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Description of document: National Transportation Safety Board (NTSB) Letters with Commercial Spaceflight Federation (Russia) 2014-2017

Requested date: 2017

Release date: 06-August-2020

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Source of document: National Transportation Safety Board  
Attention: FOIA Requester Service Center, CIO-40  
490 L'Enfant Plaza, SW  
Washington, DC 20594-2000  
Fax: (240) 752-6257  
[Freedom of Information Act \(FOIA\) Public Access Link](#)  
Email: [foia@ntsb.gov](mailto:foia@ntsb.gov)

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**National Transportation Safety Board**  
**Washington, D.C. 20594**

August 6, 2020

Re: National Transportation Safety Board (NTSB)  
Freedom of Information Act (FOIA) No. FOIA-2017-00377

This letter responds to your FOIA request for correspondence during calendar years 2016 and 2017 between the NTSB Aviation Safety Office and the Commercial Spaceflight Federation.

The Safety Board located several responsive documents. The approximately 25 pages of documents that we determined may be released are enclosed. However, we withheld certain information partially and in full pursuant to the following exemptions specified below:

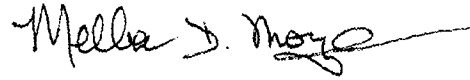
Personal information, notably autopsy information and graphic photos, social security numbers, and any personal identifying information, is withheld pursuant to 5 U.S.C. 552(b)(6), which exempts from disclosure "personnel and medical files and similar files the disclosure of which would constitute a clearly unwarranted invasion of personal privacy," to include personal addresses, phone numbers, etc.

In several documents enclosed with this letter, I determined that exemptions to the FOIA required that I redact a limited amount of material. The redactions are clearly marked, and the applicable exemptions are noted at the place of the redaction.

The NTSB has concluded processing your FOIA. No fees are being charged for processing the request. You may contact Ms. Joy Gordon, the analyst who processed your request or our FOIA Public Liaison at 202-314-6540, for any further assistance and to discuss any aspect of your request. Additionally, you may contact the Office of Government Information Services (OGIS) at the National Archives and Records Administration (NARA) to inquire about the FOIA mediation services they offer. The contact information for OGIS is as follows: OGIS, NARA, 8601 Adelphi Road-OGIS, College Park, Maryland 20740-6001, e-mail at [ogis@nara.gov](mailto:ogis@nara.gov); telephone at 202-741-5770; toll free at 1-877-684-6448; or facsimile at 202-741-5769.

If you are not satisfied with the response to this request, you may administratively appeal by writing to the NTSB, Attn: Ms. Sharon Bryson, Managing Director, 490 L'Enfant Plaza, SW, Washington, D.C. 20594. Your appeal must be postmarked or electronically transmitted within 90 days of the date of the response to your request.

Sincerely,

A handwritten signature in black ink, appearing to read "Melba D. Moye", with a long horizontal flourish extending to the right.

Melba D. Moye  
FOIA Officer

Enclosure

**From:** Eric Stallmer  
**Sent:** 20 Oct 2016 16:40:40 -0400  
**To:** Correspondence  
**Cc:** Jane Kinney; Tommy Sanford  
**Subject:** CSF Response to reference A15-27 and A-15-28  
**Attachments:** CSF NTSB Response 10-17-16.pdf

Chairman Hart,

Attached you will find our responses to the the two recommendations from the National Transportation Safety Board (NTSB) following your investigation into the Scaled Composites SpaceShipTwo accident.

If you have any further questions or comments for us, please do not hesitate to contact me.

Lastly, I want to commend your organization for the outstanding work you do keeping all modes of transportation moving safely for this great nation of ours.

Most Sincerely,

Eric Stallmer

**Eric W. Stallmer**

President  
Commercial Spaceflight Federation  
727 15th Street NW.  
Suite 800  
Washington DC, 20005

Email address: (b)(6)

(b)(6)

(b)(6)

The Honorable Christopher A. Hart  
National Transportation Safety Board  
490 L'Enfant Plaza SW  
Washington, D.C. 20024

Dear Chairman Hart,

The Commercial Spaceflight Federation (CSF) was provided two recommendations from the National Transportation Safety Board (NTSB) following their investigation into the Scaled Composites SpaceShipTwo accident. Our responses can be found on the following page.

