U.S. DEPARTMENT OF TRANSPORTATION, FEDERAL AVIATION ADMINISTRATION
COMMERCIAL SPACE TRANSPORTATION ADVISORY COMMITTEE (COMSTAC)

MINUTES FOR WEDNESDAY, DECEMBER 11, 2013 MEETING

The Advisory Committee met at the National Housing Center, 1201 15th Street, N.W., Washington D.C., at 8:30 a.m., Michael N. Gold, Chairman, presiding.

MEMBERS PRESENT:
MICHAEL N. GOLD, Bigelow Aerospace (Committee Chairman)
MICHAEL LÓPEZ-ALEGRÍA, Commercial Spaceflight Federation (Vice Chairman)
PATRICIA COOPER, Satellite Industry Association
PETER FAHRENTHOLD, Northrop Grumman Corporation
OSCAR GARCIA, InterFlight Global Corporation
JEFFREY KENNETH GREASON, XCOR Aerospace
LIVINGSTON L. HOLDER, JR., Holder Aerospace
TIMOTHY HUGHES, Space Exploration Technologies Corporation
RAY F. JOHNSON, The Aerospace Corporation
JANET C. KARIKA, Jacobs NASA Launch Services Program
DEBRA FACKTOR LEPORE, Ball Aerospace & Technologies Corporation
MARK SUNDAHL, Cleveland State University
JENNIFER A. WARREN, Lockheed Martin Washington Operations

MEMBERS ABSENT:
BRETTON S. ALEXANDER, Blue Origin, LLC
CHRISTINE ANDERSON, New Mexico Spaceport Authority
MARK R. CAMPBELL, Commercial Space Flight Working Group, Aerospace Medical Association
DANIEL J. COLLINS, United Launch Alliance
STEVE ISAKOWITZ, Virgin Galactic
BILL N. KHOURIE, Oklahoma Space Industry Development Authority
CHRISTOPHER KUNSTADTER, XL Insurance
RUSS MCMURRY, Boeing Network & Space Systems
CHARLES J. PRECOURT, ATK Launch Systems
CARL D. RISING, Stellar Solutions
WILBUR C. TRAFTON, Will Trafton and Associates, LLC

ALSO PRESENT:
THE HONORABLE MICHAEL G. WHITAKER, FAA Deputy Administrator
GEORGE C. NIELD, Associate Administrator for Commercial Space Transportation
RICHARD DALBELLO, OSTP Assistant Director, Space and Aeronautics
MARK DAWSON, Legislative Director, Congressman Robert Aderholt
LORI B. GARVER, Former NASA Deputy Administrator
ROBERT M. LIGHTFOOT JR., Associate Administrator, NASA
CHIRAG PARIKH, NSS Director of Space Policy
ANN ZULKOSKY, Sr. Prof. Staff, Senate Commerce Subcommittee on Science & Space
TOM HAMMOND, Senior Prof. Staff, House Committee on Science, Space & Technologies

COMSTAC Agenda

- Welcome/Opening Remarks
- Introduction and Agenda Overview
- Featured Speaker - Michael G. Whitaker
- Remarks from Senate Staff
- Remarks from House Staff
  - House and Senate Staff Q & A
- Systems Working Group Report
- Remarks from White House OSTP
- Remarks from White House NSS
  - OSTP and NSS Q and A
- Observations from NASA
  - NASA Q & A
- Perspectives on Commercial Space Development
- Business/Legal Working Group Report
- Additional Remarks from House Staff
- Operations Working Group Report
- International Space Policy Working Group Report
- Wrap-Up and Adjournment

Welcome and Opening Remarks

- **Dr. George Nield, Associate Administrator for Commercial Space Transportation**

Remarks:

DR. NIELD: Good morning everyone, and welcome to the 58th Meeting of COMSTAC, the Commercial Space Transportation Advisory Committee. Really appreciate all of you sticking with us during some rather challenging weather conditions this week.

We'll be hearing from some outstanding speakers today. But before we get started with that, let me ask you a question. When you hear someone talking about the Challenger mission, what do you think of?

Most people I know have an image hard-wired into their brains related to the tragic loss of the space shuttle, and bitter cold temperatures, an unforgiving vehicle design and a flawed decision process that led to the loss of seven astronauts.

That was something that I'm sure those of us who lived through it will never forget. But there was another Challenger mission in our nation's aerospace history. In fact, it was 41 years ago today on December 11th, 1972, that the lunar module Challenger touched down on the lunar surface, as part of Apollo 17.

It was on that flight that Gene Cernan and Harrison Schmitt became the last human beings to set foot on the moon. Although there have been a lot of space flights in the intervening years, that was also the last time that our species dared to venture beyond low earth orbit. If you ask me, it's been way too long.

Fortunately, when it comes to making progress in our nation's space program, I'm starting to see some rather encouraging signs. Some of that progress is on the part of NASA and the rest of the federal government. But an awful lot of it is the result of what is going on in private industry.

Just in the last year, we've seen multiple commercial cargo missions to the International Space Station, ongoing efforts by several different companies to develop a commercial crew transportation capability; the first lifting body flight test in almost 40 years; some rather remarkable flights of a large; reusable vertical takeoff, vertical landing rocket booster; great studies on the feasibility of a near-term human flyby of Mars; the birth of several new space companies, with missions ranging from satellite serving to extraterrestrial resource extraction; and the beginning of a healthy debate about outer space property rights.

Over the next 12 months, I'm expecting at least one company to start flying suborbital space flights, with paying passengers on board, both for space tourism and to conduct scientific research. This is an exciting time for our nation's space program, and the commercial space sector is definitely where the action is.

I feel very fortunate to be able to introduce a new member of our AST senior leadership team this morning. This person has an outstanding background and is really going to be able to help us out in meeting the many new challenges we face.

Mike Romanowski received his B.S. in Aerospace Engineering from Boston University. He got an MS in Mechanical Engineering from RPI, and completed his Ph.D. in Mechanical Engineering from Duke. The last two years, he's been serving as an advisor to the White House, in the Office of Science and Technology Policy, working on policies designed to promote innovation and modernization of our nation's aviation infrastructure.

