

**COMSTAC Spring Meeting (May 3rd- 4th, 2022)
Meeting Notes**

List of Committee Members Present at the Meeting
Kate Kronmiller
Eric Stallmer
Greg Autry
Clay Mowry
Paul Dampousse
Mike French
Dale Ketcham
Sharon Pinkerton
Charity Weeden - Chair
Karina Drees - Vice Chair
Mike Moses
Steven Lindsay
Committee Staff
Jim Hatt - DFO
John Venditti
Tara Halt
Bob Roxbrough
Other Guests in Room
Jane Kinney
Lisa Loucks
Craig Pritsky
Megan Mitchell
Mat Dunn

Members Online
Bill Beckman
Dale Nash
Robbie Sabathier
Mary Lynne Dittmar
Edward Bolton
Ann Zulkosky
Agency Staff
Leslie Welch
Janice Kauffman
Talisa White
Jack Fino
Michelle Duquette
Other Guests Online
Christopher Allison
Brandon Eden
Tim Bruber
Valerie Gawron
Randy Lycans

Description of each matter discussed and conclusions reached:

Meeting Started at 1PM.

Jim Hatt gave a brief welcome. Charity and Karina gave a brief welcome and had each of the COMSTAC members introduce themselves in the room and then on zoom.

Played a pre-recorded message from Secretary Buttigieg to the members of COMSTAC. Secretary Buttigieg mentioned the rapid increase in the number of licensed launches and recent accomplishments. He pointed out the need to address debris mitigation and alternative fuels. He will bring the insights and recommendations from COMSTAC to the National Space Council. He thanked COMSTAC members for their service.

Kelvin Coleman gave his remarks to COMSTAC. He welcomed all of the Committee members; particularly the members who are leaving COMSTAC after this meeting. Talked about the start of AST. The future is bright. Wayne Monteith retired from the FAA and went to private industry. Want to continue make positive change in commercial space transportation. Wanted to acknowledge some new members of management at AST (Dan Murray, Operational Safety;

Minh Nguyen, Strategic Management; Michelle Murray, Safety Authorization Division). This morning AST announced Michael O'Donnell as the Acting AST-2. Mr Coleman discussed the changes to AST's organizational structure. Looking forward to FY23, the President has requested a significant increase to our budget so that we can bring on the additional staff we need to meet the increased launch cadence. AST plans to have industry days to discuss different areas. For example, AST will discuss what system safety looks like from a compliance perspective. First industry meeting will be in June and AST hopes to have a robust discussion. Additionally, talked about Commercial Human Spaceflight. The moratorium is in place until October 2023, but AST must start preparing now. AST is establishing an aerospace rulemaking committee (SpARC) that will help us prepare new or revised regulations. There were a lot of concerns about the Part 450 rulemaking and AST will take the lessons learned and improve the process going forward. AST is also currently updating our recommended practices. Through the ASTM F47 Committee on Human Spaceflight, AST has increased our engagement and has involved more of our subject matter experts in the working groups. All of these activities will put AST in a good place to eventually regulate commercial human spaceflight. On the topic of Congressional reports, AST is almost complete with its standards report and is currently working with Aerospace Corporation to develop the Safety Framework report. Later this year, AST will have an independent review completed by the RAND Corporation to evaluate the readiness to move to a regulatory environment. Mr Coleman addressed the 21st century licensing regime. AST recently made a decision on defining what is complete enough for a license application. AST is working on issuing a policy including the definition of complete enough and how applications will be evaluated; it is mostly a quantitative assessment. Mr Coleman stated this will work well for industry and for AST. It will help AST streamline our processes. Mr Coleman finished with his five high priority areas:

1. Maintain safety
2. Make determinations faster
3. Improve processes
4. Communicate better with industry
5. Work on balancing risk on the industry side and government side.

Finally, Mr. Coleman provided an update on a few additional items AST is working. AST is working closely with NTSB to update the MOU that has been in place to 2004. The Orbital Debris Mitigation rule Notice of Proposed Rulemaking (NPRM) is in final review and is expected to be published early Fall 2022. AST is also standing up a SpARC on financial responsibility (Part 440). Kelvin thanked the COMSTAC members for their work and said he looked forward to continuing working with the members.

Next, Billy Nolen (FAA Administrator) gave his remarks to COMSTAC. He thanked the members who are leaving COMSTAC after this meeting for their service and participation in these efforts. He highlighted some of the recent accomplishments by the industry including having the oldest and youngest people go to space. He spoke about industry's assistance with getting Part 450 written and published quickly to streamline the regulations. Mr Nolen mentioned the FAA was moving forward with electronic licensing, with a goal that someday licensing a space launch or reentry could be as easy as filing a flight plan. He said the FAA is extremely interested in hearing COMSTAC's views on Climate Change and recommendations on new types of vehicles such as High-Speed Aerospace Transportation (HSAT). FAA wants to get ahead of the curve and

understand how these new vehicles will impact our airspace. Based on input from the Chair and Vice-chair, Department of Transportation (DOT) is increasing the number of COMSTAC members.

Administrator Billy Nolen took several questions from COMSTAC members at the end of his remarks.

