

Selection Statement  
For  
Commercial Crew Integrated Capability  
(Announcement Number NASA-CCiCap)

On July 10, 2012, I along with other senior officials of the National Aeronautics and Space Administration (NASA), met with the Participant Evaluation Panel (PEP) appointed to evaluate proposals submitted in response to the Commercial Crew Integrated Capability (CCiCap) Announcement (Announcement Number NASA-CCiCap).

**I. Background and Evaluation Process**

In 2009, NASA began commercial crew initiatives to stimulate the private sector to develop and demonstrate human spaceflight capabilities that could ultimately lead to the availability of commercial human spaceflight services for both commercial and Government customers. Those initiatives focused on maturing designs of elements of a crew transportation system (CTS). The Announcement for the Commercial Crew Integrated Capability (CCiCap) began a new initiative to facilitate industry's development of an integrated CTS. Facilitating development of this U.S. capability will provide national economic benefit and support safe, reliable, and cost effective transportation to Low-Earth Orbit (LEO). NASA solicited proposals from U.S. space industry Participants to further mature the design and development of an integrated CTS that includes spacecraft, launch vehicle, and ground and mission systems. In order to open up the design trade space and encourage innovations and efficiencies in system design solutions, NASA did not dictate a specific integrated crew transportation system design. NASA made available the current standards and requirements that could ultimately apply to crew transportation (e.g. NASA's 1100 series, SSP 50808 and industry standards). Each Participant determined its integrated system requirements and design that best serves its target markets. This activity is expected to result in significant maturation of commercial CTS capabilities and significant progress towards an orbital crewed demonstration flight of these systems. CCiCap will consist of a base period from award to no later than May 31, 2014, which will include detailed integrated system design and significant risk reduction activities. CCiCap will be structured to allow extension beyond the base period via execution of optional milestones.

Selected CCiCap Participants will receive funded Space Act Agreements (SAAs) under NASA's other transactions authority within the National Aeronautics and Space Act, 51 U.S.C. 20113 et seq.

The Announcement was released on February 7, 2012. It divided the proposals into three sections with one appendix, all due on March 23, 2012. Section I was an Executive Summary, Section II was the Technical Approach, and Section III required Business Information. The appendix contained a proposed Space Act Agreement. Proposals were received from the following companies (Participants):

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|---|---|
| – Sierra Nevada Corporation Space Systems (SNC) | – The Boeing Company                                  |
| – ATK Aerospace Systems                         | – Space Exploration Technologies Corporation (SpaceX) |
| – Space Operations,                             | – Spacedesign Corporation                             |
| – American Aerospace, Inc                       |   |

The proposal from Spacedesign Corporation was late and therefore was not evaluated.

The evaluation and selection were conducted using a five-step process:

- Step 1 – Acceptability Screening
- Step 2 – Initial Evaluation
- Step 3 – Due Diligence
- Step 4 – Portfolio Selection
- Step 5 – Finalize Space Act Agreements

**Acceptability Screening:** Upon proposal receipt, the Agreements Officer reviewed all proposals to determine whether each proposal was consistent with the Announcement's proposal instructions.

Additionally, the voting members of the PEP read the executive summary of each proposal to determine whether the proposal satisfied the following fundamental criteria:

1. Proposes an integrated CTS;
2. Demonstrates significant risk reduction test activities in the base period; and
3. Culminates with an orbital crewed demonstration flight.






If after reading the executive summary, it was determined that the proposal failed to meet the fundamental criteria, it was considered an unacceptable proposal. Proposals that received an unacceptable proposal rating were eliminated from further evaluation.

American Aerospace, Inc.'s proposal was inconsistent with the Announcement's proposal instructions because it failed to address the eligibility requirements of the Announcement and lacked an executive summary. Therefore, the proposal was considered unacceptable and eliminated from further evaluation.

Space Operations, Inc.'s proposal did not meet the fundamental criteria because the executive summary did not demonstrate significant risk reduction test activities and did not propose an integrated CTS. Therefore, the proposal was considered unacceptable and eliminated from further evaluation.