Prior to that assignment, he was a senior executive with the FAA here at headquarters, as the Director of Next Gen Integration and Implementation. Earlier in his career, he held a number of positions with the Aerospace Industries Association, and had worked for United Technologies Corporation, both with Sikorsky Aircraft and with Pratt and Whitney. His job here in AST will be to serve as the Director of Space Integration.

George Zamka, as our deputy associate administrator, will continue to be responsible for making top level programmatic decisions on what we do and when, and Mike is going to be responsible for how we do what we do. Who's doing the work, whether they have the training and resources they need, processes we put in place and so forth.

I'm also asking him to lead our work in developing and implementing a pilot program for Space Traffic Management, taking advantage of his experience with ATO and Next Gen, to build the bridges and the senior level relationships that we're going to need in order for that effort to be successful.

If you haven't had a chance to do so yet, please take a minute to introduce yourself to Mike during one of the breaks, and welcome him to the team. Mike, would you stand? Great, thanks.

Finally, I'd like to take the opportunity to thank all of the members of COMSTAC for their service. Between the current budget environment and a long list of technical and policy issues, the FAA's Office of Commercial Space Transportation is facing some rather daunting challenges right now.

So we really appreciate your engagement, your feedback, your insights and your advice. At this point, let me turn the podium over to Mike Gold, our COMSTAC chair, who will be providing us with a preview of today's agenda.

Chairman's Comments

- **Mike Gold, Chairman Commercial Space Transportation Advisory Committee**

Remarks:

Thank you George and good morning everyone. You know, some people blame Republicans for government shutdown; some people blame the President, Democrats, I blame this COMSTAC meeting. We cannot seem to have this COMSTAC meeting without a government shutdown. I swear for the May meeting, I am going to build an ark, whatever will help us survive the floods, snowstorms, or other difficulties we may face.

First and foremost, I want to acknowledge the incredible work of the FAA staff and Dr. Nield in helping us set up the first meeting in October and then shut it down, and particularly yesterday

with the government shutdown, I want to thank Harry, Larry, Greg, and Paul for showing up and getting things done, and our gratitude goes out to Larry Scott in the back of the room there.

For those of you who know me, I'm not a pleasant guy, and poor Larry has every day faced multiple calls from me and has been getting things done over the past couple of months. Let's have a round of applause for our sponsors at the FAA.

And also to you, the members of the COMSTAC. I know some people are taking red eyes and transportation was completely messed up. I also really appreciate everyone from the audience taking the time both today and yesterday for the working groups.

We do have at least one new member of the COMSTAC who I'd like to acknowledge. Jennifer Warren, if you could please stand up. Let's have a round of applause for our new friend from Lockheed, Jennifer.

So, just setting the table a little bit to follow on George's comments, let me bring up the presentation here. As Dr. Nield mentioned, we've had a lot happen, and you know, I had five minutes to sum up just what's occurred since our last meeting in May and I think it's a tribute to our industry that, given everything that's happened, I can't do it in just five minutes. As a matter of fact, forget the last six months; let's just look at the last week. We had the, and Tim correct me if I'm wrong here, seventh consecutive successful launch of the Falcon 9, the first Falcon 9 launch to put a payload into GEO, the second consecutive successful launch of the Falcon 9 Version 1.1, and the first to go from Kennedy.

As you can see, it was as pretty as a picture. For you Star Wars fans out there, I also understand the Millennium Falcon stage is set up again. So we're very pleased about everything occurring with the Falcon, one way or the other right now.

So some historic accomplishments, and you know, what's really most important about this from a commercial perspective is that, for the first time, we're bringing commsat work back to American shores. This was an industry that was innovated in America and we shipped it out but now we're bringing it back. So a terrific accomplishment there.

In the meantime, over to our friends with United Launch Alliance, they have just kept up a blistering pace of launches. We have seen three Delta launches, including the Delta IV Heavy, the largest rocket in America's arsenal today, and five Atlas launches, all successful, achieving a consecutive record of success that I won't even bother to mention, and among those five Atlas launches was the largest payload that the Atlas has ever deployed.

So we've seen some really tremendous progress just in the launch industry alone. We had that Atlas launch last week. Very, very impressive, and again I'm going to skip a bunch of stuff that occurred, but just to hit a few other highlights that have occurred in the past six months we had Orbital for the first time go to the ISS delivering Cygnus, which signaled the entrance of a new major player, I think, in the spaceport world with Wallop's Island, actually launching to the International Space Station for the first time. We now have a spaceport not three hours away from Washington, D.C. here. Our friends in Blue Origin tested a new engine for the first time, and of course Virgin Galactic, with their second powered flight, have continued to enjoy success with Spaceship 2. Extraordinarily exciting things are happening.

Of course, the most important thing to happen since our last May meeting was the Red Sox World Series victory. I'm still basking in Red Sox glory.

In terms of today's agenda, as Dr. Nield mentioned, we're facing a number of critical issues.

First, what is the future of the commercial crew program?

And I should mention that we're happy to have associate administrator Robert Lightfoot here to talk about what's occurring both within NASA and what the impact will be on the industry.

As we mentioned yesterday during the working groups, established practices for human space flight is one of, if not the most important topic that we're going to be tackling today. I'd like to thank Jeff Greason, Livingston Holder, and Jim Muncy for their work on this topic. We'll hear more about that during the systems working group report.

Next, what will we learn from COTS? You know COTS, which has been completed, was extraordinarily successful from a technical and substantive perspective, and as I mentioned yesterday, a concern is that we're already forgetting about the lessons of COTS and moving back to the status quo. This was a program that had strong bipartisan support and was very successful. I hope we take a look at that and we have Lori Garver, former Deputy Administrator of NASA, who is going to speak to those issues.

We are also going to hit the critical topic of indemnification. We're fortunate to have Ann Zulkosky here from the Senate Commerce Committee, and Tom Hammond from the House Space Subcommittee, who specifically requested to address the COMSTAC on this topic. So, a lot to cover. We're very excited about moving forward, and hey, last but not least, the most important issue we can possibly deal with, export control reform, which is of course going completely off the rails. We will talk more about that later on.