We would also like to extend our willingness to participate in and assist with future investigations that may arise. We hope that the NTSB feels comfortable reaching out to us for assistance and expertise from the very earliest stages of future investigations so that we may optimize our contributions.

The Commercial Spaceflight Federation would like to thank the NTSB for the substantial amount of time and effort NTSB dedicated to this investigation. We appreciate the NTSB's professionalism and patience, as well as its efforts to complete the investigation within nine months. CSF and the NTSB share the common goal of developing a safe and flourishing commercial space industry and appreciate the effort put forth towards achieving that goal.

Sincerely,

Eric Stallmer  
President  
Commercial Spaceflight Federation  
727 15th St NW, Suite 800  
Washington, D.C. 20005



## **Part I - Emergency Response (A-15-27)**

The first recommendation is as follows:

**Advise commercial space operators to work with local emergency response partners to revise emergency response procedures and planning to ensure that helicopter and other resources are appropriately deployed during flights.**

The CSF has advised all its member companies to work with local emergency response partners to review their emergency response procedures, planning, training, and readiness tests to ensure that helicopter and other resources are appropriately deployed during flights. We note that, in addition, CSF members currently have extensive emergency plans and procedures in place for accident scenarios. Additionally, in 2014, CSF drafted and adopted a standard that addresses preparations for hazardous test operations and includes emergency response efforts. CSF's Standards Committee will review that standard to determine if revisions are appropriate in light of NTSB's findings and recommendations.

## **Part II - Human Factors Guidance (A-15-28)**

The second recommendation from the NTSB to CSF is as follows:

**“Work with the Federal Aviation Administration to develop and issue human factors guidance for operators to use throughout the design and operation of a crewed vehicle. The guidance should address, but not be limited to, the human factor issues identified during the SpaceShipTwo accident investigation.”**

The CSF will work with the FAA to develop and issue supplemental human factors guidance in addition to those presently in use throughout the design and operation of crewed vehicles, including human factor issues like those identified in the SpaceShipTwo accident investigation. Documentation and knowledge sharing are both integral in developing human factors guidance for commercial space transportation operators.

**From:** Correspondence  
**Sent:** 4 Aug 2015 19:17:42 +0000  
**To:** tommy@ (b)(6); Barbara McCann; Deirdre Breithaupt; FAA-NTSB-Correspondence (b)(6); Rita Maxwell  
**Cc:** robert.hendrickson@ (b)(6); ben.diachun@ (b)(6); Todd.Ericson@ (b)(6); roberto@ (b)(6)  
(b)(6)  
**Subject:** NEW NTSB Safety Recommendations A-15-19 through -26 (201500712) & A-15-27 and -28 to the Commercial Spaceflight Federation (201500713)  
**Attachments:** 201500712\_Out.pdf, 201500713\_Out.pdf

Please find the attached correspondence from the National Transportation Safety Board regarding Safety Recommendations A-15-19 through -26 to the FAA and New Recommendations A-15-27 and -28 to the Commercial Spaceflight Federation.



Correspondence - crb  
National Transportation Safety Board  
490 L'Enfant Plaza East, SW  
Washington, DC 20594  
If needed, please reply to us at  
[correspondence@ntsb.gov](mailto:correspondence@ntsb.gov)

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# National Transportation Safety Board

Washington, DC 20594

## Safety Recommendation

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**Date:** August 4, 2014

**In reply refer to:** A-15-19 through -26

The Honorable Michael P. Huerta  
Administrator  
Federal Aviation Administration  
Washington, DC 20591

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On July 28, 2015, the National Transportation Safety Board (NTSB) adopted its report concerning the October 31, 2014, accident in which the SpaceShipTwo reusable suborbital rocket, N339SS, operated by Scaled Composites LLC, broke up into multiple pieces during a rocket-powered test flight and impacted terrain over a 5-mile area near Koehn Dry Lake, California.<sup>1</sup> Additional information about this accident and the resulting recommendations may be found in the report of the investigation, which can be accessed at our website, <http://www.nts.gov>, under report number NTSB/AAR-15/02.