**Initial Evaluation:** The PEP then conducted an initial evaluation of the remaining proposals that passed the acceptability screening. Each proposal was evaluated on its Technical Approach and Business Information sections on a standalone basis without comparison to other proposals. Evaluators identified the distinguishing factors of each proposal, which were documented as findings of strengths and weaknesses. The Business Information and Technical Approach team leads each convened a meeting of the evaluation team to review all findings in their respective areas, and prepared team findings representing their respective areas along with a recommended Level of Effectiveness and Level of Confidence rating for their respective areas based upon the team findings. The team leads then presented the proposed team findings and ratings recommendations for their respective areas to the PEP voting members. At the conclusion of the initial evaluation, the PEP voting members reached a consensus on all findings and determined initial Level of Effectiveness and Confidence ratings for each proposal's Technical Approach and Business Information sections. The PEP voting members then determined, after consultation with me, the proposals most favorably evaluated as candidates for further due diligence. All other proposals received no further evaluation at this point but their evaluation results were presented to me and my advisors during the Portfolio Selection.

There are five Level of Effectiveness ratings:

Color	Criteria
	<b>Very High Level of Effectiveness:</b> The proposal is very highly effective in meeting the goals of this announcement.
	<b>High Level of Effectiveness:</b> The proposal is highly effective in meeting the goals of this announcement.
	<b>Moderate Level of Effectiveness:</b> The proposal is moderately effective in meeting the goals of this announcement.
	<b>Low Level of Effectiveness:</b> The proposal has low effectiveness in meeting the goals of this announcement.
	<b>Very Low Level of Effectiveness:</b> The proposal has very low effectiveness in meeting the goals of this announcement.

There are three Level of Confidence ratings:

Confidence	Criteria
<b>High</b>	The proposal demonstrates that the Participant is very likely to successfully perform the proposed effort according to the goals of the announcement.
<b>Medium</b>	The proposal demonstrates that the Participant is likely to successfully perform the proposed effort according to the goals of the announcement.
<b>Low</b>	The proposal demonstrates that the Participant is less likely to successfully perform the proposed effort according to the goals of the announcement.

**Due Diligence:** The PEP conducted face-to-face meetings with the Participants whose proposals were most favorably evaluated. During these meetings, Participants presented their overall CCiCap proposed approach, responded to the initial evaluation findings and questions submitted to them by the PEP, and resolved issues associated with draft Space Act Agreements and their proposed performance milestones. After completion of the due diligence meetings, the PEP reconvened to amend the consensus findings based on any new information obtained from the revised proposals that may have impacted the initial evaluation results and assigned final Level of Effectiveness and Level of Confidence ratings based on the final consensus findings.

**Portfolio Selection:** The PEP presented to me and my advisors a summary of the proposal evaluations including the consensus findings, Level of Confidence and Effectiveness ratings, proposed NASA funding amounts, and the identification of all other proposals that did not receive further evaluation. This included the PEP's analysis of different portfolio combinations for award and the respective amounts of NASA contribution to be offered.



## Initial Evaluation

Four proposals passed the Acceptability Screening and were evaluated by the full PEP. The Technical Approach and Business Information sections were evaluated separately with a Level of Effectiveness rating and Confidence rating given for each, based on the consensus findings prepared using the distinguishing factors (strengths or weaknesses) in the proposal.

### Sierra Nevada Corporation Space Systems (SNC)

For the Technical Approach evaluation, SNC received a Level of Effectiveness color rating of “GREEN” and a “LOW” Level of Confidence rating.

**Strengths included:** Spacecraft design provides a robust operational capability, which offers significant performance advantages; use of non-toxic propellants significantly reduces the complexity of ground operations and risk to both the ground and flight crew; use of failure tolerance and dissimilar redundancy improves overall system robustness and crew survivability; demonstrates the criteria and plans for their system certification, which considers potential customer standards; a comprehensive insight approach that should provide NASA visibility into all aspects of the CTS design and development process; use of a booster that has extensive flight history and proven success record; organizational structure has a Safety and Mission Assurance (S&MA) organization with an independent reporting path and an independent assessment capability; mapped a series of well defined technical milestones to specific CCiCap goals and program risks; and includes multiple safety review milestones and provides Safety and Mission Assurance (S&MA) products at significant design review and development milestones.

