A Report by a Panel of the

NATIONAL ACADEMY OF PUBLIC ADMINISTRATION

for the National Aeronautics and Space Administration

Practices for an Effective NASA Advisory Council: The Results of an Independent Assessment

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June 29, 2018

Practices for an Effective NASA Advisory Council: The Results of an Independent Assessment

PANEL

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The views expressed in this report are those of the panel. They do not necessarily reflect the views of the Academy as an institution.

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Foreword

The National Aeronautics and Space Administration (NASA) has a long tradition of seeking outside advice on its major program and policy issues. As an example, the NASA Advisory Council (NAC), established in 1977, is an agency-level advisory committee that provides strategic advice and recommendations to the NASA Administrator on agency programs, policies, plans, financial controls, and other matters pertinent to agency responsibilities. Members of the NAC are appointed by, and serve at the pleasure of, the NASA Administrator; and the structure of the NAC has changed over time at the discretion of the Administrator. As an advisory body, the NAC is subject to the general requirements of the Federal Advisory Committee Act (FACA), which provides a mechanism for external stakeholders to offer advice to the executive branch of the federal government and aims to ensure an effective, open, and balanced advisory process.

The NASA Authorization Act of 2017 directed NASA to contract with the National Academy of Public Administration (the Academy) to conduct an independent review to assess the effectiveness of the NAC and to consider the implications of extending the NAC's role, to include providing advice to Congress. As a congressionally chartered, non-partisan, and non-profit organization with over 850 distinguished Fellows, the Academy brings nationally-recognized public administration experts together to help public organizations address future challenges. We formed a Panel of five Academy Fellows to lead this project over the past seven months. This report presents the Panel's assessment and a series of recommendations intended to enhance the advisory process of the NAC, bolster the agency's efforts to select NAC members, and strengthen the administrative infrastructure of the NAC. The Panel also considered the advantages and drawbacks of expanding the role of the NAC and the interaction between the NAC and Congress.

We were pleased to conduct this study and appreciate the support of the NASA leadership, NAC members, and other stakeholders who provided important insights and context to inform this report. I extend my earnest thanks to the members of the Academy Panel, who provided invaluable expertise and thoughtful analysis to this undertaking, and to the professional Study Team that provided critical support on this project. I expect that this report will contribute to NASA's efforts to improve the effectiveness of the NAC and promote greater policy stability and accountability.

Teresa W. Gerton
President and Chief Executive Officer
National Academy of Public Administration

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Acronyms and Abbreviations

Academy	National Academy of Public Administration
ASAP	Aerospace Safety Advisory Panel
B.S.	Bachelor of Science
CEO	Chief Executive Officer
DOC	Department of Corrections
DHS	Department of Homeland Security
DOI	Department of the Interior
DoD	Department of Defense
DOT	Department of Transportation
EPA	Environmental Protection Agency
ERDDAA	Environmental Research, Development, and Demonstration Authorization Act
FACA	Federal Advisory Committee Act
GMU	George Mason University
GSA	General Services Administration
HQ	Headquarters
NAC	NASA Advisory Council
NASA	National Space and Aeronautics Administration
NSB	National Science Board
NSF	National Science Foundation
OIG	Office of Inspector General
OMB	Office of Management and Budget
PNT EX COM	Positioning, Navigation, and Timing Executive Committee
SAB	Science Advisory Board
SSA	Social Security Administration
USD (AT&L)	Under Secretary of Defense for Acquisition, Technology, and Logistics
USDA	United States Department of Agriculture

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Executive Summary

As directed in the National Space and Aeronautics Administration (NASA) Authorization Act of 2017, NASA contracted with the National Academy of Public Administration (the Academy) to conduct an independent review assessing the effectiveness of the NASA Advisory Council (NAC) and to consider the impacts of broadening the NAC's role to include providing consultation and advice to Congress. The Academy appointed a Panel of five Academy Fellows to oversee a professional study team while conducting the review.

In the past, Administrators have used the NAC in different ways, reflecting both the different challenges and priorities that face them during their time in office, as well as their personal and professional inclinations. Recognizing this variability, the Panel sought to identify practices likely to contribute to an effective NAC across diverse challenges and Administrator styles. In its assessment of these practices, the Panel took a multi-dimensional view of effectiveness, informed by the different roles played by the NAC and the different interests it serves.

The Panel developed a set of five criteria for assessing practices as they relate to the effectiveness of the NAC in performing its different roles, recognizing that overall effectiveness entails balancing competing criteria. These criteria included strategic focus, independence, deliberative processes, flexibility, and actionable recommendations.

The Panel makes fifteen recommendations intended as good practice guidance for the consideration of future Administrators. Panel recommendations generally affirm current NASA practice, but three suggest new or modified practices. One or more of five criteria inform the panel's recommendations. Three headings—advisory process, membership, and administrative infrastructure, organize the recommendations.

Panel recommendations under the first heading, advisory process, relate to the advisory process, which the Panel views broadly to include agenda setting, deliberation, informal advice, and the development, review, and approval of formal, written NAC recommendations, and the tracking of their implementation. A unifying theme across Panel recommendations under this heading is the importance of a collaborative, two-way working relationship between the Administrator and the NAC. Panel recommendations under the heading, membership, relate in various ways to the membership of the NAC—types and roles of members, number of members, membership qualifications, and the appointment process. Panel recommendations under the heading, administrative infrastructure, relate to policies and processes that help ensure that the NAC is able to deliberate effectively by providing for continuity, regular meetings and timely information.

The Panel recommends against extending the role of the NAC to include advising Congress given the potential for this to undermine the effectiveness of the NAC in advising the Administrator. However, the Panel concludes that, given the critical role Congress plays in the successful execution of NASA's mission, it would be wise for the NAC to seek input from majority and minority

stakeholders in the House and Senate about their priorities and concerns to inform its deliberations.

Listing of Panel Recommendations

The following recommendations are for the Administrator to consider in coordination with NAC leadership and support.

Advisory Process

Recommendation 1: Clearly communicate issues to be considered by the NAC and why they are important, while, at the same time, being open to alternative views.

Recommendation 2: Work collaboratively with the NAC Chair to develop agendas for NAC meetings.

Recommendation 3: Establish mechanisms to keep the NAC well informed of agency-wide processes that bear on mission performance.

Recommendation 4: Refer directly to the responsible NASA office for consideration and possible action, any NAC-approved, organizational sub-unit level recommendations.

Recommendation 5: Provide formal written responses to NAC recommendations.

Recommendation 6: Adopt a process for tracking the implementation of NAC recommendations formally accepted by the Administrator.

Membership

Recommendation 7: Use at-large members on the NAC to help ensure attention to crosscutting issues, an independent perspective, and the effective communication of issues to NASA external stakeholders.

Recommendation 8: Keep the NAC small to facilitate deliberation.

Recommendation 9: Select the NAC Chair for his or her ability to: 1) Work collaboratively with the Administrator and other stakeholders (e.g., developing meeting agendas); 2) Keep Council members focused and engaged; and 3) Channel Council discussions in constructive directions.

Recommendation 10: Select NAC members based on a balanced consideration of qualifications including: subject matter expertise, executive experience, capacity for independence, and communication skills.

Recommendation 11: Conduct inclusive internal agency reviews of individuals nominated to serve on the NAC.

Recommendation 12: Develop job descriptions to guide the recruitment and orientation of new members on roles and expectations.

Administrative Infrastructure

Recommendation 13: Adopt three-year, staggered terms for NAC members to increase continuity.

Recommendation 14: Convene regular meetings to enable continuity of attention to important issues.

Recommendation 15: Provide adequate professional staffing for the NAC to ensure NASA's ability to regularly convene meetings and provide timely information for deliberation.