- Greg Autry expressed a concern that the FAA is managing a more mature industry (aviation) and how that viewpoint may impact the space industry, which is still developing and is extremely innovative. Billy Nolen responded that those issues are one of the reasons are FAA has groups like COMSTAC. He said that the FAA wants to equally innovate the policy as much as industry is innovating their technology.
- Greg Autry noted that the 20s and 30s were not a safe time for the aviation industry. Autry feels like many people in the FAA are not familiar with the space industry. Billy Nolen responded that proof is in action -- AST is continually increasing its licensing activity significantly in the past couple years.
- Charity Weeden said that there are authority grey areas for the space industry and wanted to know how the FAA will prepare for those areas in the future. Billy Nolen responded that FAA should continue to partner with industry so everyone can move forward safely.

Mr. Coleman then answered questions from his presentation.

- Clay Mowry asked for an update on the electronic licensing. Michelle Murray said that AST is looking at contractors and she will discuss it further during her remarks later in the day.
- Clay Mowry asked about putting bounds on review times. Kelvin said that he didn't have all the details but AST wants to communicate with industry better. Jim Hatt clarified that this topic will be covered at a later briefing when talking about "complete enough".
- Mike Moses asked about the Human Spaceflight Tiger Team. Kelvin said that he refers to them as AST's in-house consulting team. It is a team of 10 individuals being led by Jen Bailey. They have given AST great advice, including have more SMEs involved with ASTM's F47 working groups. They are helping AST not let anything slip through the cracks for Commercial Human Spaceflight. They will be the core subject matter experts that AST will rely on moving forward.
- Eric Stallmer asked if there has ever been a time that AST denied an application that was at the complete enough determination stage. Kelvin responded that AST has extended the evaluation process beyond 180 days. AST has not denied a license application. AST is going to do all it can to make sure companies understand the regulations and will work with companies to be as clear and precise as we can. Most companies are used to an iterative process; AST wants to improve the process and make it a tighter process.
- Karina Drees made an observation that over the past few years the rest of the FAA has become more interested in commercial space activity. She wanted to know how communication internal to the FAA may help AST. And how COMSTAC may assist with that? Kelvin said that in 2016, he heard the FAA Administrator mention commercial space transportation at a town hall meeting and he knew that was a sign that the FAA is more aware of our activities. AST is working with ATO and airports. The collaboration has never been better. AST understands that the big FAA has a specific vision on how to

regulate aviation but AST has a larger voice now and we can emphasize that space is different than aviation.

Kelvin finished taking questions.

Break began at 2:06 PM.

Break ended at 2:28 PM.

Diane Howard from the National Space Council started her remarks. She is impressed with all of the work that COMSTAC is doing related to commercial human spaceflight, MPL, and many other areas. It's important to do everything possible to keep rulemaking responsive. She said she is pleased that spaceports are finally getting some overdue attention. The U.S. Space Priorities Framework document provides the guidepost for our national strategy. It acknowledges the leading services and technology that are coming online. The National Space Council (NSpC) is committed to finding the right balance between responsible space behavior and regulatory flexibility. To be effective, NSpC needs to maximize existing executive branch authorities.

Diane Howard took a few questions from COMSTAC.

- Karina Drees noted that Diane mentioned a co-working approach. She wanted to know how Diane Howard saw that shaping out over the next couple years. Diane Howard said they will be convening an interagency meeting and have developed a roadmap of what questions are needed to be tackled together as threshold issues. There is not a standardized protocol to supervise new types of activities. Diane also noted that you need to separate the authorization authority from the supervision authority.
- Eric Staller asked about feedback on the International Committee on Norms. Diane Howard said there has been a lot of support. She said they are starting a working group and some international partners have their own ideas of norms that would be helpful.
- Charity Weeden asked about the enforcement aspect. Diane Howard said they need to take these initial steps first. They need to establish supervision and authorization before looking at enforcement.
- Mike French asked what role the Department of Commerce would have. Diane Howard said they will definitely be playing a role and they have a lot of useful authority in this context. They will have an increased budget which will help with their mission.

Diane ended her remarks at 2:44 PM.

Jim introduced Randy Repcheck and Michelle Murray to give policy updates from AST. Michelle started her presentation on "Complete Enough" with regards to accepting license applications. COMSTAC has made some recommendations to AST and referencing those recommendations, AST has established a new 'complete enough' policy called Part 450 Guidance for Complete Application. AST is also working to develop a list of criteria to provide clarity on what it would take for AST to accept an application. This will be used in conjunction with an internal process. AST will provide this process to COMSTAC for your review and comments. Michelle Murray discussed the underlying need for the complete process change. She also discussed the complete enough determination implementation timeline. she stated they hoped to get the guidance to COMSTAC sometime this month. It is currently under review at AST. AST is aiming to do reviews in 120 days but operators must take into account the

established 180 day evaluation timelines when scheduling proposed or anticipated operations. Pre-application consultation is going to look a bit different. AST envisions 4 phases and are still in the process of developing this phased approach. If AST can't continue the evaluation, then AST would consider tolling. Michelle Murray showed a screenshot of what the guidance for a complete application will look like. Anything that is listed in Phase 1 are items that are needed to accept the application.

Michelle Murray took several questions from COMSTAC.