**Weaknesses included:** Does not adequately address the design for the mechanical interface with the Atlas V Launch Vehicle Interface System (LVIS); does not adequately address the mitigation strategy for risks associated with its pressurized crew module; does not adequately address the launch site development required during the CCiCap base period; does not include any provisions for Air Force (AF) or Federal Aviation Administration (FAA) regulations, AF range approval, and FAA and FCC licensing; does not adequately address the risk associated with Thermal Protection System (TPS) damage; schedule is extremely aggressive and is back-loaded with key test milestones; reflects a lack of maturity in the area of nominal and off-nominal ascent performance analysis and does not include a detailed plan for the analysis and testing required prior to a crewed demonstration flight; does not adequately address the launch vehicle configuration, development and qualification; does not adequately address the method of assessing risk to human life (e.g. the Probabilistic Safety Analysis (PSA)); milestones do not include enough detail to clearly establish the scope and content of the proposed activity; and does not adequately associate proposed optional period test activities with the completion of their certification prior to the orbital crewed demonstration flight.

For the Business Information evaluation, SNC received a Level of Effectiveness color rating of “WHITE” and a “MEDIUM” Level of Confidence rating.

**Strengths Included:** Business plan includes expanding early to diverse non-NASA customers and ability to fund its proposed investment without reliance on external sources.

**Weaknesses Included:** Business plan provided inadequate information to assess its analysis of the commercial market and the likelihood of obtaining their projected market share;

inadequately describes its product pricing to determine the feasibility of the Participant's business case; business strategy lacks adequate consideration of launch pad availability and demand in 2016 and out years, creating significant uncertainty as to its CTS business plan; cost estimate lacks any discussion of how technical risks and cost growth are incorporated into the cost estimate; does not adequately describe critical Government and key external resources to meet all proposed milestones, critical Government agreements and key external contracts already in place and those pending, or potential impacts/workarounds if the proposed Government resources are not available; and assertion that its option period activities are exempt from INKSNA and its failure to address procedures to ensure NASA technical support is not provided to prohibited sources.

#### **ATK Aerospace Systems (ATK)**

For the Technical Approach evaluation, ATK received a Level of Effectiveness color rating of “YELLOW” and a “LOW” Level of Confidence rating.

**Strengths Included:** Launch vehicle offers significant performance margin, which should reduce impacts associated with potential spacecraft mass growth; Situational Awareness and Fault Evaluation (SAFE) system increases confidence to provide a safe and reliable CTS; organizational structure has a Safety and Mission Assurance (S&MA) organization with an independent reporting path and an independent assessment team; and provides Safety and Mission Assurance (S&MA) products at significant design review and development milestones.

**Weaknesses Included:** Does not provide sufficient detail regarding the Participant's ground processing plan for the spacecraft and launch vehicle to evaluate the proposed flight rate; proposes orbital crewed demonstration flight during the optional period of CCiCap, but does not provide adequate detail to understand if its proposed flight in 2015 is achievable; does not provide adequate rationale to support the stated maturity level (TRL) of many key elements of its proposed architecture; does not provide sufficient detail to evaluate the integrated spacecraft design or the Participant's plans for spacecraft development, testing, and operations; identifies “systems integration of heritage and new items” as a significant program risk; however, insufficient information is provided to evaluate if this risk has been adequately mitigated; development schedule does not allow sufficient time to complete the Air Force (AF) range and Federal Aviation Administration (FAA) licensing approval process and does not address requirements for FCC licensing; schedule appears extremely aggressive and does not include supporting rationale; does not adequately address the method of assessing risk to human life (e.g. the Probabilistic Risk Analysis (PRA)) and lacks adequate information to support the statements in the proposal on LOC and overall safety; SAA milestones lack sufficient content; does not adequately propose optional period milestones that demonstrate significant test activities leading to the completion of its certification prior to the orbital crewed demonstration flight; and failed to propose milestones representing significant financial events.

For the Business Information evaluation, ATK received a Level of Effectiveness color rating of “YELLOW” and a “LOW” Level of Confidence rating.

**Strengths Included:** Business plan demonstrates viability by including services for multiple primary markets with multiple Launch Vehicle (LV) configurations for crew and supplies/cargo to LEO and ISS; has established infrastructure, management processes, and diverse, mature product lines; and proposed corporate investment into the CTS is significant.