We are looking forward to an interesting meeting, an exciting meeting, and dealing with some important issues, and finishing what we began yesterday with the working groups. But to take this plane out of the hangar, if I could begin by introducing Michael G. Whitaker, Deputy Administrator for the Federal Aviation Administration.

He was sworn into office on June 3rd, 2013. He also served as Chief of the Next Gen Office, and is responsible for the development and implementation of the FAA's Next Generation Air Transportation System. Next Gen is an air traffic control modernization program. They're shifting from ground-based radar to state-of-the-art satellite technology.

Featured Speaker – Michael Whitaker – Deputy Administrator for the Federal Aviation Administration

Michael Whitaker was sworn into office on June 3rd, 2013. He also served as Chief of the Next Gen Office, and is responsible for the development and implementation of the FAA's Next Generation Air Transportation System. Next Gen is an air traffic control modernization program. NEXTGEN is shifting from ground-based radar to state-of-the-art satellite technology.

Remarks:

- **National Space Transportation Policy**
  - Commercial Space Growing from 3 launches in 2012 to 18 last year
    - SpaceX and Orbital Sciences launching to ISS
    - NASA released RFP for next phase of Commercial Crew
  - Commercial Space Tourism by the end of this year
  - USG moving to fixed price contracts
  - USG working in concert to promote commercial space
  - DOT leading orbital debris mitigation for launch
  - NSTP supports continuing current liability regime
  - NSTP supports developing international safety standards

US Senate Perspectives- Ann Zulkosky - Senate Science and Space Subcommittee

She has developed major legislation and provided key oversight responsibilities for NASA, the Science Foundation, National Institute of Standards and Technology and the Office of Science and Technology Policy. In the 111th Congress, she served as the lead staffer for the Senate Democrats during the 2010 NASA reauthorization.

Remarks:

- **Challenges to getting things done on the Hill**
- **Working extension of the current liability regime**
  - **Differences between the House and Senate visions**
- **CSLAA Update and NASA Reauthorization to be worked in the current session**
  - **Looking to COMSTAC for new witnesses instead of the usual 2 or 3 testifying**
  - **Seeking to broaden the base of expertise and interests**

- **FY 14 Budget and Appropriation**
  - **Awaiting definition and clarification in determining the way ahead**

US House Perspective – Mark Dawson – Legislative Director for U.S. Congressman Robert Aderholt of Alabama

He has worked for Mr. Aderholt since 1997. Mr. Aderholt was appointed to the House Committee on Appropriations in 1997 and his Subcommittee assignments currently include the CJS Subcommittee, and also the previous subcommittee for NASA Oversight. Mark oversees appropriations for Mr. Aderholt, with a focus on Defense and NASA.

Remarks –

- Providing perspective of Representative Aderholt
- House and committees are awaiting budget agreement
  - Agreement allows appropriations to move forward
  - Does not want to rely on sequestration mechanism
- Supports development of the Space Launch System
  - Allows larger payloads and deep space missions not served by current commercial development
- Supports human exploration of space which should not just be left to robotics

House and Senate Questions and Answers

- **Question:** What are the challenges in terms of getting multi-year indemnification? Where has there been resistance to that concept, and again, briefly, where do we see things moving forward on that?
- **Answer: Ann Zulkosky** – "It depends on what member and what chamber and what party you're talking about. The consistent message is that we haven't gotten any opposition to doing this. It's really just a question of timing."
- **Question:** Could you say a few words about that Termination Liability and why we should be concerned and what's going on there?
- **Answer: Mark Dawson** – Termination liability has been a real problem for the SLS program, and it could pose a problem for any new, large budget program, because a lot of that termination liability is held (and ties up a lot of money) at the beginning of the program. Mr. Aderholt's very much in favor of eliminating this current interpretation.
- **Question:** Could you give us some notional idea of what the appropriations schedule will look like?

- **Answer: Mark Dawson** – I don't want to speak too much for the Appropriations Committee, because they have a number of options. But one possibility would be a kind of omnibus bill in which you have, you know, a section or a title for each of the subcommittees.

- **Question: Mike Gold** – I was wondering if you could give us a sense of a broader debate about the other issues relating to indemnification.

- **Answer: Ann Zulkosky** – Right now, the only issue being considered is the current indemnification regime and the extension of that.

- **Question: Jim Vedda** – The alternative uses of SLS and always calling on the science to pick up that slack, seems to be a really big disconnect. Do you see big increases in the science budget in the years to come, or some other reason why we could expect science could pick up some missions on SLS?

- **Answer: Mark Dawson** – There really has to be some vision there, and it has to be sold very strongly by the administration. So what will happen in the next couple of years on that, I don't know. But you know we'll do the best we can.

- **Question: Mike Gold** – Would either of you care to comment on where we are with either the Commercial Space Launch Amendments Act or the NASA Reauthorization Act, and what, if anything, COMSTAC can do to be helpful moving forward?

- **Answer: Ann Zulkosky** – What it comes down to are the numbers that are authorized for the agency in the out-years. I'm hopeful that the budget deal and the appropriations process in the January time frame will give us a little bit more clarity with regard to what we're targeting for '14 and moving forward.

- **Question: Dr. Nield** – Concerning the moratorium or learning period, I'm interested in any thoughts either of you would have on where that should be going now, in terms of either regulations or industry standards or guidelines or what makes sense now. What should we be thinking about?

- **Answer: Ann Zulkosky** – That issue is something that would be addressed in the CSLA updates. There are a lot of ways that this can move forward with, you know, industry leading on the standards development. I think that NIST can be helpful to that process.

Report of COMSTAC Systems Working Group to the Full COMSTAC

Overview

Repcheck Presentation – Draft Established Practices for Human Space Flight Occupant Safety

Greason Presentation – Thoughts from the front line – Summary Charts

Repcheck Presentation to the Working Group

Outline

- History
- What is the FAA Hoping to Achieve?
- Other Questions and Answers
- Comment Guidance

History

1) August 14, 2012 – April 16, 2013: Held 8 teleconferences with COMSTAC Systems Working Group.

2) July 31, 2013: We submitted to COMSTAC a draft document on *Established Practices for Human Space Flight Occupant Safety* for its review and comment.

3) September 23rd: We submitted to COMSTAC a revised version of the document that provides a rationale for each established practice.