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Section 1: Background and Overview

NASA has two advisory committees that report directly to the NASA Administrator: the Aerospace Safety Advisory Panel (ASAP) and the NAC. Statute established the ASAP in 1967 to provide advice on safety-related issues both the Administrator and to Congress. Agency charter established the NAC in 1977[1] to provide advice and recommendations to the Administrator on the full range of issues related to the agency's responsibilities. Unlike the ASAP, the NAC is a discretionary body that serves at the pleasure of the Administrator and can be altered in its various aspects as he or she sees fit.

Origin and Scope of the Study

The NASA Authorization Act of 2017[2] mandated that the Academy conduct a review to assess the effectiveness of the NAC and make recommendations to Congress on any changes to

- Functions of the NAC
- Appointment of members to the NAC
- Qualifications for members of the NAC
- Duration of terms of office for members of the NAC
- Frequency of meetings of the NAC
- Structure of leadership and Committees of the NAC
- Levels of professional staffing for the NAC

The Act also mandates that the Academy consider 1) the impacts of broadening the NAC's role to include providing consultation and advice to Congress and 2) past activities of the NAC and the activities of other analogous federal advisory bodies.

This study was mandated in the context of congressional concerns about the stability and accountability of the space program, is associated with significant changes in policy from one Administrator to the next. The Space Leadership Preservation Act (H.R. 2093) introduced in the 112th Congress and re-introduced in the 113th and the 114th Congresses sought to institute various measures to promote greater institutional continuity and to strengthen the role of independent expertise.[3]

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[1] The merger of two previously established advisory bodies—the Space Program Advisory Council and the Research and Technology Advisory Council, formed the NAC in 1977.

[2] Public Law No: 115-10, section 835.

[3] On February 25, 2016, the U.S. House of Representatives, Committee on Science, Space, and Technology held a hearing entitled, **"The Space Leadership Preservation Act and the Need for Stability at NASA."** The hearing charter summarizes the major provisions of the bill and provides background on the animating concerns. The charter is available at https://science.house.gov/sites/republicans.science.house.gov/files/documents/HHRG-114-SY-20160225-SD001.pdf.

The National Space Leadership Preservation Act of 2015 (the Act) aimed at promoting greater stability and accountability in NASA space programs over time. The Act directed various measures including the creation of a Board of Directors for NASA, modeled, in part, on the National Science Board (NSB). Congress proposed these measures for inclusion in the 2014 NASA Authorization Act, however, subsequently dropped them. Congress abandoned the measure to create a Board of Directors, in part, because of a concern that by creating such a body would usurp the role of authorizers. Instead, the Act included language (in section 707) mandating that NASA contract with the Academy for an independent assessment of the effectiveness of the NAC to include implications of broadening its role as an advisor to both Congress and the Administrator. This bill passed the House but never enacted. Ultimately, the same study mandate language was included in the NASA Transition Authorization Act of 2017, enacted in March 2017.

Study Approach and Methodology

On December 1, 2017, NASA contracted with the Academy to conduct an independent, seven-month review to assess the overall effectiveness of the NAC. The Academy appointed a Panel of five Fellows to oversee the work of a study team, provide guidance on key issues, and review and approve study team products. Criterion used by the Academy to select Panel members included experience and knowledge in the following areas: NASA, scientific and technical agencies, advisory body utilization and management, program evaluation, organizational transformation, and change management. (Appendix D provides information about each member of the Academy Panel and study team.)

In its assessment, the Panel sought to identify practices likely to contribute to the effectiveness of the NAC across diverse challenges and Administrator styles. A review of the NAC's activities across the tenures of the past three Senate-confirmed NASA Administrators as well as Acting Administrator Robert Lightfoot informed the study. This period encompasses different Administrator approaches and related changes to the NAC, as well as significant policy and programmatic changes that provide the context of the study mandate.

In its research, the study team drew on a mix of documentary sources and interviews. Documentary sources included a variety of NASA documents including, but not limited to, NAC meeting minutes, Administrator statements, NASA's annual reports to General Services Administration (GSA), NAC charters, and internal NASA reviews, such as those in 2009 and 2014 that stimulated changes under the last Administrator. Other documentary sources included:

- Scholarship on recent NASA Administrators and NASA advisory processes
- Social science and practitioner literatures on effective practice
- Press coverage related to the NAC

Interviews

The study team conducted interviews with the following groups:

- Current and past NASA Administrators
- Current and past NAC Chairs
- Current NAC members
- The NAC Executive Director
- NASA Committee Management Officer
- Other federal advisory bodies that might offer insight into effective practice applicable to the NAC in its current role and perspective on the implications of adopting a dual advisory role

The study team conducted interviews with a selection of past NAC members with a focus on individuals who could provide perspective on the effectiveness of the NAC over time in its various forms. To this end, the team sought out members who had served under multiple Administrators and during periods of change within tenures. The study team also interviewed NAC members who served on the ASAP, who might provide perspective on the relationship of these two advisory bodies and the dual advisory role played by ASAP and any foreseen implications to the effectiveness of the NAC, should it adopt a dual role.

To identify similar organizations, the study team consulted various sources including the study panel, responsible NASA officials, GSA officials responsible for Federal Advisory Committee Act (FACA) compliance, and interviewees, many of whom have served on other advisory bodies across the federal government. The study team compiled an initial list of possible organizations for comparison. (Appendix E provides information about these organizations.) Upon further analysis, it was determined none of these organizations offered promising targets for identifying useful guidance regarding effective practices supporting the NAC in its current role as due to the specific nature and structure of the NAC.

To address the implications of expanding the NAC's role to include providing advice to Congress, the study team did identify two federal advisory committees that serve a dual advisory role—advising both the Administrator and Congress: NASA's own ASAP and the Environmental Protection Agency's (EPA) Science Advisory Board.[4]

Organization of the Report

- **Section 2: Features and Roles of the NAC—**identifies distinctive features of the NAC and the different roles it plays;

[4]The study team was unable to speak with agency officials responsible for the EPA's Science Advisory Board.

- **Section 3: Framework for Assessing Practices Supporting an Effective NAC—**sets out the key assumptions of the panel's approach and discusses the criteria employed in developing its recommendations on effective practices;
- **Section 4: Recommendations Supporting an Effective NAC—**discusses panel recommendations on effective practice for future Administrators; and
- **Section 5: Extending the Role of the NAC to Include Advising Congress—**discusses the pros and cons of such a change and presents the Panel's conclusion.

Section 2: Features and Roles of the NAC

This section reviews three factors important to consider in an assessment of practices likely to contribute to an effective NAC. First are the general requirements of FACA applicable to the NAC. Second, the distinctive features of the NAC, or those features that set it apart from other, if not all, FACA advisory committees and is pertinent to understanding its effectiveness. These features include the scope and purpose of the NAC and its structure, which to the Panel's knowledge, has no analog among other federal science and technology agencies. Third, the different roles played by the NAC that reflect, in part, the distinctive features of the NAC.

General FACA Requirements

The NAC is an advisory body, constituted to provide collective advice to the executive branch and contains more than one non-federal employee. As such, it is subject to general FACA requirements including: developing and filing a charter with Congress; maintaining a "fairly balanced" membership; holding open public meetings; keeping minutes of meetings; allowing public filing of written statements; announcing all meetings in the federal register; and maintaining all committee documents for public inspection.[5]

Two of these requirements and their interpretation have particular relevance to the Panel's assessment of the NAC's effectiveness. These are maintaining a "fairly balanced" membership and holding open public meetings.