- Clay Mowry asked about support for smaller launch companies who may not have as many staff or resources as large companies. Michelle Murray said AST is working with a lot of companies on means of compliance and once those are accepted AST can update the table so that other companies can follow those. AST is open to the idea of templates.
- Bill Beckman wanted to know the feedback timeline and if was collected all at once or if a “no” on a particular checklist item would be provided to the applicant sooner. Michelle Murray said all the yes/no questions are designed to determine if the FAA has information it needs to start its evaluation in that area. AST gives feedback once they start reviewing in-depth. AST is looking to automate the system so that they can improve the efficiency. Bill Beckman said that the progress to more automation creates an opportunity to provide more real time feedback.
- Clay Mowry noted that a lot of companies would be willing to test the automated system. Michelle confirmed that several companies have offered to test it at some point.
- Bill Beckman asked when industry will see this guidance ‘complete enough’. Michelle said that once it is through more levels of review, AST will be able to share it.
- Karina Drees asked that as 450 becomes the norm for operators going forward, does AST expect the 180 day window to decrease as launches occur more often at a specific location. Michelle Murray responded that under part 450 companies have a lot more flexibility with adding additional vehicles or operational changes. Once a company has a license, they are in lifecycle management. Certain changes will be able to be evaluated much more quickly.
- Mike Moses asked about small modifications or administrative changes. Michelle Murray said AST could look into guidance that focuses on smaller changes or administrative changes vs a larger in depth change.

Randy Repcheck addressed Part 450 updates. He covered current activity, early benefits, early challenges, advisory circulars, and the way forward. Part 450 become effective in March 2021 and at the time of COMSTAC meeting, there was 1 active license (Astra), 4 active application evaluations, and 8 in pre-application consultation. The FAA also issued 10 ACS last year. Early benefits of Part 450 includes comprehensively capturing safety issues, reducing scope of launch, the implementation of separate risk criteria for neighboring operations personal, updated collision avoidance analysis, streamlined ground safety at Federal launch ranges, and the use of Conditional Expected Casualty (CEC). Early challenges include the learning curve for FAA and industry. Being a performance based rule, it provides a lot of flexibility, but it can be a challenge to provide clarity and to maintain consistency. There are also areas that need additional clarity including data flows to and from federal launch ranges, focus on methodologies, incremental review, systems safety specifically levels of rigor, safety critical systems, and software safety, transitioning from Part 431 or 415/417 to Part 450, and unique means of compliance. Ten

advisory circulars were issued from May- September 2021. Three of the 10 have already been revised. AST plans to continually update all ACs. There are 8 ACs that are currently planned for this year and 8 more will be published after this fiscal year. There are 26 for now with the possibility that additional ACs may be added. The way forward for Part 450 includes, continuing to develop advisory circulars, tracking lessons learned, developing the application portal to improve the application submission and evaluation process, and continuing to work with the federal launch ranges to improve efficiency and establish baselined timelines for input and out data flows (a lot of this work is with the Common Standards Working Group (CSWG). AST will also continue to work with industry to understand the issues it sees with Part 450 and suggested solutions. AST plans to conduct workshops in June on system safety. AST would like to discuss lessons learned to provide better understanding of what is needed to comply with the Part 450 system safety regulatory requirements. Additional workshops will be planned later.

Questions for Randy Repcheck

- Mike Moses asked when the invites will go out for the June workshops. Randy Repcheck said they will be sent in the next couple weeks.
- Eric Stallmer asked how long does each AC take. Randy Repcheck said AST is working on them concurrently, but some take longer than others depending on the subject matter.
- Karina Drees commented that it is great that the FAA is working with the ranges to try to reduce the duplication of work.
- Bill Beckman asked about the process to notify industry on the release of the draft AC. Jim Hatt said AST does send out draft ACs, but a notification will be sent out via GovDelivery when new ACs are released. AST may also do AC workshops in the future depending on the topic.

Randy then transitioned to the Lox Methane discussion. There are five launch vehicles currently under development that use liquid oxygen and methane propellants. There is significant uncertainty in explosive yield for intact launch vehicle impact vs total mass and vs impact speed. AST wants to understand the explosive potential in order to improve our modeling. The DoD has funded the COMET explosive test series for pre-flight scenarios in 2020. The DoD/NASA JASG are also planning long term test series for data to support (pre-flight explosive siting). The new LOX/CH4 CSWG subgroup was formed in mid-2021; they will develop a common roadmap. FAA is the only CSWG member that has currently planned and funded intact impact testing to date. It will likely take until the end of 2023 to finish Phase 1. Phase 2 testing has not been funded yet. FAA will share intact impact test results with U.S. Government agencies and with industry.

- Charity Weeden asked if there were other propellants combinations have not been tested. Paul Wilde said there are some hybrid combinations out there that not have been tested but LOX Methane is by far the most widely used one.
- Bill Beckman asked about the limit of jurisdiction and if explosive testing included transportation trucks. Paul Wilde said AST is only looking at launch vehicles.