**Weaknesses Included:** Business plan lacks definition on the return on investment, number of seats, the combination of seats and cargo needed to reach its expected business revenue, and does not provide the business case rationale to support the pro forma information; schedule is extremely aggressive with a high likelihood of significant cost growth; business plan provided inadequate information to assess its analysis of the commercial market and the likelihood of obtaining its projected market share; proposal significantly underestimates the cost risk associated with the maturity of many key elements of their proposed architecture; and does not identify potential impacts and workarounds if the proposed NASA resources are not available.

#### **The Boeing Company (Boeing)**

For the Technical Approach evaluation, Boeing received a Level of Effectiveness color rating of “GREEN” and a “MEDIUM” Level of Confidence rating.

**Strengths Included:** Demonstrates the criteria and plans for its system certification, which considers potential customer standards; proposes a detailed, comprehensive approach to its overall integrated vehicle development plan for CCiCap; contains numerous capabilities and development plans in regards to human systems integration and crew survivability; proposes to mature the Emergency Detection System (EDS) design and then integrate the EDS into the CCTS early in the development cycle; utilizes heritage technologies in sub-systems and existing processes in the CCTS with appropriate verification; proposes a comprehensive insight approach, which should provide NASA visibility into all aspects of the CTS design and development process; use of a booster that has extensive flight history and proven success record; organizational structure has a Safety, Reliability, and Quality Assurance (SRQA) organization and an independent assessment team; and use of failure tolerance and dissimilar redundancy improves overall system robustness and crew survivability.

**Weaknesses Included:** Does not adequately address the launch site development required during the CCiCap base period; does not address Common Communication for Visiting Vehicle (C2V2), which is required for two-way audio to the ISS; does not adequately address the Dual Engine Centaur (DEC) configuration, development and qualification; does not include any provisions for Air Force (AF) range approval, and FAA and FCC licensing; does not adequately address the method of assessing risk to human life (e.g. the Probabilistic Safety Analysis (PSA)); milestones do not include sufficient content to provide verifiable confidence of safe design and operations and do not include enough detail to clearly establish the scope and content of the associated activity; does not adequately associate proposed optional period test activities with the completion of its certification prior to the orbital crewed demonstration flight; and fails to include significant financial events that reduce risk of increased costs to the Government.

For the Business Information evaluation, Boeing received a Level of Effectiveness color rating of “WHITE” and a “MEDIUM” Level of Confidence rating.

**Strengths Included:** Demonstrates its business viability through profitable and mature product lines.

**Weaknesses Included:** Identified technical risks without demonstrating that these risks are considered in the cost estimate and overall business plan which could significantly drive

redesign of the vehicle and result in an increase in the life cycle cost; business case lacks sufficient data to determine the per seat cost; business plan provided inadequate information to assess its analysis of the commercial market and the likelihood of obtaining its projected market share; business strategy lacks adequate consideration of launch pad availability and demand in 2016 and out years, creating significant uncertainty as to its CTS business plan; corporate investment during the CCiCap period does not provide significant industry financial investment and there is increased risk of having insufficient funding in the base period; business plan lacks future financial status information; does not adequately identify critical Government agreements already in place and those pending, nor describe potential impact and workarounds if proposed Government resources are not available; and the Participant's assertion that its option period activities are exempt from INKSNA and its failure to address procedures to ensure NASA technical support is not provided to prohibited sources.

### **Space Exploration Technologies Corporation (SpaceX)**

For the Technical Approach evaluation, SpaceX received a Level of Effectiveness color rating of "GREEN" and a "LOW" Level of Confidence rating.

**Strengths Included:** Testing plan for the CTS includes significant risk reduction activities, CTS should provide a robust operational capability with failure tolerance and dissimilar redundancy; states numerous capabilities and development activities for human system integration with the CTS; mapped a series of well defined technical milestones to specific CCiCap goals and program risks; demonstrates the criteria and plans for its system certification which considers potential customer standards; approach of leveraging its existing cargo transportation system with incremental targeted design upgrades should result in a CTS with significant flight experience before early crewed flights; and its organizational structure has a Quality Assurance organization and a Safety and Mission Assurance (S&MA) organization with independent reporting paths, as well as an independent assessment team.