"Fairly balanced" is generally interpreted to mean including members with a range of expertise and perspectives appropriate to the issues considered by the advisory committee; and in some cases including "representatives" of key stakeholder groups. In the case of the NAC, *ex officio* members (the Chairs of the Space Studies Board and the Aeronautics and Space Engineering Board, both part of the National Academies of Science, Engineering and Medicine's Division of Engineering and Physical Sciences) provide an institutional connection to the relevant scientific and engineering communities. The Panel considers this an important feature of the NAC.

As a FACA advisory body, the NAC's deliberations—discussions that relate to developing recommendations to the agency, must be conducted in public. This requirement is important to understanding the education and outreach role[6] played by the NAC (discussed later in this section). In addition, it relates to the panel's emphasis on the importance of a relationship of trust between Administrators and members of the NAC (discussed in the next section).

[5] The panel acquired the list of general requirements from a NASA presentation on FACA, used in the orientation of NAC members.

[6] While the charter does not specify this role, multiple interviewees used this terminology to address the impact that NAC activities have on both internal and external stakeholders.

Distinctive Features of the NAC

While the NAC is a discretionary body that Administrators can, and have, altered in various aspects, several features have endured over time. In the panel's view, two of these features are especially important to consider in assessing the effectiveness of the NAC.

- Agency-wide scope
- Tiered structure/interaction of NAC committees with working-level NASA officials

In its most recent charter, the purpose of the NAC is described as follows: *". . . to provide advice and make recommendations to the NASA Administrator on Agency programs, policies, plans, financial controls, and other matters pertinent to the Agency's responsibilities."*[7] While the Administrator can change the NAC charter every two years, the agency-wide scope of the NAC is a consistent element of charters over time. Relatedly, there is an expectation that the NAC should be able to advise the Administrator on crosscutting issues and choices involving tradeoffs with significant implications for the agency's ability to effectively perform its different mission responsibilities over time.

For the majority of the period under review for this assessment (2001 – 2018), the NAC has operated with some form of tiered structure, with the NAC at the top level reporting to the Administrator, underlying committees reporting up to the NAC, and, in some cases, subcommittees and task forces reporting to the committees. The chairs of NAC committees have served as members of the NAC, reporting on issues arising in the deliberations of the committees and proposing recommendations for deliberation by the NAC. While the NAC has been chartered to advise on the full range of issues related to the agency's responsibilities, NAC committees are intended to advise on issues at the organizational sub-unit level.

The number and focus of NAC committees and subcommittees and their correspondence to NASA's directorates and divisions changed over time. For instance, under the 2017 NAC Charter, NAC committees correspond to the four mission directorates; but under past charters, other directorates and offices also had corresponding committees. In addition, under different NAC charters, committee and sub-committee levels represented division-level issues. Most recently, in 2017, those subcommittees of the NAC Science Committee and the NAC Human Exploration and Operations (HEO) Committee, previously chartered under the 2015 NAC Charter, became five individual FACA advisory committees under the new charter. The Panel did not assess the relative merits of these variations. The most recent change is too recent to assess, as the changes were effective after the last Senate-confirmed Administrator left office.

Putting aside these variations, in general, the new, tiered structure allows for continued, focused attention to issues at the organizational sub-unit level, while at the same time enables the NAC to deliberate on crosscutting issues. In addition, the NAC committees are an important source of

[7] NAC Charter, 2017.

advice to NASA senior officials responsible for agency operations at the organizational sub-unit level. The Panel affirms the importance of the NAC's tiered structure.

Different roles played by the NAC

The main role of the NAC is to advise the Administrator; but as noted earlier, the NAC also has played a role in advising the Associate Administrators and Division Directors through its committees. The NAC has performed this advisory role in at least two ways, providing 1) independent perspective on issues that may or may not translate into findings or recommendations and 2) directive guidance in the form of consensus findings or recommendations. While attention tends to focus on the formal, written recommendations issued by the NAC, it plays an equally important role in providing informal advice to the Administrator and other NASA officials. Interviewees have described this advice variously as offering the Administrator a "sounding board" for ideas and strategies, identifying "blind spots," and suggesting alternative ways to frame issues.

In addition to its formal and informal advisory roles, the Council has played an important role in education and outreach, and in communicating complex/technical issues to NASA external stakeholders. This role follows inevitably from the public nature of the NAC's deliberations.

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Section 3: Framework for Assessing Practices Supporting an Effective NAC

The NAC serves several different needs: those of the Administrator, the agency, and the national interest. Interviewees commonly emphasized that the ultimate measure of the NAC's effectiveness is whether it serves the needs of the Administrator. While it is certainly true that the primary purpose of the NAC is to serve the needs of the Administrator, other important interests should inform an understanding of the NAC's effectiveness.

The institutional need is to maintain capabilities necessary to successfully perform the agency's various mission responsibilities, even while the Administrator appropriately focuses on pursuing the particular priorities of a given Administration. The long-standing role of the NAC in providing advice and recommendations to senior NASA officials (Associate Administrators and Division Directors) through its committees and subcommittees reflects this institutional interest.

The national interest lies in the often multiple mission needs that the NASA programs must balance and in those mission responsibilities and capabilities that are unique to NASA in the federal government.

Administrators' needs vary, reflecting different challenges and priorities that face them during their time in office, as well as their distinct personal and professional inclinations. Recognizing this variability, the Panel identified practices that are likely to contribute to an effective NAC across diverse challenges and administrator styles. In its assessment of these practices, the panel takes a multi-dimensional view of effectiveness that is informed by the different roles played by the NAC (discussed in Section 2) and the different needs the NAC serves (discussed above).

The Panel developed a set of five criteria for assessing practices as they relate to the effectiveness of the NAC in performing its different roles. The Panel recognizes that an assessment of overall effectiveness entails balancing competing criteria, based on the relative importance of the NAC's different roles and the purposes. Therefore, the Panel gives priority to criteria relating to the agency-wide scope of the NAC and to the role of FACA advisory committees in providing a source of independent perspective on issues. The five criteria include:

1. Strategic focus
2. Independence
3. Deliberative processes
4. Flexibility
5. Actionable recommendations

The Panel presents criterion actionable recommendations last because it applies only to advice in the form of formal, consensus recommendations.

With the exception of strategic focus, these are general evaluative criteria applicable broadly to FACA advisory committees. The criterion, strategic focus, was included to encompass a distinguishing, if not unique, feature of the NAC; its agency-wide scope; the related expectation that it should advise the Administrator on crosscutting issues; and the associated tradeoffs those decisions often entail.

Strategic focus. FACA advisory committees, chartered to advise agency leadership on crosscutting issues, should have the ability to provide perspective on the tradeoffs entailed by decisions regarding the allocation of finite resources across programs and activities and how best to preserve the workforce and infrastructure capabilities necessary to ensure the agency's continued success in carrying out its different mission responsibilities.

The ability of an advisory committee to advise agency leadership on these tradeoffs depends on its awareness of key NASA internal and external stakeholder communities and understanding of their perspective on the agency's mission responsibilities. This awareness and understanding depends in part on the background and experience of the advisory committees members, but also on the ability of the Committee to receive input from external NASA stakeholder communities on the issues before it.

Independence. A FACA advisory committee should provide not just expertise but perspective that may not be available within the agency. This alternative perspective helps combat insularity and the tendency toward tunnel vision that can result from the day-to-day pressures on agency leadership and the inclination of agency staff to defer to agency leadership. The effectiveness of an advisory committee depends on its ability, as a body, and the ability of individual members to raise issues deemed important to the agency and the nation, with the ability to challenge agency leadership if necessary.

Deliberative processes. A FACA advisory committee is not just a collection of expert individuals, but the Committee's intention is to function as a deliberative body able to develop consensus advice and provide that advice to agency leadership on important issues facing NASA and the nation. Success depends on the ability of the group to meet, be informed, work together, have time to constructively discuss issues, and a develop a process for handling minority views. Effective deliberation also depends on the ability of members of an advisory committee to influence the agenda, to raise issues, and obtain pertinent information from the agency on issues considered in a timely way.