Jim Hatt introduced the next speaker, Valda Vikmanis-Keller, director of the Office of Space Affairs (OSA), Bureau of Oceans and International Environmental Scientific Affairs. Valda Vikmanis-Keller discussed how the world has changed a lot in the past 25 years. She stated that it presents significant challenges to the sustainability to the space environment. It will require a

global effort and robust international cooperation. The approach should be logical and effective. OSA works with the United Nations Committee on Peaceful Uses of Outer Space (COPUOS), which is the primary multilateral forum to discuss space issues. There are over 100 member states in the COPUOS which covers a wide range of issues. There are two areas that are particularly important to OSA. First, Guidelines for the Long-term Sustainability of Outer Space Activities (2018) which was significant work for the member states to agree to the guidelines. The committee recently adopted a 5-year work plan to deal with on the guidelines. The second important area is space resource utilization. The new working group will collect information on activities related to space resource to ensure they are carried in accordance with international law. OSA looks forward to engaging with this new working group. OSA brings a representative from private sector to attend plenary and give presentations. In January, State Department released a notice soliciting private sector advisors. Another solicitation has been posted in mid-April and it is open until May 9th. It is an open solicitation, which benefits OSA because it can be difficult to reach smaller companies. OSA plans to employ this mechanism more in the future and expand it beyond COPUOS.

Questions for Valda Vikmanis-Keller

- Clay Mowry said several companies are developing private space stations and would like input from State on how that will evolve in the future with international partners; particularly when governments are not driving it. Vikmanis-Keller said State is thinking about this and it is imperative to get this right and it is important to have better communication.
- Charity Weeden asked if State is intending to consult with industry for the LTS 2.0 agenda. Valda Vikmanis-Keller responded that they are. She said that industry will bring a lot of concrete practical vision and suggestions. As LTS 2.0 moves forward, State will find ways to bring in industry.
- Charity Weeden asked about reactions to the US Government's declaration on ASAT direct-ascent test ban. Valda responded that State was involved in those conversations. The initial feedback that State have been receiving from partners has been positive. Generally speaking, it was well received from most international partners.
- Greg Autry asked if India will be signing the Artemis Accords. Valda said that State is continuing to have on-going conversations with India.

Karina read a question from online asking which agencies does the FAA coordinate its responsibilities in regards with LOX Methane testing. Jim said that FAA is working with DOD and NASA, as well as the CSWG. The next online question was asked if the introduction of LOX Methane was impacted by the debris analysis work that MITRE did last year. Jim responded that he didn't the answer on hand but will contact MITRE.

Charity Weeden and Karina Drees presented a look on the commercial space industry from 2020-2022. It has been two years of giant leaps for the U.S. Commercial Space Transportation industry including:

- The return of crewed launch to the ISS from the United states
- Era of space tourism kicked off
- Deployment of large satellite constellations
- Enabling exploration (Landing on mars)

- Enabling critical services for national security, weather, and data needed to make decisions
- A booming launch industry
- Putting spaceports on aviation maps
- Resilience of the industry during a global pandemic

Charity Weeden showed slides showcasing COMSTAC efforts over the past couple years when they were exclusively virtual and remarked it has been nice today to do a hybrid meeting.

Jim Hatt gave brief closing remarks for Day 1.

Jim Hatt clarified that according to the COMSTAC charter you can serve a maximum of 4 years with the exception of the chair. People who have served the past 4 years they will be coming off COMSTAC. If a member has only served two years, they can be re-nominated to serve an additional two years.

Day 1 of COMSTAC adjourned at 4:14 PM

Day 2 of COMSTAC

Members Present in Room
Clay Mowry
Paul Dampousse
Bill Beckman
Mike French
Dale Ketcham
Charity Weeden – Chair
Karina Drees – Vice Chair
Greg Autry
Mike Moses
Kate Kronmiller
Committee Staff
Jim Hatt - DFO
John Venditti
Tara Halt
Bob Roxbrough
Other (In Room)
Craig Pritsky
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Members Present Online
Robbie Sabathier
Eric Stallmer
Mary Lynne Dittmar
Steve Lindsey
Dale Nash
Chris Hassler
Ed Bolton
Agency Staff
Kelvin Coleman
Jack Fino
Leslie Welch
Talisa White
Janice Kauffman
Other (Online)
Brandon Eden
Valerie Gawron
Andrew Nelson

Day 2 of COMSTAC started at 9:08 AM

Karina Drees gave some opening remarks and introduced the first speaker Mr Joel Graham, Staffer for Senate Commerce, Aviation, and Space Subcommittee. Joel Graham discussed that the committee was looking to pass the Competiveness Act and NASA Reauthorization together. Looking ahead to the FAA reauthorization that will come up in about a year, it will likely have some FAA AST provisions; particularly for human spaceflight.

Questions for Joel Graham

- Dale Ketcham asked if they don't get a reauthorization for NASA in as part of the law would you do it separately. Joel responded that they would have to do the reauthorization separately.
- Greg Autry asked about assigning Space Situational Awareness (SSA) to the Department of Commerce under space policy Directive 3. Joel Graham responded that he was happy to see Rich Dalbello appointed to head the Office of Space Commerce. 2024 is the operational date but that is too far out; that capability is needed in place sooner.
- Charity Weeden asked about mission authorization in Department of Commerce. Joel Graham responded that they are focused more on debris questions right now, but mission authorization is something that needs to be clarified.
- Mike French asked about the human spaceflight learning period and if Congress was waiting for the reports. Joel Graham responded that they are going to have some hearings as well.