**Weaknesses Included:** Does not adequately address the launch site development required during CCiCap; does not provide sufficient detail regarding its ground processing plan for the spacecraft and launch vehicle to evaluate the proposed flight rate; does not provide sufficient detail to assess scope of work and level of effort required to mature the integrated CTS from the current cargo configuration to a human rated configuration; does not provide sufficient detail to assess its approach to systems engineering; milestone content lacks the maturity for the corresponding phase of the design development and does not adequately support utilization of a mature Probabilistic Safety Assessment (PSA) to influence the design; milestones do not include enough detail to clearly establish the scope and content of the proposed activity; optional period milestones that include NASA certification and a second demo flight with NASA crews are outside the scope of the Announcement; does not adequately associate proposed optional period test activities with the completion of its certification prior to the orbital crewed demonstration flight; and financial and business review milestone (#2) does not show funding schedule or enable risk reduction.

For the Business Information evaluation, SpaceX received a Level of Effectiveness color rating of "GREEN" and a "MEDIUM" Level of Confidence.

**Strengths Included:** CTS will utilize significant hardware elements of the existing cargo architecture, infrastructure, and processes to support the development of the future crew



architecture which minimizes development costs; and demonstrates a viable business plan that targets different markets beyond crew transportation to LEO and ISS with multiple spacecraft and launch vehicle configurations.

**Weaknesses Included:** Business plan provides inadequate information to assess its analysis of the commercial market and the likelihood of obtaining their projected market share; does not substantiate how it is obtaining a steady source of revenue from the provision of launch services and investor's capital and how such source(s) are sufficient to support its ongoing operations; cost estimate lacks any discussion on how technical risks and cost growth are incorporated into the cost estimate; and does not adequately describe critical key external resources, adequately identify Government agreements, key external contracts already in place and those pending, or describe potential impact and workarounds if proposed Government resources are not available.

### **Final Evaluation after Due Diligence**

In accordance with the Announcement and Evaluation Plan, the most favorably evaluated proposals were selected for due diligence. Four proposals went through due diligence: Sierra Nevada Corporation Space Systems, ATK Aerospace Systems, The Boeing Company, and Space Exploration Technologies Corporation.

The PEP amended the consensus findings, Level of Effectiveness color ratings, and Level of Confidence ratings based on the proposal revisions received after the due diligence meetings. These final findings, Effectiveness ratings and Confidence ratings were presented to me on July 10, 2012, and are summarized below.

#### **Sierra Nevada Corporation Space Systems (SNC)**

For the Technical Approach evaluation, the Level of Effectiveness color rating changed from "GREEN" to "BLUE" and the Level of Confidence rating changed from "LOW" to "MEDIUM".

No new strengths were identified; however, the following strength was revised for emphasis of the Participant's detailed milestone objective criteria: has a series of well defined technical milestones "*including detailed objective criteria, which are mapped*" to specific CCIcap goals and program risks. (Italicized represents revised finding) All weaknesses were fully addressed except as follows: does not adequately address the risk associated with spacecraft Thermal Protection System (TPS) damage.

For the Business Information evaluation, the Level of Effectiveness color rating changed from "WHITE" to "BLUE" and the Level of Confidence rating remained "MEDIUM".

No new strengths were identified. All weaknesses were fully addressed.

#### **ATK Aerospace Systems (ATK)**

For the Technical Approach evaluation, the Level of Effectiveness color rating changed from "YELLOW" to "WHITE" and the Level of Confidence rating remained "LOW".

No new strengths were identified. All weaknesses were fully addressed except as follows: does not provide sufficient detail to evaluate the integrated spacecraft design or the Participant's



plans for spacecraft development, testing, and operations; identifies “systems integration of heritage and new items” as a significant program risk; however, insufficient information is provided to evaluate if this risk has been adequately mitigated; and the schedule appears extremely aggressive and does not include supporting rationale.

For the Business Information evaluation, the Level of Effectiveness color rating changed from **“YELLOW”** to **“GREEN”** and the Level of Confidence rating changed from **“LOW”** to **“MEDIUM”**.

No new strengths were identified. All weaknesses were fully addressed.

#### **The Boeing Company (Boeing)**

For the Technical Approach evaluation, the Level of Effectiveness color rating changed from **“GREEN”** to **“BLUE”** and the Level of Confidence rating changed from **“MEDIUM”** to **“HIGH”**.

No new strengths were identified. All weaknesses were fully addressed.