More broadly, the ability of a FACA advisory committee to deliberate effectively depends on a mutual relationship of trust and respect between the agency sponsor and the advisory committee. For example, the effectiveness of an advisory committee depends heavily on the willingness of the Administrator to share issues for deliberation despite the risk that deliberation may not go in a direction that the Administrator finds desirable. Members of an advisory committee are more likely to provide advice that is responsive to the needs of an agency sponsor if he or she fully

communicates these needs and advisory committee members believe their advice is seriously considered.

Flexibility. An advisory body should be able to respond to changes in the agenda and priorities of the agency sponsor. When crises occur, for example, the advisory committee should be able to reorient its agenda and focus to attend to them.

Actionable recommendations. Actionable recommendations are feasible, specific, and measureable. Feasibility refers to the ability of an agency sponsor to act on advice, given existing constraints. Recommendations should also be specific and measurable enough to evoke action with progress tracked.

ILLUSTRATIVE NOTE ON BALANCING CRITERIA

Some interviewees emphasized that NAC recommendations calling for changes in Administration priorities and agency budgets are generally beyond the Administrator's control and not useful. In this view, recommendations should focus on helping the Administrator operate the agency as efficiently as possible, within constraints of the Administration's priorities and existing budget resources. However, in the Panel's view, considerations of feasibility require balance with the importance of independence. As noted earlier, the effectiveness of the NAC depends also on its ability as a body and the ability of its individual members to raise issues deemed important to an agency and the nation and to challenge the Administrator, if and when necessary.

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Section 4: Recommendations Supporting an Effective NAC

Recognizing that administrators have different leadership styles and face different challenges, the Panel has identified a set of practices it determines to be generally conducive to an effective NAC. The following fourteen recommendations are intended as good practice guidance for the consideration of future administrators. Each recommendation is informed by one or more of the five criteria of an effective NAC discussed in Section 3. They are organized under three headings, mapped to the scope elements identified in the NASA Statement of Work in footnotes as follows:

- Advisory process[8]
- Membership[9]
- Administrative Infrastructure[10]

Advisory Process

This heading covers recommended practices supporting the advisory process viewed broadly to include agenda setting; deliberation; informal advice; the development, review, and approval of formal, written NAC recommendations; and tracking the implementation of recommendations. A unifying theme across these recommendations is the importance of a collaborative, two-way working relationship between the Administrator and the NAC in supporting effective deliberation. This theme runs through the first recommendation about sharing issues for deliberation by the NAC and being open to alternative views through to the last recommendations about an effective infrastructure that supports informed deliberation.

Recommendation 1: Clearly communicate issues to be considered by the NAC and why they are important, while, at the same time, being open to alternative views.

NAC members are generally composed of accomplished individuals with their own concerns and strongly held views. It will always be a challenge to bring them together as a group and get them to focus on a given set of issues and to keep the discussion with the boundaries an Administrator may find useful given his or her particular constraints (e.g., Administration policy and priorities and budget). This makes it vitally important that the Administrator not only clearly communicate the issues he or she would like addressed, but that he or she also convey why they are important in ways that galvanize members as a deliberative body and not simply individuals.

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[8] "Advisory process" encompasses the following scope elements: structure of leadership and committees of the NAC and functions of the NAC.

[9] "Membership" encompasses the following scope elements: qualifications for members of the NAC and the appointment of members to the NAC.

[10] "Administrative infrastructure" encompasses the following scope elements: duration of terms of office for members of the NAC; frequency of meetings of the NAC; and levels of professional staffing for the NAC.

At the same time, it is important to recognize the value of an independent perspective on issues and priorities and try to engage these views productively within the limits of what is possible. In addition, the Administrator's willingness to listen to and discuss alternative views can contribute to goodwill with members of the NAC, possibly leading them to be more responsive to the needs of the Administrator in developing recommendations.

Recommendation 2: Work collaboratively with the NAC Chair to develop agendas for NAC meetings.

The Administrator has limited time to spend with the NAC. He or she must rely largely on the NAC Chair to focus the Committee's discussions in productive directions. The goals to establish agendas should be two-fold—ensure the NAC addresses issues of concern and enlist the talents of the NAC fully to yield useful insights. Therefore, it is important for the Administrator to share his or her thinking on issues of concern to enable the Chair to play his or her role effectively.

Recommendation 3: Establish mechanisms to keep the NAC well informed of agency-wide processes that bear on mission performance.

This recommendation promotes strategic focus and deliberation. For the NAC to effectively deliberate and advise the Administrator on tradeoffs, it must be knowledgeable about agency-wide processes bearing on the mission performance of the agency. Examples of such processes include the ASAP's deliberations on safety issues, budget and appropriations processes, and strategic planning processes.

In recent years, special attention has been given to better coordination between the NAC and the ASAP. While safety is the focus of the ASAP, safety is also an important issue for the NAC as it is critical to NASA's overall mission performance. In recent years, it became apparent that a lack of coordination between the ASAP and the NAC led to significant duplication of efforts contributing to inefficiency and undue burden on staff supporting the ASAP and NAC through briefings and other activities. In addition, the panel recognized that decisions about safety inevitably entail tradeoffs with other mission objectives; however, in those instances, the NAC's strategic, agency-wide perspective should inform those decisions. To enable better coordination and to bring complementary perspectives to bear on safety issues, the NAC and ASAP adopted the informal practice of the chairs (or designees) attending each other's meetings. Interviewees familiar with the NAC and ASAP view this practice as effective.

Recommendation 4: Refer directly to the responsible NASA office for consideration and possible action, any NAC-approved, organizational sub-unit level recommendations.

This recommendation aims to enable the strategic focus of the Administrator and to help ensure that organizational sub-unit level officials have timely access to NAC committee recommendations. Directly referring NAC approved organizational sub-unit level recommendations to the responsible organizational sub-unit level NASA official allows the Administrator to focus his or her attention on

the NAC recommendations addressing crosscutting issues. Deliberation and approval of NAC committee recommendations by the NAC (required under FACA) offers an opportunity for the Administrator, directly or indirectly through the NAC Chair, to consider the broader implications of these recommendations. Responsible NASA officials do not have to wait on the Administrator to respond to organizational sub-unit level recommendations.

Recommendation 5: Provide formal written responses to NAC recommendations.

The practice of formal written Administrator responses to NAC recommendations contributes to effectiveness in two ways. First, it encourages the participation and engagement of NAC members by assuring them that the agency seriously considers their advice, even if not always acted on. Second, formal acceptance of a recommendation encourages action by setting the expectation.

Recommendation 6: Adopt a process for tracking the implementation of NAC recommendations formally accepted by the Administrator.

Tracking the implementation of recommendations bolsters the effectiveness of the NAC in its role of providing formal recommendations. Tracking the implementation of recommendations is desirable to communicate agency commitment to action and to help ensure follow through, especially where effective action spans long periods.

Adoption of Recommendations 5 and 6 communicates the agency's commitment to an effective, deliberative process; takes the advice of the NAC seriously; and ensures that action taken on recommendations is acceptable to the agency.

Membership

This heading covers recommended practices related in various ways to the membership of the NAC—types and roles of members, number of members, membership qualifications, and the appointment process.

Recommendation 7: Use at-large members on the NAC to help ensure attention to crosscutting issues, independent perspective, and effective communication of issues to NASA external stakeholders.

The dual service of committee chairs as NAC members creates the potential for the domination of NAC meetings by committee-specific concerns at the expense of attention to crosscutting issues. Using at-large membership successfully counterbalances this tendency by bringing on individuals with the aim of focusing attention on crosscutting issues.