4) September 24th: Teleconference held to introduce the document, obtain early feedback from COMSTAC members, and discuss a way ahead.

What is the FAA Hoping to Achieve?

1) The Established Practices document is aimed at documenting the occupant safety measures that –

    a. Have historically proven to be worthwhile for most human space flight system concepts, and

    b. Are appropriate for the commercial human space flight industry.

2) Four purposes can be served by doing this –

    a. Can serve as a framework for industry standards

    b. Can serve as a starting point for a potential future rulemaking effort

    c. Helps the FAA discuss commercial occupant safety measures with the international community

    d. Can serve as a benchmark of whether market forces result in adequate occupant safety.

Other Questions and Answers

1) How did we develop the draft established practices?

- We reviewed existing government and private sector requirements and standards.

- Chose to primarily use NASA's requirements and guidance for its Commercial Crew Program as our guide.
  - Purpose was not to copy NASA's requirements, but to use them as a means to capture relevant safety concepts.
- We also consulted with –
  - COMSTAC
  - Civil Aerospace Medical Institute
  - Center of Excellence for Commercial Space Transportation
  - NASA.

2) What is the document's scope?

- Occupant safety only
  - Public safety and mission assurance are not directly addressed
  - Orbital and suborbital flights.
- Orbital rendezvous and docking, long duration flights, extravehicular activity, and any flights beyond earth orbit are <u>not</u> explicitly covered.
- Period of coverage – from when occupants are exposed to vehicle hazards prior to flight through when they are no longer exposed to vehicle hazards after landing.

3) What level of safety and level of care does the document address?

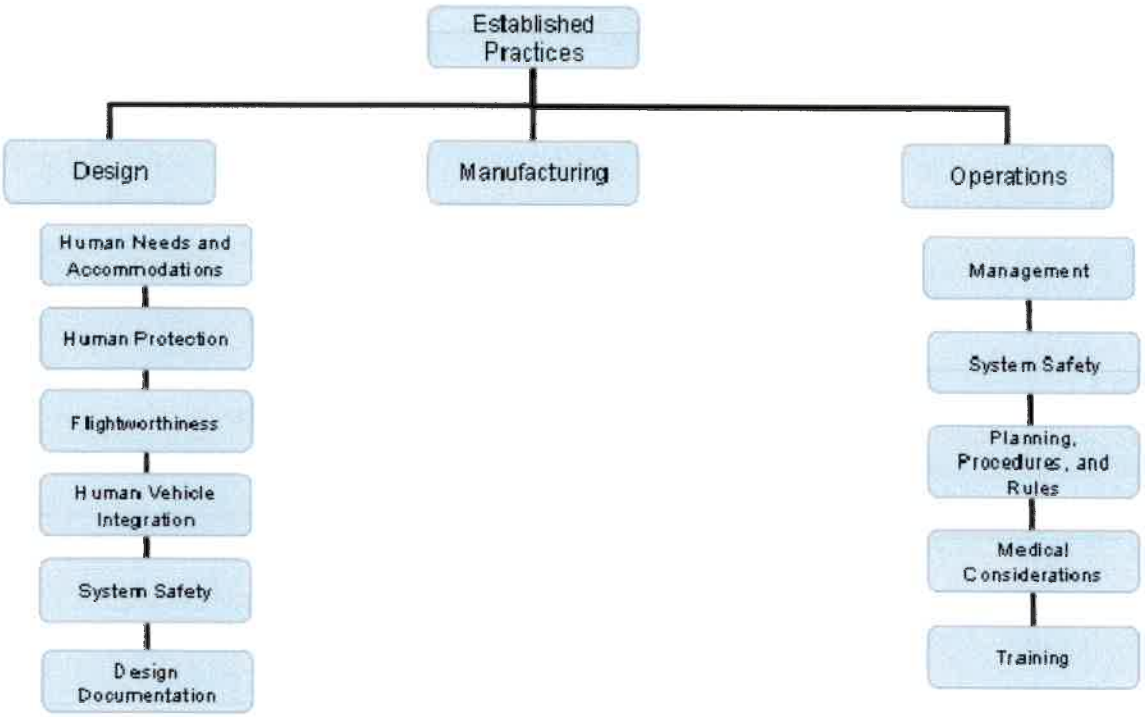
- No specific level of safety (risk) due to a wide variety of systems and flight profiles likely in the near future.
- Two levels of care are articulated in the document:
  - Occupants should not experience an environment during flight that would cause death or serious injury (this is a low bar).
  - The level of care for flight crew when performing safety critical operations is increased to the level necessary to perform those operations.
  - In an emergency the same level of care is not expected to be maintained - only a reasonable chance of survival.

4) What assumptions did we make?

- Any orbital vehicle –
  - Will stay on orbit for a maximum of 2 weeks, and
  - Can return to earth in under 24 hours if necessary.

- Each member of the flight crew is safety critical.
- Space flight participants may be called upon to perform limited safety critical tasks.
- Clean sheet philosophy - no other regulations act to protect occupants from harm.

5) How are the practices organized?



Comments Guidance - We would like COMSTAC comments to include:

1) Overall –
   - Did we capture all established practices?
   - Did we miss any? If yes, what did we miss?
   - Is the organization correct, or is there a better way to organize the established practices? What is it?
   - Is each category useable?
2) For each established practice –
   - Is it an established practice?
   - Is the level of detail correct? Why or why not?
   - Is it understandable?

- When numbers are used, is there an alternative approach?
  - Any comments on the topics discussed in the introduction?
- How to Provide Comments to the FAA:
  - E-mail comments to: randy.repcheck@faa.gov
  - cc: jeff.ctr.sugar@faa.gov

    livingston@holderaerospace.com

    larry.scott@faa.gov
- We will keep all comments confidential.
- We would like COMSTAC comments by the end of CY 2013.