For the Business Information evaluation, the Level of Effectiveness color rating remained **“WHITE”** and the Level of Confidence changed from **“MEDIUM”** to **“HIGH”**.

No new strengths were identified. All weaknesses were fully addressed except as follows: proposed corporate investment during the CCiCap period does not provide significant industry financial investment and there is increased risk of having insufficient funding in the base period.

#### **Space Exploration Technologies Corporation (SpaceX)**

For the Technical Approach evaluation, the Level of Effectiveness color rating changed from **“GREEN”** to **“BLUE”** and the Level of Confidence rating changed from **“LOW”** to **“MEDIUM”**.

No new strengths were identified. All weaknesses were fully addressed except as follows: does not provide sufficient detail to assess scope of work and level of effort required to mature the integrated CTS from the current cargo configuration to a human rated configuration.

For the Business Information evaluation, the Level of Effectiveness color rating changed from **“GREEN”** to **“BLUE”** and the Level of Confidence rating changed from **“MEDIUM”** to **“HIGH”**.

No new strengths were identified. All weaknesses were fully addressed.

#### **Portfolio Selection Decision**

On July 10, 2012, following the presentation by the PEP, I fully considered the findings presented to me and held an executive session with my advisors to discuss the evaluation results. I asked the opinion of the advisors and asked for their comments, objections, or concerns with the materials presented. Following this discussion, I compared the proposals against one another to select a portfolio of approaches that collectively best meets the CCiCap goals within the available funding, as stated in the Announcement. I explain the discriminating factors and the significance of those

discriminators in my selection decision, as follows:

In accordance with the evaluation plan, I considered which proposals had the most effective approach to accomplish the CCIcap goals listed in the Announcement and the highest likelihood of successfully executing the proposed approach.

ATK's proposal had a strong business case that leveraged Liberty's characteristics and capabilities, such as the ability to support a wide variety of missions beyond crew transportation, including non-NASA customers, through multiple vehicle configurations for crew and cargo, and the proposal showed a significant financial investment by the ATK team as compared to the requested NASA contribution, which gave me confidence in the company's commitment to this activity. However, I had some significant concerns about the lack of detail in some areas of ATK's technical approach that outweighed its strengths in the Business Information section. In reviewing the PEP findings, ATK was rated the lowest of the four proposals in Level of Effectiveness for Technical Approach, with a rating of WHITE (Moderate). The PEP also identified more technical weaknesses (3) for ATK than for the other proposals. The first two of these three weaknesses would have a significant effect on the ability of ATK to meet the goals of the Announcement. The PEP also had a Technical Level of Confidence rating for ATK of LOW, which was the lowest of all proposals. Based on the PEP findings on technical approach, I found the ATK proposal to be the weakest of the four proposals. Specifically, while the proposal described the use of a particular spacecraft design as a point of departure for the Liberty spacecraft and the use of heritage systems, the proposal did not include enough data to understand the spacecraft baseline configuration that would serve as the starting point, the system changes planned to bring this spacecraft to the Liberty baseline, or how heritage systems will be modified and integrated to enable a CTS capability. The use of heritage components alone does not relieve the requirement to define a plan for development using these components. The proposal identified systems integration as a significant program risk, but did not provide sufficient information on how the systems integration risk would be mitigated. In addition to this lack of detail, the proposed schedule was very aggressive without enough information to satisfy me on the credibility of the schedule. It was not clear how ATK plans to integrate the spacecraft, launch vehicle, and ground and mission systems within the proposed schedule. All these elements combined causes significant concern regarding schedule integrity, which could negatively affect ATK's development cost. Basically the proposal lacked enough detail to determine if a safe crew transportation system could be developed in a timely and cost effective manner out of the heritage components ATK selected for this concept. The proposal recognized changes needed in these heritage systems and new integration activities, but did not provide a path to understand how these changes and integration activities would occur. Understanding these changes to heritage systems or the process for managing these changes is critical to understanding the viability of the overall proposal, and the integration work required can also dominate the effort if not controlled. The proposal correctly identified the integration risks, but did not offer a sufficient approach to manage this risk. It was for these reasons that I ranked ATK significantly lower than the other three proposals. There was a natural break in the overall technical proposal quality for ATK compared to the other three proposals.