Over time, there is also the potential for committee chairs to lose independent perspective on issues in their domain given their immersion in the work of the agency and the close ties that may develop with agency staff. Involving at-large members help ensure an independent perspective.

Education and outreach to NASA external stakeholders and the broader public has always been an important aspect of the NAC. This role can become relatively more important at certain times, such as when an Administrator is seeking to implement a policy change or dealing with a crisis (e.g., shuttle disaster). At such times, an Administrator may seek to bring on NAC members with particular skills in communication to help explain NASA initiatives and related issues to the public. At-large membership offers one option for doing this. In recent years, knowledge of media and communications has taken on new significance with the rise of social media. The influence of bloggers and Tweets in publicizing NAC discussions and focusing the attention of external NASA stakeholders has transformed communications from an intermittent concern to an operating condition. At-large membership is one tool for tapping expertise to help manage the NAC's education and outreach impact in this new media environment.

Recommendation 8: Keep the NAC small to facilitate deliberation.

Social science and best practice literatures indicate that the optimal size range for deliberative bodies is five to eight members—large enough to provide diversity of perspective but small enough to enable individual engagement and avoid communication breakdowns. (See Appendix D for a brief review of the literature.) In addition, interviewees suggested that a smaller size group has the potential to make it easier for the Administrator to establish a rapport with the group, increasing his or her willingness to share issues for deliberation.

The efficacy of a deliberative body may benefit from more participants by providing a greater breadth of perspective but at the likely cost of efficiency. However, in the case of the NAC, the tradeoff entailed by adding more participants in the form of at-large members may be limited to the extent this mitigates the tendency toward the stove-piped perspective associated with committee chairs serving as NAC members. Still, the role of the NAC Chair in facilitating discussions becomes even more important as the size of the NAC increases beyond the optimal range.

Recommendation 9: Select the NAC Chair for his or her the ability to: 1) Work collaboratively with the Administrator and other stakeholders (e.g., developing meeting agendas); 2) Keep Council members focused and engaged; and 3) Channel Council discussions in constructive directions.

As already mentioned in the earlier discussions of Recommendations 1 and 2, the ability of the Chair to engage the Council members in productive discussions depends on a good working relationship with the Administrator, who must be willing to share issues for deliberation. Engaging a group of strong, accomplished individuals productively as a deliberative body demands strong facilitation skills.

Recommendation 10: Select NAC members based on a balanced consideration of qualifications including: subject matter expertise, executive experience, capacity for independence, and communication skills.

In addition to subject matter expertise, interviewees identified executive experience, capacity for independence, and communications skills as important attributes to consider in the selection of NAC members. Executive experience was associated with a greater appreciation for practical considerations that should inform feasible recommendations for action and the tradeoffs involved in top-level decisions on crosscutting issues that are the intended focus of the NAC.

It is equally important that individuals are willing to raise issues and even challenge the Administrator where they believe choices may have the potential to adversely affect the interests of the institution and the nation in significant ways. To help ensure this independence, some interviewees emphasized the selection of well-established, senior-level individuals who most likely would feel less constrained about speaking their minds for fear of professional consequences. However, leadership should not discount the benefits of selecting independent-minded individuals, earlier in their careers, who may have greater incentives to contribute a fresh perspective.

Interviewees also emphasized the importance of strong communication skills, specifically the ability to translate complex, technical issues to external NASA stakeholders and the broader public. With greater public attention to the NAC proceedings via social media, this observation is in line with the NAC's role in education and outreach.

Recommendation 11: Conduct inclusive internal agency reviews of individuals nominated to serve on the NAC.

While it is the prerogative of the Administrator to select members of the NAC, submitting information on nominees for an internal review that provides an opportunity for the relevant agency organizational sub-units to provide input is a good practice. Such a process helps ensure a robust vetting of nominees that enhances the credibility of the NAC internally and externally in terms of the independence of its members and their capacity to deliberate effectively on the range of issues before them. This is consistent with the current NASA practice of submitting information on nominees for review by internal subject matter experts and management across directorates and divisions.

Recommendation 12: Develop job descriptions to guide the recruitment and orientation of new members on roles and expectations.

The effectiveness of an advisory body depends on a clear understanding of the roles and responsibilities of the chairperson and its members. In the case of the NAC, members fall into three categories, each with different roles to play. These are members of the NAC who also serve as committee chairs, at-large members, and *ex officio*, non-voting members. In these cases, the member's role is to represent the views of these institutions on scientific and engineering related issues (Chairs of the National Academies of Science, Engineering, and Medicine, Division of Engineering and Physical Sciences' Space Studies Board, and the Aeronautics and Space Engineering Board).

Job descriptions and orientation are especially important for NAC members serving as committee chairs. To help counteract the tendency toward narrow advocacy of a given committee's positions, it important to emphasize to nominees the two different roles they are to play as committee chairs and as members of the NAC. In their role as a member of the NAC, the expectation should be clear that members actively contribute to crosscutting discussions, not to simply represent committee issues. This orientation complements the use of at-large members to help ensure attention to crosscutting issues.

Administrative Infrastructure

This heading covers recommended practices related to policies and processes that help ensure that the NAC is able to deliberate effectively through continuity, regular meetings, and timely information.

Recommendation 13: Adopt three-year, staggered terms for NAC members to increase continuity.

Currently, individuals appointed to the NAC serve a two-year term with the possibility of reappointment at the discretion of the Administrator. The Panel concludes that lengthening and staggering the terms of membership would bolster the NAC's effectiveness as a deliberative body by increasing continuity without unduly hindering the flexibility of Administrators to make changes to the membership in response to changing needs. Adding a year to the term would allow members more time to contribute more effectively after an initial learning curve, which interviewees suggested can run up to one year. Lengthening and staggering terms would support greater institutional memory by limiting turnover. (See Appendix F for details on how NASA could implement three-year, staggered terms of membership.)

Under this recommendation, the possibility of indefinite reappointment remains. The panel does not see this practice as problematic given that Administrators often serve only several years.

Recommendation 14: Convene regular meetings to enable continuity of attention to important issues.

Continuity of attention to issues should be an important consideration in setting the normal meeting schedule of the NAC, but the agency should weight the frequency of meetings against the burden on members, who volunteer their time. In recent years, the NAC meeting schedule was reduced from four to three times annually. This meeting schedule seems appropriate given the demands on the time of people of this stature, especially given the collateral time demands of members who also serve as NAC committee chairs.

Recommendation 15: Provide adequate professional staffing for the NAC to ensure NASA's ability to regularly convene meetings and provide timely information for deliberation.

The Panel concludes that the current level of staff support for the NAC is appropriate to its current role[11]. Moreover, interviewees are unanimous in praising staff support for the NAC and saying they receive the information needed to deliberate effectively.

Conclusion

Panel recommendations generally affirm current NASA practice, but three suggest new or modified practices.

- Recommendation 6: Adopt a process for tracking the implementation of NAC recommendations formally accepted by the Administrator.
- Recommendation 12: Develop job descriptions to guide the recruitment and orientation of new members on roles and expectations.
- Recommendation 13: Adopt three-year, staggered terms for NAC members to increase continuity.

[11] According to GSA's FACA Database, 8.3 full-time equivalents support the NAC.

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Section 5: Extending the Role of the NAC to Include Advising Congress

The study team's interviews identified varied views on the issue of adding an advisory-capacity to the NAC's role and relationship with Congress. Some congressional staff expressed a positive view. In this view, interviewees felt the extension of a congressional advisory role to the NAC would help to ensure Congress efficiently receives important issues and policies related to the space program for consideration.