- Dale Ketcham asked who will fill the vacuum on the appropriations committee. Joel Graham responded that there is an opportunity for advocacy and education to say that space is important. There may not be just one champion; having many champions is a better way to go.
- Bill Beckman stated that as industry starts expanding missions, they are doing things they have never encountered before. The FAA needs the tools and resources in order to keep up with the pace. Joel Graham responded that human spaceflight operates under the informed consent regime. The looming deadline on the learning period means that Congress has to figure out where to go from here and what the roadmap looks like.
- Karina Drees read a question from online asking for updates on National Transportation Safety Board (NTSB) investigation of space accidents and mishaps. Joel Graham said that there are conversations going on between NTSB and FAA focused on updating the current MOU; it has to be a collaborative effort.
- Kate Kronmiller noted that most companies are using government facilities. Most are impacted by climate change and have major hurricane impacts on launch sites. She asked if Congress understands that there are national security implications on spaceports because of climate change.
 - Joel responded that there likely is some research on that. It will be important moving forward. It's important to make the buildings resilient. There is a lot of NASA infrastructure needs that must be addressed.
- Karina Drees asked if there are any continued discussions on the Hill on elevating AST to DOT secretary's office. Joel Graham responded that is an interesting one. As the FAA process gets moving, we might see continued talk about moving AST.
- Charity asked about the process of airspace integration. Joel Graham said that he knows it is in ATO, but he hasn't seen much movement recently. It can be challenging to work new processes and systems into a current system that can never really be taken offline.
- Dale Ketcham asked how the commercial space industry might best collectively shape the message to the broader audience – including Congress. For example, how space impacted the war in Ukraine. There are a lot of good stories that fundamentally reinforce why space is important. Joel Graham responded that there has been a lot of turnover on Capitol Hill, especially with staffers. There has been some erosion of understanding. There needs to be more education across the spectrum.
- Mike French said that the committee has led the way on the SPACE act with discussions on SSA and asked if debris is the next step. Joel Graham responded that hopefully Space Commerce can be elevated out of NOAA; support for the office of Space Commerce will require some economic analysis.
- Charity Weeden mentioned that one thing that the industry needs for success is a good talent pipeline. Joel Graham responded that every company he talks to is having trouble finding talent. There is competition in the space industry for talent.

Started break at 9:50 AM.

Resumed at 10:03 AM.

Jim introduced the next speaker Dr. Valerie Jane Gawron from MITRE. Dr. Gawron's presentation was on Space Health. The team first looked previous COMSTAC findings; specifically findings from the September 2020 meeting by the Safety Working Group. The

CSF/MITRE workshop was held to create a human research program for spaceflight participants in the commercialization of space. The working group had two subcommittees, suborbital and orbital & beyond. The two day virtual workshop was held May 2021. The summary report was rolled out in November 2021¹. The report identified research areas and their order of priority. MITRE also established advisory committee to help us look at next steps. I can be reached vgawron@mitre.org.

Questions for Valerie Gawron

- Karina Drees read a question from online asking if there is an opportunity to sign up to contribute for the advisory committees. Valerie responded that they would definitely need help from Commercial Spaceflight Federation (CSF). Perhaps the advisory group should be reporting to the COMSTAC Safety Working group. They are looking for people to sign up and are working to figure out their next steps

Jim Hatt introduced the next speaker Andrew Nelson, Vice Chair of ASTM F47 Committee. Andrew Nelson gave a status update on the ASTM Committee F47 on Commercial Human Space Flight. The foundation for the implementation of standards is governed by the NTTAA of 1995 and OMB Circular No. A-119. F47 committee was formed in 2016 with support/interest from CSF and industry. There are 8 sub-committees with plans to increase the sub-committees. ASTM F47 has six published standards with another 12 in the pipeline. ASTM F47 has very broad representation with participation from most of the major spaceflight operators. A list of recent and upcoming meetings for F47 if was shown for anyone who is interested in participating. There were no questions for Andrew.

Charity Weeden opened the discussion for the working group reports.

The regulatory working group (RWG) report was presented by Clay Mowry. RWG had two tasks and the second task was discussed first. COMSTAC Task #2: the FAA requested COMSTAC review and recommend improvements and changes to Part 440. Specifically, provide recommended language on thresholds used to determine MPL, the cost of casualty, and what alternatives to insurance sources would industry recommend. COMSTAC recommendations on maximum loss requirements (MPL) are the following:

- MPL calculations should not and cannot be based only on the likelihood of damage or casualties but must include the federal government's assurance to the public and to the licensee that regulatory requirements and compliance with regulatory requirements protect against the likelihood of damage or casualties
- Increase transparency around the process for determining MPLs so that insurance providers can better understand the process for calculating them.

The RWG developed a list of questions that could be asked for insurance providers. Some of these may be vehicle specific. It is fairly complex depending on the type of system and fuel. The FAA should contract with a third party entity with a strong and credible background in risk assessment to evaluate the appropriateness of the current 1 in 10 million MPL threshold. Prior to formal rulemaking on MPL thresholds the FAA should consult with industry and assess the insurance market. COMSTAC believes that the 1 in 100,000 threshold for government

¹ <https://www.mitre.org/publications/technical-papers/csffitre-workshop-created-a-human-research-program-for-spaceflight>

property is appropriate. There is also a white paper that will be circulated. At the Fall meeting, COMSTAC should vote on whether or not to approve the content of the white paper.