Greason Presentation -Thoughts from the front line – Summary Charts

Overview

- Purpose and Structure
- Ways to Make this More Useful
- Critical: Dealing with Anomalies

Purpose and structure

- Writing down standards for HSF safety is really hard and AST has done some very good work on this
- Not all stated purposes are mutually consistent
  - Recommend focus on guiding rapid learning and continuous improvement of industry safety instead of framing future regulation
- Provide more heritage documentation for practices
- Structure document to allow updating with industry standards as they are developed

Ways to make this more useful

- Really need to establish priorities among the concerns that underlay the practices
- Performance-based standards are HELPFUL because they allow for new methods
- Non-definitive process standards are NOT HELPFUL and potentially counterproductive
- Exception: "you have to have a process" (but you can choose/design it)

Critical: Dealing w/ Anomalies

- Many examples of creating a strict process that morphs into "deviation as the norm"
- Solving anomalies is a multi-step process

  1. Identify root causes 2. Identify possible corrections

  3. Determine best actions 4. Implement action

- Not one size fits all; judgment is required.
  - e.g. you may need to fly before you have a solution in order to get data to diagnose cause

White House OSTP – Richard DalBello -- Assistant Director of Space and Aeronautics, Office of Science and Technology Policy

Richard is the principal advisor on space aeronautics to Dr. John Holdren, the Science Advisor to the President. In this position, Richard plays a key role in the development and implementation of the administration's domestic and international space policy and program priorities. Richard has had over 25 years of experience, both in government and the private sector.

Remarks

- NSTP Policy serves a number of functions.
  - A clarification of our position on government-hosted payloads
  - Older themes of a commitment to the industrial base, with newer themes of a commitment to entrepreneurial partnership
  - Encourage a blending of commercial and government resources to accomplish objectives
  - There are a lot of new themes in here.
- Reaffirm our commitment to supporting human robotic exploration to multiple destinations beyond low earth orbit, including asteroids and the moon
- Supports creating heavy lift capabilities.
- Working the details of this in a national industry base study

White House NSS – Chirag Parikh – Director of Space Policy

Remarks

- National Space Transportation Policy
  - Worked with DoD and NASA for the new entrant certification guidelines and strategy, cooperation with state entities, and collaborative work amongst many, DoD, NASA, the intelligence community, State Department, Commerce, and industry
- Our ultimate goal is: assured access to space, and for all the orbital regimes, to include of course suborbital space flight:
  - Our other goals are: maintaining a healthy industrial base; cost effectiveness; entrepreneurship; international competitiveness; research and development; human transport to LEO and beyond; development of a heavy lift vehicle, and finally, fostering the commercial human space flight market
  - We're going to launch on U.S.-manufactured space launch vehicles
  - We allow new entrants to compete for U.S. government payloads, but it is very important that we don't just automatically throw this to everybody – we set the bar high.

NSC and OSTP Questions and Answers

- **Question: Oscar Garcia** – Regarding the industrial base study, could you give us a preview of the public-private partnership innovation or formulas that you are looking at?
- **Answer: Richard Dalbello** – I can't really talk about what's in the report, because it's pre-decisional at this point, but it will have two components. One will be an industrial base survey of what is going on, and where we are. Then on top of that, there will be a strategy piece, which will direct departments and agencies to do things in support of the transportation policy.
- **Question: Debra Lepore** – So following up on the industrial base study, is it focused specifically on the transportation side? But what about on the application side, you know, science and spacecraft and capability?
- **Answer: Richard Dalbello** – The report is really narrowly focused on the earth to orbit boost phase. So really, we're looking at the harder part of the problem. On the broader issue, it is a perennial problem of where you draw the line between government and private sector investment, and I think this report is not really going to look at that issue.
- **Question: Janet Karika** – On the issue of the new entrant coordinated certification strategy, the Air Force, the NRO and NASA got together and came up with this strategy. What would make them need to come back to see you? What sort of a change?

- **Answer: Chirag Parikh** – We're going to hear it from industry, right? That would trigger us to be able to go and investigate the situation in the first place, and then based upon the analysis between the strategy and what the applications are, then we would consider first trying to re-vector the departments and agencies, if indeed it is not fair or not in accordance with the strategy.

NASA Perspectives – Mr. Lightfoot – Associate Administrator for NASA (the agency's highest-ranking civil servant position)

Previously was Director of NASA's Marshall Space Flight Center in Huntsville, Alabama. Named to the position in August 2009, he headed one of NASA's largest field installations, which plays a critical role in NASA space operations, exploration and science missions. Mr. Lightfoot managed a broad range of propulsion, scientific and space transportation activities, contributing to the nation's space program and served as acting director of the Center from March 2009 until his appointment as director.

Remarks

- A couple of years after the end of the space shuttle program, we now have the capability in the United State to take cargo to the ISS
- As an agency, we can focus on the bigger piece of getting beyond low earth orbit
  - SpaceX Dragon successfully completed their second cargo flight
  - We completed the COTS program with Orbital's demonstration flight and now we're moving on to the CRS piece
  - Poised to start flying people as well as soon as we can
- We're trying to establish a new sector in our economy and we depend on the entrepreneurs
- Last year was kind of a watershed year from the cargo perspective, and now let's move on to crew.

NASA Questions and Answers

- **Question: Mike Gold** – Probably second only to NASA, no entity has more invested and at stake relative to getting commercial crew going than Bigelow Aerospace. You have a desire for competition in keeping multiple entities going on one hand, and then limited resources and timing on the other, how are you going to strike that balance, and what can we expect moving forward with the commercial crew program?
- **Answer:** Once we see what our final budget numbers are, that will help us. We have these discussions constantly, you know, in terms of, I'll call it, the "what ifs," the scenario planning that we go forward. But we're not wavering on our need for the commercial capability to get crews to and from low earth orbit. We're going to do a plan that keeps the crew safe, but also provides us the best benefit we can get.

- **Question: Mike Gold** – Relative to the FAA, could you maybe just say a little bit more in the future, as we actually get to those launches, who you see as taking the lead in being responsible for licensing commercial crew activity, either that's being conducted for NASA primarily, or that has NASA astronauts on board?

- **Answer:** The goal for all of us is safe flight to low earth orbit, right, because any incident or issue there could be devastating for what we're trying to do. We all know that. I don't think any of us – we are actively collaborating because of the importance of it, not saying it's their job or their job. We are, I think, frankly synched and have to be. That doesn't mean we're always going to agree, right? That's part of the fun. But we are going to take care of our astronauts when our astronauts fly, and we're going to help FAA if they need help.