Other congressional staff expressed concern about this level of NAC independence—a potential willingness and ability of the NAC to raise issues the Administrator may not want considered. The idea of adding a congressional advisory role to the NAC was inspired by the positive experience with the ASAP, which was established by statute to provide advice to both Congress and the Administrator. It is believed that the ASAP's statutory mandate and associated practice of informal communications between members of the ASAP and Congress has enabled Congress to make sure that certain issues are raised and addressed. The NAC's role of advising Congress provides a balance from the pressure to conform to the agenda of the Administrator.

The predominant view among interviewees is that extending the role of the NAC to include advising Congress could undermine its effectiveness. In this view, if the NAC were obliged to serve two customers, who often have different objectives, it would lose the full confidence of the Administrator, who would no longer view it as a source of trusted advice. Therefore, he or she may no longer be willing to share issues for deliberation by the NAC and would limit the NAC's ability to provide advice.

Interviewees familiar with the workings of the ASAP, generally did not see it as offering a useful model for thinking about implications of a dual advisory role for the NAC. They pointed to the ASAP's narrow focus on safety, on which there is generally more consensus than is the case with many of the other issues that are addressed by the NAC.

Some interviewees expressed a neutral view on the implications of a dual advisory role. In this view, it might be possible to add a congressional advisory role to the NAC without compromising its effectiveness. At the same time, none of these interviewees offered that a strong positive benefit that would result from this change.

The Academy Panel believes that the ASAP's Congressional/Administrator role works because providing congressional advice giving is a statutory responsibility of the ASAP and, therefore, is something the Administrator has no choice but to embrace. This is not the case with the NAC. If the Congressional advice did not align with the Administrator's priorities, the Administrator could choose to reduce the scope of issues he or she places before the NAC for advice, rendering the NAC less effective in its advisory role. Therefore, the Academy Panel recommends against extending the role of the NAC to include advising Congress. However, the Panel concludes that, given the critical role Congress plays in the successful execution of NASA's mission, it would be wise for the NAC to

seek input from the majority and minority stakeholders in the U.S. House of Representatives and Senate about their priorities and concerns to inform its deliberations. [12]

[12] Concern was expressed about the legality of seeking input from Congress. Research findings informed the study that in the past, a NAC chair occasionally consulted informally with Congressional staff for the purpose of understanding congressional interest and concern, and received positive feedback for doing so. Additionally, study research found that FACA committees have sought input from the relevant Congressional committees, without raising concerns about propriety or permissibility under FACA.

Appendix A: Panel Members and Study Team Biographies

Panel Members

Robert Tobias (Chair) is a Distinguished Practitioner in Residence, Department of Public Administration and Policy, American University; Director, Business Development, Key Executive Leadership Program, American University; Director, Institute for the Study of Public Policy Implementation, American University; and Member, Internal Revenue Service Oversight Board. Mr. Tobias held former positions with National Treasury Employees Union as National President, Executive Vice President, and General Counsel. He is a former Member of the Commercial Activities Panel.

Shantanu Agrawal, M.D., is President and Chief Executive Officer (CEO) of the National Quality Forum. Dr. Agrawal was former Deputy Administrator and Center Director for the Centers for Medicare and Medicaid Services and Managing Director for Clinical Analytics and Efficiency, ChenMedical, Limited Liability Corporation. Dr. Agrawal held former positions with Center for Program Integrity, Centers for Medicare & Medicaid Services as Director, Data Sharing and Partnership and Chief Medical Officer, and Engagement Manager, Senior Associate, and Associate with McKinsey and Company, Incorporated.

David Berteau is currently President and CEO for the Professional Services Council. Mr. Berteau is the former Assistant Secretary of Defense for Logistics and Materiel Readiness, U.S. Department of Defense (DoD); Vice President and Director for the National Security Program on Industry and Resources, Center for Strategic and International Studies; Director, Clark and Weinstock; Director, National Security Studies, Maxwell School of Citizenship and Public Affairs, Syracuse University; and Senior Vice President and Operations Manager for the Science Applications International Corporation. Mr. Berteau formerly held positions with the U.S. DoD as Principal Deputy Assistant Secretary, Production and Logistics; Deputy Assistant Secretary, Force Management and Personnel; Executive Secretary, President's Blue Ribbon Commission on Defense Management (Packard Commission); Special Assistant to the Deputy Secretary of Defense; Special Assistant to the Defense Comptroller; and Presidential Management Intern, Office of the Secretary of Defense.

Philip Rubin is a Senior Advisor to the President, Haskins Laboratories. Dr. Rubin was a former Principal Assistant Director for Science, Office of Science and Technology Policy (OSTP), Executive Office of the President of the United States; Senior Scientist, Haskins Laboratories; Assistant Director for Social, Behavioral and Economic Science, OSTP, Executive Office of the President of the United States; Professor Adjunct, Yale University School of Medicine, Department of Surgery, Otolaryngology; and Director, Division of Behavioral and Cognitive Sciences, National Science Foundation (NSF). Dr. Rubin held former positions at Haskins Laboratories as CEO, Vice President, and Chief Operating Officer.

Janet Weiss is the Mary C. Bromage Collegiate Professor of Business and Professor of Public Policy at the Gerald R. Ford School of Public Policy, University of Michigan. Ms. Weiss is a former Visiting Scholar, Trachtenberg School of Public Policy and Public Affairs, George Washington University;

Visiting Professor, McCourt School of Public Policy, Georgetown University. She held former positions with University of Michigan as Vice Provost for Academic Affairs and Dean, Rackham Graduate School; was a former Fellow, Center for Advanced Study in the Behavioral Sciences, Stanford, CA; and held former positions with School of Organization and Management and Institution for Social and Policy Studies, Yale University as Assistant Professor and Associate Professor.

Academy Study Team

Roger Kodat, *Program Area Director.* Mr. Kodat has led fifteen projects as a consultant to the Academy, several focusing on strategic planning and organizational transformation. He brings twenty years of commercial and investment banking experience with JPMorgan Chase, and six years of senior level federal government experience at the Department of the Treasury. Appointed by President George W. Bush in 2001 to serve as Deputy Assistant Secretary of Treasury, he was responsible for Federal Financial Policy. Some of his tasks at Treasury included policy formulation for the 2006 Postal Accountability and Enhancement Act; rule making and oversight of Federal loan and loan guarantee programs; and management of the Federal Financing Bank (a $32 billion bank at that time). Mr. Kodat holds a Bachelor of Science (B.S.) in Education from Northwestern University and both a Masters of Business Administration (M.B.A.) in Finance and Masters of Arts (M.A.) in Political Science from Indiana University.

Brenna Isman, *Project Director.* Ms. Isman is a Project Director at the Academy. She has directed projects with the EPA, the Office of the Inspector General (OIG) for the Department of State; the Office of Management and Budget (OMB); Amtrak's OIG; and has provided subject matter expertise for projects with the Veterans Administration, Social Security Administration (SSA), and United States Coast Guard (USCG). She is an experienced facilitator and her expertise focuses on development of communication and business strategy frameworks, analysis of ongoing transformation initiatives, and strengthening stakeholder engagement. Prior to joining the Academy, Ms. Isman was a Senior Consultant for the Ambit Group and a Consultant with Mercer Human Resource Consulting, facilitating effective organizational change and process improvement. As the Assistant Director for Executive Education for the Kogod School of Business at American University, Ms. Isman developed curriculum for business certificate programs and managed program delivery. She holds an M.B.A. from American University and a B.S. in Human Resource Management from the University of Delaware.