Task Discussion

- Clay Mowry said that everyone at their last meeting was pretty much in agreement on what the RWG are proposing.
- Steve Lindsey made a comment that they don't have insight into how the calculations are developed because those impact insurance and how a vehicle is designed. There are a lot of secondary effects.
- Karina read an online question that asked has COMSTAC talked with Air Force Safety Center because they had to calculate MPL at the Cape for dropping aerial refueling hoses on private property. Charity responded that the FAA will have to revisit this.

Clay Mowry recommended a vote on this for at the fall meeting to give the members more time to resolve some remaining questions.

Next presentation was COMSTAC RWG Task #5. The RWG was asked to prioritize the upcoming advisory list and the slide has the priority for the next 16 ACs. The RWG reached out broadly so this list had a thorough vetting with the various groups. In addition to the list of ACs, the RWG also has recommendations for additional ACs, including identifying how legacy operators can smoothly and easily transit to Part 450. Additionally, new operators may find it challenging to operate under the new rule.

- Charity asked if timing need was discussed. Clay said they did not get into the specific timing but expected the top four would come out in the next four months.
- Mike French asked what the current timeline is for the list regardless of priority. Jim Hatt said that AST is projecting eight this year with some revisions based on industry input. Every AC has a comment form. After this year's eight, AST will follow up next year with six to eight depending on the rulemaking activities.
- Mike French suggested that COMSTAC should be aware of AC progress moving forward and can comment on the priority on the ones that are left. Jim Hatt said that this could be an ongoing discussion at future meetings

All members in the room voted Aye

All members online voted Aye (except for Sharon Pinkerton who was not present online)

Karina Drees read a question from the online chat: Will this task on Part 440 be expanded beyond MPL and casualty cost? Jim Hatt replied that there will be a SpARC established for Part 440, so likely there won't be another task. The work COMSTAC has done will be a good foundation for the SpARC.

COMSTAC moved onto the Safety Working Group (SWG) Tasks. The Safety Working Group slides were presented by Greg Autry. The first Safety Working Group Task was on human spaceflight. The SWG identified five priorities for future human spaceflight regulation. Greg Autry stated that they had pretty good consensus on the priorities. Priorities included a permanent regulatory environment that incorporates performance-based requirements, incorporation of consensus standards, utilization of industry input, including the November 2021 recommendations, addressing integration of occupant safety, and building a regulatory

framework that considers applicability to/dovetailing with future orbital transportation/orbiting platform requirements. The SWG then discussed their comments on Recommended Practices scope expansions. COMSTAC found the proposed topics to be of interest to industry and appropriate for the US Government to address. Greg Autry stated that he had private observation of scope overreach with trying to bring in planetary protection. He believes AST should be focused on launch and re-entry activities. The SWG made additional comments for the scope expansion for radiation hazards and Space Flight Participants (SFPs) flying on-board autonomous vehicles. For Suborbital vs. Orbital in recommended practices, additional industry input and deliberation is needed.

Discussions on SWG Tasks

- Mike Moses said when there are commonalities with suborbital and orbital, it should be one document.
- Charity Weeden said that COMSTAC is voting on the five priorities and the rest is discussion.
- Mike Moses noted that for #1 on the priorities, the SpARC is likely where that will occur but the SWG thought it was relevant to put here.
- Robbie Sabathier stated that commercial space is a very diverse industry and doesn't always see eye to eye. The SWG had a lot of back and forth but did reach consensus on this.
- Charity said that COMSTAC wants the FAA to focus on their primary mission. There are a lot of items emerging and COMSTAC wants the FAA to be informed when they go to interagency meetings on these related topics, like rendezvous and docking. COMSTAC is in a good place to provide that background. Greg Autry agreed with this.

Karina Drees asked for a motion and a second. Dale Nash motioned and Bill Beckman seconded.

All COMSTAC members in the room vote Aye

All COMSTAC members online voted yes (Except for Sharon Pinkerton who was not online)

COMSTAC took a break for lunch.

COMSTAC resumed after lunch at 12:33 PM.

Jim Hatt called the group to order and Charity Weeden introduced the next section, I&I work group report

Paul Dampousse presented for the Innovation and Infrastructure working group (IIWG). The first task is on Global Climate Change Impact Response. Dale Ketcham presented the slides on Climate Change. Dale Ketcham first covered observations including rising sea levels where spaceports are located and the frequency intensity and duration of storms. He then presented the findings slide that found the most critical is the need for long-term maintenance, monitoring, and replenishment strategies for spaceports. Dale Ketcham stated that the final recommendation is to have AST request a report be compiled by an independent 3rd party with other agency participation including strategies for avoidance and mitigation and to investigate which agency will lead this effort.