- **Question: Mike Gold** – Is there anything that you would recommend that the COMSTAC and commercial space industry in general can do to be helpful to you and to your budget efforts?

- **Answer:** I think it's – I'll tell you the same thing I tell our folks, right, where this industry is, is deliver on what we say we're going to deliver on, right, and adjust the – if we have agreements, which we all do, if resources don't appear to allow us to do those agreements, let's renegotiate those agreements, and I'm talking about agreements with our stakeholders, whether it's on the Hill or in the administration.

- **Question**: **Jim Muncy** – What is the next place NASA is going to try using fixed price, other transactions authority, Space Act agreement, partnerships with industry, to go develop a capability that NASA clearly needs in some mission area, but that it can't afford to do the traditional way?

- **Answer**: Part of our discussion we're having internally is we have a whole capabilities assessment going on, and that's where this is really going to play in. What does it cost me to maintain something, right, within the agency and the way that I'm doing it, versus can I get it somewhere else, and it's all a risk-risk trade.

- **Question: Mike Gold** – Whenever I talk to Gerstenmaier about what your most important legislative concern would be, termination liability comes up as an issue. Would you just want to say a quick word about those concerns, and what you see developing in that arena?

- **Answer:** Our position has been pretty firm from the legal and the procurement side, in terms of what we're supposed to do contract-wise. I think I understand everybody's concern, I really do. I mean it makes a lot of sense. There's funding there that's available to – it could be available to go do some stuff, but it's also if we terminate it, what do you do with it, right? I mean that's the – do we have to go pay that?

NASA Perspective – Lori Garver – Former Deputy Administrator of NASA

Lori Garver currently serves as general manager of the Airline Pilots Association. She was formerly an associate administrator under Dan Golden, former staffer for John Glenn. She ran the space policy function for John Kerry, Hillary Clinton, and then for President Obama.

Remarks

- My perspective is we have a lot farther to go, and it's time to accelerate that progress. Enough of the debate
  - We should not be debating whether or not we should have the ability to terminate a program that is not working in a cost-plus environment
  - We should not be debating whether to allow researchers to fly with their experiments on suborbital commercial vehicles
  - We shouldn't be debating whether or not we would rather spend $400 million to Russia versus here in the United States, spending it on U.S. industry, or whether we should extend launch indemnification
  - We really should not be debating whether to fund programs that truly advance space development, at less than 20 percent of what we're spending on programs that slow space development
- The government should be advancing space commerce – It's the best way to have an innovative program that out-competes the world.

The national security of this nation, the economic security of this nation isn't built on programs that were developed 20, 30 years ago, and planned to explore 20 years from now. That is not how we do it.

Garver Questions and Answers

- **Question: Mike Gold** – Relative to where you encountered resistance, where was the pushback, and any lessons that we can learn moving forward from those encounters?
- **Answer:** That's their job. I do not fault them for that, and even a member of Congress here or there who was protecting their jobs in their district, and they want to fight for that. As NASA, and in my role, and in the President's role to look out for the future of the economic welfare of this country, it was our job to do more, to actually invest in programs that will return, and not to protect industries that are not going to advance our economic or national security future.
- **Question: Oscar Garcia** – With you on Airlines for America, I think that conversation of high speed air transportation or air and space transportation for passengers and freight, could take another dose of reality.
- **Answer:** I guess my view is similar to how it is in space, that the government's classical role is to invest in those technologies, and it will be the markets that decide. We should

be looking at helping inspire and incentivize investment for those entities that are going to utilize it in the future, to develop new markets, and that may still be one of them.

- **Question: Mike Gold** – We've looked at the balance between limited funds and timing on one end with commercial crew, and then the desire for competition on the other. How do you balance those and what would your thoughts be, in terms of the commercial crew program moving forward, assuming that we're relatively close to the same numbers that the program has received traditionally?

- **Answer:** Assuming the NASA budget at a 16 to 17 billion dollars, are you really going to say that we should only have 700-800 million dollars in the program that stands to benefit not only the NASA program itself, because let's face it, everything we do in space needs to get to orbit. The fact that we have through this program helped incentivize at least one entrant now into the commercial launch world, bids that will allow us to launch our science payloads for fractions of the cost that we do have to budget for today, will shift and allow for a greater percentage of the NASA budget to be spent on those truly cutting edge science technology missions that we should be doing.

Report of COMSTAC Business/Legal Working Group to the full COMSTAC

- **Recommendation**

"Per its previous recommendation, the COMSTAC desires confirmation that private entities which extract resources from the surface or subsurface of the Moon, asteroids, or other celestial bodies own and may utilize or transfer such resources, once extracted, as they see fit. Moreover, the COMSTAC wishes to emphasize the importance of promoting an environment that is conducive to private sector investment, and the value of a federal legal structure that enables private entities to assert property rights in extracted resources, as well as the right to operate without interference, against other private entities. The sole need for "supervision" by the U.S. government would be to monitor activities to ensure that they are conducted on a noninterference basis and are not contrary to the national security and foreign policy objectives of the U.S."

- **Observations**

  - Spaceflight participants (SFPs) are likely to be named in a lawsuit in the event of an accident causing damage to third parties. Such liability could be based on a claim that the SFPs procured the flight and are therefore responsible for any damage resulting from the flight.

  - Spaceflight participants are explicitly excluded from third-party indemnification by the federal government and are not required to be protected by the licensee's insurance. While a licensee has the option to name the SFP as a co-insured, the SFP would still be exposed to liability in excess of insurance (whereas indemnification currently protects the licensee from such excess liability). Insurance would most likely not be available for the SFP to cover this excess liability.

  - The risk of an SFP facing personal liability in the event of an accident may deter prospective customers from participating in commercial spaceflight and could harm the development of the domestic spaceflight industry.

- The risk of an SFP facing personal liability in the event of an accident may deter prospective customers from participating in commercial spaceflight and could harm the development of the domestic spaceflight industry.

- **Recommendations**

  - The risk COMSTAC recommends that FAA AST advocate for the modification of CSLA language to specifically include spaceflight participants in third-party indemnification. COMSTAC recommends that FAA AST, in their communications with the Administration and Congress regarding indemnification extension, point out that industry is permanently required to shield the federal government against third party legal claims at significant financial cost to industry and zero cost to the government, and therefore the government should be permanently authorized to meet its obligation under the third party risk sharing regime.