Jonathan Tucker, *Deputy Project Director.* Dr. Tucker's areas of expertise include strategic planning/foresight, organizational design, change management, and science and technology/innovation policy. His public management consulting experience includes projects with over twenty federal agencies. His recent Academy projects included assessing the consensus study process at the National Research Council; developing a strategic plan for the Office of Urban Indian Health Programs; developing options for the establishment of a new Under Secretary at U.S. Department of Agriculture (USDA) focused on international trade; developing a white paper for the Project Management Institute on institutionalizing project and program management in the federal government; assessing Census transformation initiatives; and developing a long-term strategic plan

for operational transformation at the SSA. Before joining the Academy, he worked for organizations including Battelle; the National Research Council; the National Institute of Standards and Technology; and the New York State Department of Economic Development. Dr. Tucker holds a Ph.D. in Public Policy from George Mason University, a Master of Science in Science and Technology Studies from Rensselaer Polytechnic Institute, and a B.A. from New College of Florida.

Chloe Yang, *Research Analyst.* Since joining the Academy in 2009, Ms. Yang has worked on projects involving a range of federal agencies, including the National Science Foundation, OMB, Pension Benefits Guarantee Corporation, Amtrak OIG, U.S. Coast Guard, and the Government Accountability Office. Her expertise spans the fields of strategic planning, intergovernmental collaboration, and financial and performance management. Before joining the Academy, Ms. Yang was the research intern at the Foundation of Environmental Security and Sustainability. She also worked as an intern at the Woodrow Wilson Center for Scholars and research assistant at George Mason University (GMU). Ms. Yang is a Ph.D. candidate at GMU, from which she also holds a Masters of Public Administration degree. She also holds a bachelor's degree in Financial Management from the Renmin University of China.

Elijah Evans, *Research Associate.* Mr. Evans joined the Academy in February 2017. Since that time, he served on congressionally directed engagements that examined the EPA's guidelines for affordability of infrastructure investments and NASA's use of its Advisory Council. Mr. Evans has also worked on other strategic planning engagements and he leads internal efforts driving digital modernization efforts at the Academy. Mr. Evans received a B.S. in Convergence Journalism and Political Science from Abilene Christian University in December 2016.

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Appendix B: Interviewee List

(Titles and positions listed are accurate as of the time of the Academy's initial contact)

NASA Leadership and Staff (Current and Former)

Charles Bolden – Former Administrator (2009 – 2017)
Michael Griffin – Former Administrator (2005 – 2009)
Robert Lightfoot, Jr. – Former Acting Administrator (2017 – 2018)
William Gerstenmaier – Associate Administrator, Human Exploration and Operations Mission Directorate
Jolene Meidinger – Interagency Liaison, Office of International and Interagency Relations
Sean O'Keefe – Former Administrator (2001 – 2005)
P. Diane Rausch – Executive Director, NASA Advisory Council
Christopher Scolese – Former Acting Administrator (2009)

NASA Advisory Council Chairs and Members (Current and Former)

Wanda Austin – Former President and Chief Executive Officer, The Aerospace Corporation
Penina Axelrad – Professor and Chair, Department of Aerospace Engineering Sciences, University of Colorado, Boulder
William Ballhaus, Jr. – Former President and Chief Executive Officer, The Aerospace Corporation
John Borghese – Vice President, Rockwell Collins Advanced Technology Center
Kenneth Bowersox – U.S. Naval Aviator (Retired), and Former NASA Astronaut
William Cole – Vice President, FireEye
Raymond Colladay – Former President, Lockheed Martin Astronautics
Eileen Collins – Former NASA Astronaut and U.S. Air Force Colonel (Retired)
Alan Epstein – Chair, Aeronautics and Space Engineering Board, National Academy of Engineering
Kenneth Ford – Founder and Director, Florida Institute for Human and Machine Cognition
N. Wayne Hale – Consultant, Special Aerospace Services
Fiona Harrison – Benjamin M. Rosen Professor of Physics, Kent and Joyce Kresa Leadership Chair, Division of Physics, Mathematics and Astronomy, California Institute of Technology
G. Scott Hubbard – Adjunct Professor, Aeronautics and Astronautics, Stanford University
Wesley Huntress, Jr. – Director Emeritus, Geophysical Laboratory, Carnegie Institute of Washington
Charles Kennel – Chair, Space Studies Board, National Academy of Science
John Logsdon – Professor Emeritus of Political Science and International Affairs, George Washington University
General Lester Lyles (U.S. Air Force Retired) – Chairman, Board of Directors, USAA
Bradley Parkinson – Emeritus Edward C. Wells Professor in the School of Engineering, Stanford University
Elisabeth Pate-Cornell – Professor and Founding Chair, Department of Management Science and Engineering, Stanford University
Bradley Peterson – Professor Emeritus, and former Chair, Department of Astronomy, Ohio State University

Harrison ("Jack") Schmitt – Former NASA Apollo Astronaut and U.S. Senator
Steven Squyres – James A. Weeks Professor of Physical Sciences, Cornell University
A. Thomas Young - Former Executive Vice President, Lockheed Martin Corporation

NASA Aerospace Safety Advisory Panel

Admiral Joseph Dyer (U.S. Navy Retired) (Former Chair) – Chief Strategy Officer, National Spectrum Consortium
Patricia Sanders (Chair) – Independent Aerospace Consultant

Miscellaneous

Amanda Chuzi – Former Legislative Aide, Office of Senator Tim Kaine
Martin Faga – Member, National Space-Based Positioning, Navigation and Timing Advisory Board, and former President and Chief Executive Officer, MITRE
Tom Hammond – Majority Staff Director, Science, Space, and Technology Committee, U.S. House of Representatives
Lorelei Kowalski – Director, Committee Management Secretariat, U.S. General Services Administration
W. Henry Lambright – Professor of Political Science and Public Administration, The Maxwell School, Syracuse University
Marcia Smith – Founder and Editor, SpacePolicyOnline.com

Appendix C: Selected Bibliography

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Appendix D: Review of Literature on Optimal Size of Decision-making Bodies

Social science and best practice literature suggests that the optimal size of decision-making bodies falls somewhere between five and eight people. Differences on the margins relate to the efficacy of decision-making on the low end and its efficiency on the high end of the group size continuum. Groups on the low end may not have the breadth of expertise or experience to effectively address problems, while larger groups become unwieldy.

There is broad agreement on a logic underlying the tradeoff between group size and efficiency, as founded on the seminal research of Richard Hackman,[13] which focuses on the number of communication links that must be maintained among group members (assuming a task defined by interdependence).[14] As the size of the group grows, the number of communication links expands, rising steeply beyond five. As the number of communication links a group must maintain grows, communication breakdowns become more likely, hindering the efficiency and effectiveness of the group. (Relatedly, Hackman found that participant satisfaction was greatest in a group size of five members—neither too small nor too large in the view of participants). A recent study found that the optimum group size is seven and that with every person added thereafter, decision-making effectiveness by the group decreased by 10 percent.[15] In addition to empirical tests, studies used probability and statistics to argue that the decision-making accuracy becomes greatest at a group size of five but does not decrease between five and eight.[16] It can be inferred from the research on group size and decision-making accuracy that the effectiveness of groups would benefit from a greater number of participants (with the appropriate knowledge) when confronting problems involving more domains of expertise. However, the literature on communication losses related to increasing group size suggests that improved effectiveness (accuracy) will entail an increasing loss of efficiency. Measures such as skilled facilitation and breaking into smaller subgroups may at least partially compensate for communication losses in groups larger than eight.

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[13] J. Richard Hackman and Neil Vidmar, ***Effects of Size and Task Type on Group Performance and Member Reactions***, Sociometry, March, 1970.