In reviewing the remaining three proposals, while all three received a Very High Level of Effectiveness rating for the Technical Approach, it seemed clear to me that SpaceX and Boeing had the stronger technical proposals. This is evidenced by the Medium technical Confidence rating for SNC. Even though SpaceX also received a Medium technical Confidence rating, I do not consider these technical Confidence ratings of Medium for SNC and SpaceX as equivalent. The SNC Confidence rating is driven by several factors: complexity of the heat shield design, complexity in abort conditions, controlling weight of the design, and ability to bring green propellants on line in a cost effective and

timely manner. Whereas the SpaceX rating is driven predominately by a single consideration: design changes from the current cargo vehicle to a crew vehicle and human rating. Boeing had a High technical Confidence rating.

I find SpaceX's ability to leverage its existing Dragon/Falcon cargo system with incremental targeted design upgrades reduces the overall scope of the development effort going forward. Furthermore, their ground systems and mission control capability will be demonstrated several times on cargo missions prior to making the step to crewed missions, which is an advantage. SpaceX also maps a series of well defined technical milestones to specific CCiCap goals and program risks to include a clear connection between risk reduction and milestones. Its CTS should provide a robust operational capability with failure tolerance and dissimilar redundancy. I recognize there is some schedule uncertainty on the proposed Dragon/Falcon upgrades, but have good confidence that SpaceX can successfully perform the proposed effort. Leveraging the CTS off of the current cargo systems offers SpaceX a strong technical advantage. However there is a technical weakness identified by the PEP in this area. The PEP was concerned about the lack of sufficient detail provided to show how SpaceX will mature the integrated CTS from the current cargo configuration to a human configuration. I share that concern, but temper the concern with the advantages of having flown the basic cargo system. Flight experience with the cargo version will show areas of the design that will need additional work. Flying a version of the design will provide additional insight above single tests of systems. Flying the cargo version will lower the risk to the final CTS version, if the process for changes can be identified.

SpaceX's Business Information received the highest allowable Effectiveness rating of BLUE (Very High) with the highest allowable Confidence rating of High. SpaceX's ability to utilize significant hardware elements of its existing cargo system, infrastructure, and processes is consistent with it having the lowest overall development cost of all the proposals. The proposal sets out a credible business plan on how SpaceX will capture different markets to LEO and ISS and how it will utilize existing revenue streams associated with its current manifest to fund the CCiCap effort. Based on SpaceX's Technical Approach and Business Information ratings as well as the underlying findings giving rise to those ratings, I determine SpaceX has one of the top approaches for a portfolio selection.

A significant factor to me in Boeing's proposal was the comprehensive approach Boeing had to its overall integrated vehicle development plan which included an incremental approach to the detailed design and development effort, including multiple subsystem-level Critical Design Reviews (CDRs) culminating in its integrated CDR. This approach did a good job of tying the milestones to completion of certification and qualification activities and will allow for greater review and understanding of technical products prior to advancing to later development milestones. Boeing's approach also provides robust processes for mission assurance, engineering technical review boards, risk reduction, program management and design review. Also, its proposed use of heritage systems at the subsystem level provides confidence that design and development can be executed per the proposed schedule. Boeing did a good job of showing how heritage subsystem components would be integrated into the design. The integration of these heritage components into tests is well defined. This is an effective way to use heritage components at the subsystem level. Boeing's comprehensive insight approach coupled with the logically linked incremental milestones provides good access to development solution data packages that should provide greater insight into its CTS design details and trades.

It is important to note that Boeing's proposal had a single weakness in the Business section after due diligence for not achieving the significant financial investment strategic goal laid out in the Announcement. While this was only one of 13 goals, I did consider it. However, Boeing met all of the other goals and had a strong technical design; therefore, I did not find the lack of significant corporate



financial commitment to be a major discriminator in my assessment of the Boeing proposal.

As discussed above, SNC and SpaceX both received a Medium Level of Confidence rating for their Technical Approach, but SNC has many more technologies that need to be matured in order to reach a CDR and its winged lifting body design presents some unique challenges not found in a capsule design. This technology development and the rest of its development activities within the CCIcap base period make SNC's proposal a higher risk choice. However, there are some distinct advantages to keeping SNC and its winged vehicle approach in the portfolio. The use of a winged lifting body offers low entry and landing g-forces, which can be easier on humans and can enable more science payloads that require a smoother landing to be brought back from space, cross range capability (ability to deorbit on orbits not directly aligned with the runway), and runway landings which enable quick crew egress. These significant technical advantages could result in a larger customer base for SNC than a capsule design and more capability for users.