Chairman Mike Gold: Next up we have Tom Hammond. Tom, if you could come to the podium. The best introduction that I can give for Tom, who's senior professional staff on the House Committee on Science, Space and Technology, is that here's the man who got indemnification through the House.

House Perspective – Tom Hammond – Staff Director of the Space Subcommittee

Remarks

I do not want to repeat what my colleagues from the Senate side or the House said this morning. I'll just give you an update on four vehicles that are moving that might be of interest.

- We have a budget agreement.

  - This should pave the way for a NASA authorization bill, the hold-up being over the fall this agreement on budget numbers – but the 302(b) allocations that flow from the budget agreement have already been agreed to.

  - It is a big thing going forward, making sure that we provide guidance for the administration through a NASA authorization bill – making sure that there's no lapse.

- The second thing is indemnification.

  - In this NASA Authorization Act, there is a five-year extension.

  - A one-year extension passed on the House floor, with the understanding that we would take up a longer extension with the CLSAA .

  - The Science Committee, which has jurisdiction over indemnification, has a lot of new members that haven't had the benefit of hearing the various positions. So we want to make sure that they're comfortable with things moving forward.

  - The Senate may be trying to move a three-year through right now. There are concerns,

though, if a one-year is sent back over, that's obviously the cleanest one. Then we can take this up in the next few months for a longer-term extension.

  - Termination liability bill. Mark-up should be at around 2:00 or 2:30.

- FCC licensing for spectrum versus using special temporary authorities.

  - They're trying to figure out whether or not that's the best path going forward, and also some action at NOAA regarding the lowering of commercial remote sensing limits.

  - They aren't necessarily launch-related, they are commercial, and I think members will want to weigh in, particularly since the Remote Sensing Act was done solely through the Science Committee's jurisdiction, and we have broad authority for space action as well, for spectrum in space.

Question: The budget agreement that was reached yesterday, you think, will [it] pave the way to close the gap between the two versions of the NASA authorization?

Answer: I think it will pave the way for us moving, or the House moving something on the floor, because amongst – the Members on both sides of the aisle, I think, [it] had broad agreement on a vast majority of the provisions that were in both the House and Senate authorization acts. That isn't to say that 302(b) allocations that come down members aren't happy with, and we'll cross that bridge when we get to it.

Question: So speaking of those allocations, have you had a chance to look at what the numbers might look like in terms of, you know, specifically to NASA, different programs?

Answer. We're still going through that, to make sure that, you know, there's a certain wiggle room that always happens with those too. So we'll see how that plays out between now and January 15th.

Question: Could you explain a little bit about what you said on the lowering of the remote sensing limits, and that being solely through the Committee's jurisdiction, and what some of those activities are?

Answer: [Under] the Land Remote Sensing Act, sole jurisdiction was given to the Science Committee. So NOAA has the ability to promulgate regulations, in coordination with other agencies, DoD, the intel community, USGS, on establishing those limits. So now the limit may be lowered by an executive action, but if there is a Congressional directive to lower that limit, then I think we – Members on our Committee would have an interest in weighing in.

Question: I am curious if you could make some comments regarding where you think the House is, the majority, relative to the asteroid retrieval mission?

Answer: I can convey to you the Members' thoughts, and the way that I interpret them. I think the Members, the Members on the Committee still would like more details on how the asteroid retrieval mission, asteroid retrieval and rendezvous mission will be carried out, how it will be funded, where funding for such an endeavor will come from, what are the puts and takes with all the programs.

Question: We've asked the question of liability, heard a lot about it. Speaking for your Members, do you think they would be open to a broader approach, where there was termination liability relief universally across the board for all programs, and that everything could proceed in a sensible fashion, rather than just limiting that to specific programs?

Answer: I'd point you to a letter from GAO back in 2010, which highlights a lot of inconsistencies with the way that NASA has implemented termination liability, and in -- not only in individual programs and projects, but also over time. The FAR does have a limitation of funds clause in it. I think the termination liability bill that the Committee is going to mark-up later this afternoon reflects continued direction to NASA that flows from the 2005, 2008 and 2010 NASA Authorization Acts that had bipartisan, bicameral, and executive branch buy-in, to fulfill the development, to the maximum extent practicable, for priority programs.

Report of COMSTAC Operations Working Group to the Full COMSTAC

- **Debra Facktor Lepore** with the Operations Working Group Report

Review of May 2013 Actions & Input to FAA/AST

Last May, we did a ton of stuff, a lot of stuff in progress, most of which got slowed down as a result of the first round of sequestration, then the shutdown, then the snowdown. So yesterday ended up being a lot of discussion, and we punted a lot of our issues for May. So this chart summarizes all the things that we had requested on our input to FAA AST this spring, and then what happened.

Orbital safety rule: we had requested that AST look at a – give us some more insight, do a study, something that would give us an idea of what was in their heads about the role of regulatory issues on orbit.

We had had a working group that proposed limiting to or taking a case study of space traffic management, and we are hoping to look at that over the next six months. On the commercial space port licensing side, we made some recommendations and that rulemaking process was supposed to happen, and that all got delayed. So we do not have an update on that.

On the international developments in space operations, those were the issues of originally the European Code of Conduct that was proposed a couple of years ago, and long-term sustainability of space, and with the transition of the Export Control Working Group to the International Space Policy Working Group, we did an overlapping meeting, and we're transitioning all of those issues into the new working group.

We did have Dick Buenneke come speak and John Sloan, and actually Amber Charlesworth from the State Department was also on the line. Fortunately, they were able to join us by phone. We're transitioning that over.

The two Air Force presentations, issues that we've been following, Title X Commercial Space Launch, cooperation of federal ranges. We had some questions on implementation, and the Department of Defense did not have any response for us yet, and we do appreciate AST continuing

to engage with them and keeping us apprised as things come up. It just wasn't ready yet.

And the same thing on the Air Force capability base assessment at the Ranges, which we learned about and we had similarly asked some questions, or at least asked how to get input, and suggested that AST at least be able to provide input and have some visibility into that assessment, to represent, if you will, the interests of the commercial space transportation industry.