[14] Another widely accepted logic for explaining the decline in the effectiveness of groups as size increases follows from the seminal research by Maximilien Ringelmann, which explains decreasing effectiveness with reference to the declining effort by individuals as they sense that their individual contribution means less or is not noticed. This slackening of individual effort is commonly referred to as "social loafing" in the literature. This research may have some relevance to effectiveness of consensus study committees to the extent committee members are engaged not just in deliberation and reaching consensus but also in report development.

[15] Marcia W. Blenko, Michael C. Mankins, and Paul Rogers, Bain and Company, ***Decide and Deliver: Five Steps to Breakthrough Performance in Your Organization***, Harvard Business Review Press, 2009.

[16] ***How to Design Small Decision Making Groups***. www.intuitor.com/statistics/SmallGroups.html.

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Appendix E: List of Organizations Considered for Benchmarking the NAC

Table 1. List of Organizations Considered for Benchmarking the NAC

Organizations	Functions	Member Appointments	Member Qualifications	Terms of Members	Frequency of Meetings	Leadership, Structure, and Committees	Professional Staffing
NASA Aerospace Safety Advisory Panel (ASAP) https://oiir.hq.nasa.gov/asap/charter.html	• Review safety studies and operations plans referred to the ASAP and make reports thereon; • Advise the NASA Administrator and the Congress with respect to the hazards of proposed or existing facilities and proposed operations, the adequacy of proposed or existing safety standards, and management and culture related to safety; and • Perform such other duties as the NASA Administrator may request.	• A maximum of nine members, appointed by the NASA Administrator. • Not more than four members shall be chosen from among the officers and employees of NASA.	• The panel is comprised of recognized safety, management, and engineering experts from industry, academia, and other government agencies.	Six year terms	Four full panel meetings each year, on a quarterly basis	• The ASAP shall designate one member as its chairperson. • Subcommittees, taskforces, and/or work groups may be established by NASA to conduct studies and/or fact-finding, requiring an effort of limited duration. • Deliberate and report its findings and recommendations to NASA Administrator • Submit an annual report to the Administrator and the Congress	NASA's Office of International and Interagency Relations provides staff support and operating funds for the ASAP.
National Space-	• Provide advice as	• No more than	Constituent experts	• Two-year	Two public	• The PNT	The NASA

Organizations	Functions	Member Appointments	Member Qualifications	Terms of Members	Frequency of Meetings	Leadership, Structure, and Committees	Professional Staffing
Based Positioning, Navigation and Timing (PNT) Advisory Board https://www.gps.gov/governance/advisory/charter	directed by the National Space-Based Positioning, Navigation, and Timing Executive Committee (PNT EXCOM) and through NASA on U.S. PNT policy, planning, program management, and funding profiles in relation to the current state of national and international space-based PNT services. • Provides assessments and recommendations to facilitate the accomplishment of the goals and objectives of the U.S. PNT Policy on behalf of the PNT EXCOM. • Evaluate national and international needs for changes in space-based PNT capabilities; assess possible tradeoffs among options. • Provide independent advice and recommendations to the PNT EXCOM on requirements and program needs.	twenty-five members • Nominated by the agencies on the PNT EXCOM • Approved by the PNT EXCOM Co-chairs, and appointed by the NASA Administrator • The NASA Administrator, in consultation with the PNT EXCOM Co-chairs, approved the PNT Advisory Board Chair and Vice Chairs.	from outside of the government (e.g., industry sectors, academia, international organizations, or PNT user application areas)	terms, renewable at the discretion of the NASA Administrator • PNT Advisory Board member rotations generally will not exceed six members at any one time to ensure a core institutional membership is maintained.	meetings each calendar year	EXCOM is co-chaired by the Deputy Secretaries of the DoD and the Department of Transportation (or by their designated representatives). • PNT EXCOM is currently comprised of representatives at the equivalent level from the Department of State, DOC, DHS, DOI, USDA, the Joint Chiefs of Staff, and NASA. • The PNT Advisory Board Chair or Vice Chairs will report findings, recommendations, and tasking progress to the PNT EXCOM, of which NASA is a founding member.	Human Exploration and Operations Mission Directorate provides staff support and operating funds for the PNT Advisory Board.
National	• Establish the policies of	• Twenty-five	• Eminent in the	• Six-year	Five meetings a	• The NSB elects	• The

Organizations	Functions	Member Appointments	Member Qualifications	Terms of Members	Frequency of Meetings	Leadership, Structure, and Committees	Professional Staffing
Science Board (NSB) https://www.nsf.gov/nsb/index.jsp	NSF within the framework of applicable national policies set forth by the President and the Congress • Identify issues that are critical to the NSF's future • Approve NSF's strategic budget directions and the annual budget submission to the OMB • Approve new major programs and awards • Serve as an independent body of advisors to both the President and the Congress on policy matters related to science and engineering and education in science and engineering	members appointed by the President • The NSF Director is an ex officio member.	fields of the basic, medical or social sciences, engineering, agriculture, education, research management or public affairs; • Selected solely on the basis of established records of distinguished service; and • Selected as to provide representation of the views of scientific and engineering leaders in all areas of the nation.	terms • One-third of the Board has two-year appointments.	year (usually four times at the NSF Headquarters [HQ] in Alexandria, VA, and one in another part of the country)	its own Chairman and Vice Chairman. • The Chairman, in turn, is authorized to make appointments to the NSB staff. • There are six standing committees—Executive Committee, Committee on Oversight, Committee on External Engagement, Committee on Awards and Facilities, Committee on National Science and Engineering Policy, and Committee on Strategy	board's Executive Officer heads the NSB office. • NSB has the authorities to appoint its own staff and manage its own budget.
EPA Science	• Provides independent	• Forty-five	• Independent	• Three-year	Six to eight		EPA's Office

Organizations	Functions	Member Appointments	Member Qualifications	Terms of Members	Frequency of Meetings	Leadership, Structure, and Committees	Professional Staffing
Advisory Board (SAB)	advice and peer review to EPA's Administrator on the scientific and technical aspects of environmental issues. • SAB reports to the EPA Administration; congressional committees specified in ERDDAA may ask the EPA Administrator to have the SAB provide scientific advice on a particular issue.	members • The chair of the clean air scientific advisory committee is a member.	experts in the fields of science, engineering, and economics and other social sciences	terms • May be renewed for an additional three-year term	meetings each year		of the Administrator provides financial and administrative support.
Defense Policy Board	• Provides independent advice and recommendations on science, technology, manufacturing, acquisition process, and other matters of special interest to the DoD.	• No more than twenty-eight members selected by the Under Secretary of Defense for Policy, with the approval of the Secretary of Defense. • Associate members (no more than four at any one time), may be appointed to the Defense Policy Board to participate in an assessment of a particular issue.	• Membership consists primarily of private sector individuals with distinguished backgrounds in national security affairs, but may include no more than four government officials.	• Two-year terms • Appointments are renewed annually.	Quarterly meetings, or as required by the Under Secretary for Policy. Panels of the Defense Policy Board may meet at other times in support of a particular topic.	The appointment of the chair is administratively certified by the USD (AT&L) and authorized by the Secretary of Defense.	The Under Secretary of Defense for Policy will provide such personnel, facilities, and other administrative support as are deemed necessary.

Appendix F: Transitioning to a Three-Year, Staggered Term Structure

Logistics of transitioning the current NAC to a staggered three-year term would include:

- Assignment of terms:
  - Assign the one-third of the NAC with the longest tenure to a one-year term
  - Assign the middle tenured one-third of the NAC to a two-year term
  - Assign a three-year term to those most recently appointed NAC members
- Reappointment
  - Once in place, the agency can reappoint individuals for an additional three-year term or exercise the option to replace that individual with a new member
- Additional considerations
  - Aligning the charter of the NAC with the three-year terms would allow for greater coordination of activities

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