While SNC received a higher Effectiveness rating than Boeing in business approach, SNC received a lower Confidence rating than Boeing in its business approach. Boeing as a corporation contributed less to this activity than any offeror. I saw this as the primary reason for the Moderate Effectiveness rating on Boeing's business approach. Boeing had a High Confidence rating on business approach primarily because of the design simplicity and overall sound business plan. However, SNC had significant risks because of design complexity that could impact the business approach. This resulted in the Medium Confidence rating for SNC's business approach. For the reasons above, SpaceX had the overall edge in business approach among the three proposals. Even though SNC received BLUE (Very High) Effectiveness and Medium Confidence ratings and Boeing received WHITE (Moderate) Effectiveness and High Confidence ratings, I considered SNC and Boeing to be roughly equivalent in business approach for different reasons, as discussed above.

In summary, Boeing and SpaceX had the best proposals, followed by SNC as discussed above.

With this in mind, I looked at whether I had the budget to allow me to include three companies in the selected portfolio and at what levels. I believe it is in NASA's interest to include three companies in the selection because it adds robustness to the overall portfolio. This portfolio provides for a diversity of spacecraft designs (capsule and winged lifting body) as well as capturing the proposal that provides the earliest crewed demonstration flight under a credible schedule at the lowest development cost (SpaceX), and the proposal that represents the highest Level of Effectiveness and Confidence ratings on the technical approach (Boeing). Carrying a third company in the portfolio also adds robustness, if one of the three were to run into significant technical or financial trouble. Carrying a third company would keep competition even if one company needed to drop out. However, I do not have the funding to include all three companies in the portfolio at the levels of NASA contribution they have proposed. SNC has the most significant amount of risk reduction and technology development work to do before reaching CDR, and I would like to see what kind of progress SNC can make on increasing the maturity of some of its key technologies and reducing some of its key risks to increase my confidence in its ability to reach CDR before providing them with additional funding. For this reason, I decided that SNC will receive a significantly reduced award. In order to have sufficient funding, further reductions were also needed in Boeing's and SpaceX's original proposals. These reductions were moderate and determined to not adversely affect the proposals. I further evaluated if at this reduced funding level for SNC whether there is anything that would impact my decision regarding ATK. ATK's proposal remained significantly weaker in fundamental areas than the other three updated proposals.



I met with the voting members of the PEP and my advisors to evaluate some options for structuring this portfolio within the available budget on July, 18, 2012. I wanted to weigh the benefits of making awards to three companies, as described above, compared to only awarding to two companies and fully funding their proposals as submitted. I wanted to make sure that by making awards to three companies I was not adversely impacting the goals of CCIcap. Specifically, I was concerned that funding a third company would result in weakening the detailed integrated design understanding of the other two companies during the base period, weakening the understanding of the risks in their designs, or significantly impacting their testing and insight during the base period. Basically I wanted to make sure that adding the robustness of a third company did not impact significantly the progress of the other companies in meeting the goals of the Announcement. After discussion, I determined that the best approach to meet the overall goals of CCIcap was to make awards to three companies. The approach above allows for the development of fundamentally different concepts with distinct advantages in a cost effective manner without significantly impacting progress on the other two concepts. Awarding Space Act agreements to three companies with one at a significantly lower funding level is the best approach for CCIcap. I asked the PEP to obtain revised milestones consistent with the above discussions.

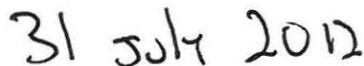
After listening to their results and reviewing the Space Act Agreements and revised milestones, I determined that it was in NASA's interest and consistent with the CCIcap goals to include all three companies in the portfolio.

In light of the discriminators I have described above, I select the following Participants for award of funded Space Act Agreements under the Commercial Crew Integrated Capability activity in the following amounts:

The Boeing Company:	\$460,000,000
Sierra Nevada Corporation Space Systems:	\$212,500,000
Space Exploration Technologies Corp.:	\$440,000,000



William Gerstenmaier  
Selection Authority



Date