The latest that we had heard is that there were 13 options and four that looked pretty good that that team was assessing, one of which included commercializing Cape Canaveral. All of that is kind of in process, and when there's an update, we will receive one. So both of those issues we'll punt for May.

On space transportation infrastructures grants, we had looked, suggested at the time whether there were some different models to look at on cost-sharing, with regards to airport infrastructure grants, and really there's no money for them in this cycle.

The last one was licensing and permit flexibility, and this was the topic of an unforeseen scenario, where you could have new space vehicles that would want to move back and forth between experimental flight and licensed flight, and go back and forth.

That really had not been anticipated, and we had recommended that that be added, and the place is probably in the CSLA. AST had agreed with our recommendation. So we didn't really quite know what to do with that, but given the discussion this morning, that a CLSA amendment or update would happen next year, that I think I wrote a recommendation literally on the fly today that AST include our recommendation in its input to the update plan for 2014.

Other Topics Discussed (1)

- **FAA/AST Space Transportation Analysis and Research "STAR" Database" – access to COMSTAC Members for the next 6 months**
  - Contains over 5,600 orbital launch events worldwide and 8,000 payloads, beginning with the first orbital launch in 1957.
  - Request to members: Log-on, test and provide feedback at OWG on usefulness.
- **Launch Vehicle & On-Orbit Standards**
  - Recommendation: FAA/AST continue to follow standards development with respect to launch vehicles and on-orbit activities and keep COMSTAC apprised. COMSTAC also requests that FAA/AST share its thoughts on the role of standards in the regulatory process.
- **Licensing/Permit Flexibility**
  - Recommendation: FAA/AST include the recommendations in its input to the update planned for 2014.
- **Findings of the Aerospace Medical Association Commercial Space Flight Working Group (for crewmembers on suborbital flights)**

- See position paper

- **"Rounds" – common themes**
  - Licensing / permit flexibility (dual regime) and CSLA updates
  - Indemnification
  - Evolution of regulatory environment in Europe
  - Spaceflight participant waiver
  - Airport and spaceport licensing & issues
- **Transition to International Space Policy Working Group**
  - International Space Developments

Revisit in May 2014

- **Orbital Safety Role**
  - FAA/AST Input
  - GWU Research Project (Scott Pace, guest speaker)
- **Air Force Topics**
  - Implementation of Title X Changes
  - Capability Based Assessment Results
- **Licensing / Permit Flexibility – what next?**
- **Role of Standards in Regulatory Process**
- **And identify priorities for 2014-2015**

Report of COMSTAC International Space Policy Working Group

Used to be called the Export Control Working Group, and we had a very productive overlapping session, as mentioned, with the -- with the OWG group.

Agenda

- Refocusing COMSTAC International Policy Working Group
  - Mike Gold, COMSTAC Chairman, and Mike Lopez-Alegria, COMSTAC Vice-Chairman
- Recent Issues at UN COPUOS and Group of Government Experts
  - Dick Buenneke, Senior Advisor, Space Policy, Bureau of Arms Control,

Verification and Compliance, U.S. State Department

  - John Sloan, FAA AST

- FAA International Outreach at International Astronautical Congress

  - John Sloan, FAA AST

- European Aviation Safety Agency: Proposed Regulatory Options and Status with European Commission

  - John Sloan, FAA AST

- Administration Update on Satellite Export Control Reform Implementation

  - Dennis Krepp, Director, Sensors & Aviation Division, Office of National Security and Technology Transfer Controls, Bureau of Industry and Security, Department of Commerce

- New Business

Recommendations

- The COMSTAC recommends the FAA AST advocate for timely implementation of export control reforms.

- The COMSTAC recommends that FAA AST continue its ongoing contribution as an expert agency to the evaluation of export controls applicable to space technology in order to support a competitive domestic space manufacturing industry.

Observations

- The COMSTAC has benefitted from representation at UN COPUOS in the past.

- The COMSTAC representation at UN COPUOS has aided the COMSTAC in commenting on various proposals in UN COPUOS in the past.

Recommendation

- The COMSTAC encourages the FAA to continue its support for official COMSTAC representation to the UN COPUOS as appropriate.

- To continue its support of international space developments and informing the COMSTAC of issues relevant to industry.

Recommendations

- The COMSTAC appreciates the FAA AST's ongoing international outreach efforts and requests that the FAA AST continue to keep industry apprised of relevant developments.

- The COMSTAC recommends the FAA AST continue to pro-actively engage with relevant international entities and organizations to support the development of appropriate

regulatory regimes and to commend the benefits of engagement with industry and industry groups when developing relevant regulations and policies.

- The COMSTAC recommends the FAA AST share lessons learned with relevant international entities and organizations from the development of our regulatory process, particularly the advantage of treating space vehicles as a different class of vehicle from aircraft with a different process.

Critical Issues

- Future of the Commercial Crew Program
- Established Practices for Human Spaceflight
- Will We Learn from COTS?
- Indemnification Extension
- Export Control Reform

Closing Comments

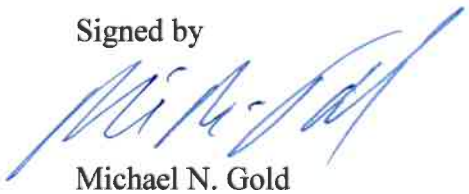
Chairman Mike Gold: Terrific. So that wraps up the COMSTAC agenda. We've spent a lot of time talking here, and now is where we transfer the power of the podium to you folks in the audience. So we would now open this up to any comments from the public.

Going once, going twice. Sold. We will now move to executive session. I'd like to thank again everyone from the FAA AST staff and Dr. Nield for putting this together under some very difficult circumstances, both the October meeting and the December meetings, all of the members, especially the working group chairs and vice chairs who put all this together, and for everyone for showing up despite government shutdowns and snow shutdowns. So let's give everyone a slap on the back and a round of applause.

And if we can clear out, take a moment or two for the folks to clear out; we will then go into closed session.

(Whereupon, at 2:20 p.m., the open meeting was adjourned.)

Signed by



Michael N. Gold
Chairman, COMSTAC