- Dale Ketcham said there is a question of what/when spaceports are identified as critical. Charity Weeden asked if this is a question that is being discussed within the FAA. Jim Hatt responded that with regards to critical infrastructure, one of the things in interagency workgroup is looking into is what happens if spaceports are considered critical infrastructure. AST wants to make sure industry and the FAA understands what those effects would be. Charity noted that there is some overlap with airports and their interest in this topic.
- Chris Hassler said one of the things is propellants and the fuels used for spaceports. Some people are concerned that certain propellants are harmful. Industry should probably get started at looking at alternatives for vehicles. Dale Ketcham responded that they were trying to keep the response focused on the impact of climate change on spaceports with the understanding that there is another question out there about propellants and the impact those have on the environment. Chris Hassler suggested that they narrow this by saying it is for external threats to spaceports and then someone needs to be mindful that licensing requirements may change in the future as you handle certain propellants. It would be the perfect topic to be studied by multiple agencies.
- Dale Ketcham asked if the charter is complete yet on the Spaceport Interagency Working Group. Jim Hatt responded that they have a complete draft but the review is not yet complete.
- Jim Hatt asked if they are only talking just FAA licensed spaceports? Dale Ketcham responded that it should include all spaceports, including federal. The interests of the nation are better served by all spaceports. Kate Kronmiller said they could only get information on government spaceports so it would be good to get information on other spaceports.

Motion was made by Dale Ketcham and seconded by Mike French.

All members in the room voted yes.

All members online voted yes except for Sharon Pinkerton (not online) and Ed Bolton (Could not be heard/likely on mute)

Paul Damphousse presented the last task on High Speed Aerospace Transportation (HSAT). The discussion focused on four broad areas that were considered: operations, airspace, spaceport, and climate impact. Industry doesn't want the systems slowed by any regulatory consideration or lack thereof. IIWG reached out to companies that they knew were developing these systems. It should be noted that this isn't supersonic, which would be regulated by other Lines of Business within the FAA. The IIWG was focused on long-range point-to-point (P2P) where the line becomes blurred with sub-orbital flight. The IIWG had several observations including:

- "Spectrum" of systems currently in development some could fly within the decade
- Companies don't want to address issues alone
- "Space Flight Rules" for exo-atmospheric ops need to be developed
- There is some ongoing work being done by NAA and FAA NextGen for Upper Class E Traffic Management
- Non-space transiting systems would prefer to be regulated under Part 91 and could operate out of airports from the start
- Airspace corridors for development, testing and initial operations are critical

Findings for this task

- Designated overland flight corridors need to be established for the development, testing, and initial operations of HSAT systems.
- There needs to be a strategic roadmap for HSAT including integration into the NAS and eventually certification.

COMSTAC discussion of the HSAT task.

- Paul Damphousse said the ultimate vision is if you are doing point to point for commerce and then eventually getting into passenger services. They have to be regularly scheduled and high ops tempo and it can't be disruptive to existing operations. It needs to have some sort of seamless integration. As for the altitude of the corridors, they would likely be above 60,000 feet because they want to do hypersonic testing.
- Chris Hassler asked if there is an emphasis on autonomous vehicle. There is a couple places that we could add that terminology. Paul Damphousse responded that a company could probably do a fully autonomous vehicle if its cargo only. Chris Hassler agreed that a company would need to start with cargo from a risk management perspective.
- Steve Lindsey said there is a tendency to think of those trajectories like airplane trajectories, but they are different, especially with point-to-point. Paul Damphousse said that some providers said their CONOPS are completely vertical. They have to figure out how they are going to integrate into the existing system.
- Charity Weeden asked if they could elaborate on the mention of Australia. Paul Damphousse said because Australia is so remote there is a lot of interest in flying there -- in fact, several companies are looking at HSAT from Australia, including flying above Mach 5.
- Paul Damphousse said that the high speed corridor should be established so people/companies can do testing. They are going to have the technology and the CONOPs that may not easily integrate with the existing airspace. Steve Lindsey noted that supersonic corridors exist in Texas, so he thinks it is achievable in the near term. Paul Damphousse said these companies are looking to go a lot faster and should be higher.
- Clay mentioned that he has seen some concepts that people board a heli-craft, then they fly to a spaceport. That heli-craft would integrate seamlessly into a rocket body.
- Chris Hassler asked is it possible in the second bullet under strategic roadmap could you say for autonomous and manned vehicles. Paul Damphousse responded it wasn't included because none of the people that they talked too made that distinction. It's worth looking it at though. Chris Hassler said that would be a slightly different designs. Mike Moses said it is the concept of takeoff and landing and it doesn't make a difference between autonomous and manned.

Karina Drees asked for a motion. Clay Mowry made a motion and Mike seconded. Bill made a suggestion that it could be strategic options instead of roadmap or could say strategic analysis. Paul Damphousse asked that with that proposed change does COSMTAC agree.

As amended, all in the room voted Aye

As amended, all on zoom voted Aye (no response from Ed Bolton and Sharon Pinkerton)

Karina Drees read an online question for the IIWG asking what critical supply chain aspects impact spaceports' infrastructure readiness and availability to support all phases of spaceport's resilience during increased national needs (i.e. launch surge capacity and constellation replenishment on demand). Dale Ketcham responded that in terms of supply, helium is a rather unique challenge. Clay Mowry said helium has been a problem for decades and it gets worse especially as there are conflicts around the world.

Charity Weeden moved forward with the agenda. The next section of the agenda was a discussion of industry consensus standards led by Jim Hatt. Jim Hatt stated that this is related to the congressional reports that Aerospace Corporation is helping us draft on safety framework. Jim Hatt first went over ASTM's answers posed by Aerospace Corporation. Then he asked several questions to COMSTAC related to safety framework. Jim Hatt emphasized that this is not an official COMSTAC tasker for this meeting and is just a general discussion. It will likely be tasker for the next COMSTAC.