As a result of this investigation, we issued 10 new recommendations, including 2 to the Commercial Spaceflight Federation and the following 8 recommendations to the Federal Aviation Administration:

### A-15-19

In collaboration with the Commercial Spaceflight Federation, develop and issue human factors guidance for operators to use throughout the design and operation of a crewed vehicle. The guidance should address, but not be limited to, the human factors issues identified during the SpaceShipTwo accident investigation.

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<sup>1</sup> National Transportation Safety Board, *In-Flight Breakup During Test Flight, Scaled Composites SpaceShipTwo, N339SS, Near Koehn Dry Lake, California, October 31, 2014*, NTSB/AAR-15/02 (Washington, DC: National Transportation Safety Board, 2015).



A-15-20

Implement steps in your evaluation of experimental permit applications to ensure that applicants have (1) identified single flight crew tasks that, if performed incorrectly or at the wrong time, could result in a catastrophic hazard, (2) assessed the reasonableness, including human factor considerations, of the proposed mitigations to prevent errors that could result from performing those tasks, and (3) fully documented the rationale used to justify related assumptions in the hazard analysis required by 14 *Code of Federal Regulations* 437.55.

A-15-21

Develop a process to determine whether an experimental permit applicant has demonstrated the adequacy of existing mitigations to ensure public health and safety as well as safety of property before granting a waiver from the human error hazard analysis requirements of 14 *Code of Federal Regulations* 437.55.

A-15-22

Develop and implement procedures and guidance for confirming that commercial space operators are implementing the mitigations identified in a safety-related waiver of federal regulations and work with the operators to determine the effectiveness of those mitigations that correspond to hazards contributing to catastrophic outcomes.

A-15-23

Develop and issue guidance for experimental permit applicants that (1) includes the information in Advisory Circular 413-1, "License Application Procedures," and (2) encourages commercial space vehicle manufacturers to begin the consultation process with the Office of Commercial Space Transportation during a vehicle's design phase.

A-15-24

Develop and implement a program for Office of Commercial Space Transportation inspectors that aligns them with individual operators applying for an experimental permit or a launch license to ensure that the inspectors have adequate time to become familiar with the technical, operational, training, and management controls that they will inspect.

A-15-25

Direct Office of Commercial Space Transportation (AST) management to work with AST technical staff to (1) develop clearer policies, practices, and procedures that allow direct communications between staff and applicants, (2) provide clearer guidance on evaluating commercial space transportation permits, waivers, and licenses, and (3) better define the line between the information needed to ensure public safety and the information pertaining more broadly to ensuring mission success.

A-15-26

In collaboration with the commercial space flight industry, continue work to implement a database of lessons learned from commercial space mishap investigations and encourage commercial space industry members to voluntarily submit lessons learned.

Chairman HART, Vice Chairman DINH-ZARR, and Members SUMWALT and WEENER concurred in these recommendations.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate receiving a response from you within 90 days, as required by 49 *United States Code* section 1135, detailing the actions you have taken or intend to take to implement them. When replying, please refer to the safety recommendations by number and submit your response electronically to [correspondence@ntsb.gov](mailto:correspondence@ntsb.gov).

By:  **Christopher A. Hart**  
**Chairman**  
*Approved for Electronic Transmittal*  
*No Hard Copy Will Follow*



# National Transportation Safety Board

Washington, DC 20594

## Safety Recommendation

---

**Date:** August 4, 2015

**In reply refer to:** A-15-27 and -28

Mr. Eric Stallmer  
President  
Commercial Spaceflight Federation  
500 New Jersey Ave. NW, Suite 400  
Washington, DC 20001

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The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant accidents in other modes of transportation—railroad, highway, marine, and pipeline. We determine the probable cause of the accidents and issue safety recommendations aimed at preventing future accidents. In addition, we carry out special studies concerning transportation safety and coordinate the resources of the federal government and other organizations to provide assistance to victims and their family members affected by major transportation disasters. We are providing the following information to urge the Commercial Spaceflight Federation to take action on the safety recommendations being issued in this letter.

