowledge to form a strong management team. **Certainty/Fairness** • Assimilates large amounts of information from across the agency. Makes decisions by keeping the big picture in mind. Considers all perspectives and proposed solutions before making a decision. **Certainty/Relatedness** • Decisions are balanced across programs and projects. **Fairness** • Works the larger agency-wide "trade space" to meet NASA's and the nation's highest priorities. Trades are made across missions and/or centers and may involve negotiations across federal agencies. **Fairness/Certainty**

Element		Representative Observable Behavior/Attribute
51.	Manages near-term and long-term goals (D&P) **(CR)**	• Keeps the end state in mind while managing day-to-day activities. **Certainty** • Continually looks at near-term activities and assesses how they may affect long-term results. **Certainty** • Proactively anticipates and positions the organization years in advance. Focuses on five years and beyond. **Certainty/Relatedness** • Sets a path and has the ability to stick to that path for an extended period of time. **Certainty** • Is mindful of the critical timing of issues (e.g." We have 12 hours to make this decision."). Will sometimes define decisions in terms of "shelf-life". **Certainty**
52.	Understands the broad implications of activities at multiple levels (D&P) **(CR)**	• Understands where NASA's mission connects to the missions of other federal agencies and foreign nations. Considers them potential partners, collaborators and in some cases customers. **Certainty/Relatedness** • Seeks to build and maintain connections and partnerships. Shares information and communicates on shared goals and projects. **Relatedness**
53.	Monitors the environment (D&P) **(CR)**	• Monitors the environment outside NASA to understand national and international priorities and issues that will have an impact on agency goals and missions. **Certainty/Relatedness** • Works to understand larger government-wide issues and problems and finds ways in which NASA's work can help solve these issues and problems. **Certainty** • Works with other federal agencies to leverage overall federal program investments (e.g. maturing another agency's technology for use in NASA's programs). **Certainty**
54.	Uses networks (C&I) **(CR)**	• Builds and uses informal networks to validate and gain additional information. **Relatedness** • Looks to many different sources to be sure issues are covered and there are no surprises. **Certainty** • Connects organizations and individuals that need to be connected to accomplish goals. **Relatedness** • Probes and tests assumptions by reaching out to individuals on the periphery. Uses the "fringe" (individuals outside of a program or project team but aware of issues and able to lend support) to gain information, test assumptions, and assess the size and scope of issues and problems. **Relatedness**

Table 7: NASA Leadership Behaviors Table

Note: Behaviors observed only in executives located at Headquarters are noted by (HQ).