- Andrew Nelson had a caveat that ASTM did map to the FAA recommended practices, and then also mapped to NASA commercial crew requirements.
- Jim Hatt noted that ASTM is not the only standards organization but they have been doing a lot of the heavy lifting when it comes to HSF.
- Jim Hatt asked if there are any changes to the list of readiness indicators from the 2014 report to Congress. This will be coming back around and he will send that list to everyone here so AST can solicit your inputs.
- Bill Beckman said there are contracts for Commercial LEO destination but he doesn't know what that will look like in two years. He asked if that is more of the type of industry indicator that you are looking at.
- Mike Moses noted they keep running up to the comparison to aviation. It just doesn't directly translate to the current variety of space transportation systems. Mike Moses said he could report all the issues they have but it does not have relevance to other systems. Companies have been struggling to try to find the common things they could share but there really isn't much. This looks like industry is failing to do what aviation does but there isn't even an analogy to start with. Mike said they are not required to follow SMS rules but some companies do. Clay Mowry noted that Blue Origin has a very robust safety management system.
- Chris Hassler asked if there is still a scorecard or that anything we can use to see how companies are performing or is there a way you could measure the participants. Mike Moses said you could come up with a checklist of best practices.
- Clay said it might not be a standard approach because of the different operations are at play. COMSTAC should have conversations with the different operators. That would be the best way forward. Chris Hassler said you could potentially create a library of best practices
- Mike French asked if these are the types of questions for the independent review. Jim Hatt clarified that this is for AST's report to Congress on the Safety Framework and not the independent review.
- Clay said he thinks it will take a few years before there is a large enough fleet of vehicles that could operate under a framework
- Greg Autry said he had a comment on levels of safety assurance. In general, they would be the same, but when it comes to radiation there might be differences. Mike Moses said

there might be stuff down in the weeds, like if a crew is actively flying they might need an increased level of redundancy in their systems.

Next up on the agenda is public comments.

- An online question asked when commercial and private companies are the bulk of companies, will there be a certification for maintenance personnel. Greg Autry said yes but there is so much more development to do. Karina Drees added the systems are so different making a certification regime nearly impossible.
- Clay Mowry noted we are getting to the point that commercial makes up the majority of the spaceflight industry.
- Charity Weeden read another comment from online that recommended reaching out more to the International System Safety Society, the International Association for the Advancement of Space Safety, the American Conference of Government and Industrial Hygienists and the American Society of Safety Professionals to reach more stakeholders who do space safety in their day to day jobs.

Charity Weeden moved on to the new business section of the agenda. New business could relate to future tasks. Greg stated that it has been an honor to serve on COMSTAC. Paul Dampousse mentioned that looking 5-10 years out, there is a lot of potential especially for lunar activities. He noted that it is coming on fast and there are so many different things in the works. Charity Weeden noted there seems to be interest on supply chain in particular helium and that could be a future task. Mike Moses mentioned that NASA looked into the helium supply chain issue recently. Mary Lynne Dittmar brought up work force challenges in the aerospace industry and how it is a threat to competitiveness globally. Charity Weeden noted that ITAR restrictions require companies to hire US persons. Mary Lynne Dittmar added it is affecting commercial space and companies are facing the same crunch. There is a real shortage in the talent pipeline and it is impacted by ITAR and immigration. Commercial space needs to use every means that it can to develop talent to support the growing US space industry.

Next on the agenda were closing remarks. Charity Weeden summarized several to-do items including:

- Circulation of the MPL documentation to COMSTAC
- The SWG will share a write-up that will reflect the recommendations discussed today
- COMSTAC wants to start the conversation on MPL calculations with AST before the next meeting
- COMSTAC is interested in understanding the current status and activities of the interagency task group on spaceports
- Exploring if there is any overlap on climate research for spaceports
- Tracking the use of standards. Charity Weeden noted there are probably some lessons learned from previous COMSTAC tasks, but there is likely additional work to do.
- COMSTAC would like to further explore and discuss workforce issues at a future meeting.

Charity Weeden ended by saying that COMSTAC has had a productive couple days and handed it over to Karina Drees.

Karina Drees thanked everyone for their diligence and appreciates their work and inclusiveness. The products COMSTAC has been submitting will be useful moving forward and she looks forward to engaging over the next couple years. Karina also thanked Charity for her leadership and diligence.

Jim Hatt thank Charity for her service as COMSTAC Chair. Her leadership has been outstanding for the past two years.

Jim Hatt provided some closing remarks. Jim Hatt stated the SpARC Charter for 440 is getting close to being approved, and the SpARC Charter for 460 is just a few steps behind. There are more workshops AST is putting together on system safety and other topics. AST is working hard to get reports to Congress.

Kelvin Coleman thanked everyone for their work and for taking time out of their busy schedules to come to the FAA and give AST advice; it is really appreciated. Kate Kronmiller thanked him for making sure AST runs seamlessly.

Jim Hatt adjourned COMSTAC at 2:44 PM.

I hereby certify that, to the best of my knowledge, the foregoing minutes are accurate and complete.

James A. Hatt
Designated Federal Officer