On July 28, 2015, we adopted our report concerning the October 31, 2014, accident in which the SpaceShipTwo reusable suborbital rocket, N339SS, operated by Scaled Composites LLC, broke up into multiple pieces during a rocket-powered test flight and impacted terrain over a 5-mile area near Koehn Dry Lake, California.<sup>1</sup> Additional information about this accident and the resulting recommendations may be found in the report of the investigation, which can be accessed at our website, <http://www.nts.gov>, under report number NTSB/AAR-15/02.

As a result of this investigation, we issued 10 new recommendations, including 8 to the Federal Aviation Administration and the following 2 recommendations to the Commercial Spaceflight Federation:

---

<sup>1</sup> National Transportation Safety Board, *In-Flight Breakup During Test Flight, Scaled Composites SpaceShipTwo, N339SS, Near Koehn Dry Lake, California, October 31, 2014*, NTSB/AAR-15/02 (Washington, DC: National Transportation Safety Board, 2015).



A-15-27

Advise commercial space operators to work with local emergency response partners to revise emergency response procedures and planning to ensure that helicopter and other resources are appropriately deployed during flights.

A-15-28

Work with the Federal Aviation Administration to develop and issue human factors guidance for operators to use throughout the design and operation of a crewed vehicle. The guidance should address, but not be limited to, the human factors issues identified during the SpaceShipTwo accident investigation.

Chairman HART, Vice Chairman DINH-ZARR, and Members SUMWALT and WEENER concurred in these recommendations.

The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives. We would appreciate receiving a response from you within 90 days detailing the actions you have taken or intend to take to implement them. When replying, please refer to the safety recommendations by number. We encourage you to submit your response electronically to [correspondence@ntsb.gov](mailto:correspondence@ntsb.gov). If it exceeds 10 megabytes, including attachments, please e-mail us at the same address for instructions. Please do not submit both an electronic copy and a hard copy of the same response.

By:  **Christopher A. Hart**  
Chairman  
*Approved for Electronic Transmittal*  
*No Hard Copy Will Follow*

**From:** Correspondence  
**Sent:** 11 Jan 2016 22:05:57 +0000  
**To:** Barbara.McCann;Deirdre Breithaupt;NTSB-Follow-On@faa.gov;Rita Maxwell  
**Subject:** NTSB Safety Recommendations A-15-19 thru -26(201501054)  
**Attachments:** 201501054\_Out.pdf

Please find the attached correspondence from the National Transportation Safety Board regarding Safety Recommendations A-15-19 thru -26.



Correspondence - lrm  
National Transportation Safety  
Board  
490 L'Enfant Plaza East, SW  
Washington, DC 20594  
If needed, please reply to us at  
[correspondence@ntsb.gov](mailto:correspondence@ntsb.gov)

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# National Transportation Safety Board

Washington, DC 20594

Office of the Chairman

January 11, 2016

The Honorable Michael P. Huerta  
Administrator  
Federal Aviation Administration  
Washington, DC 20591

Dear Administrator Huerta:

Thank you for your October 30, 2015, letter to the National Transportation Safety Board regarding Safety Recommendations A-15-19 through -26. We issued these recommendations to the Federal Aviation Administration (FAA) on August 4, 2015, as a result of our investigation of the October 31, 2014, in-flight break-up during a test flight of a SpaceShipTwo reusable suborbital rocket operated by Scaled Composites LLC, near Koehn Dry Lake, California.

## A-15-19

In collaboration with the Commercial Spaceflight Federation [CSF], develop and issue human factors guidance for operators to use throughout the design and operation of a crewed vehicle. The guidance should address, but not be limited to, the human factors issues identified during the SpaceShipTwo accident investigation.

We note that you believe your August 2014 report, titled "Recommended Practices for Human Space Flight Occupant Safety," which we reviewed as part of our investigation of the SpaceShipTwo accident, provides recommended practices. You believe this guidance is general in nature and that it forms a starting point for the development of consensus industry standards. We further note that, in collaboration with the CSF, you are developing a plan to satisfy this recommendation. Pending completion of the recommended guidance, Safety Recommendation A-15-19 is classified "Open—Acceptable Response."

## A-15-20

Implement steps in your evaluation of experimental permit applications to ensure that applicants have (1) identified single flight crew tasks that, if performed incorrectly or at the wrong time, could result in a catastrophic hazard, (2) assessed the reasonableness, including human factor considerations, of the proposed mitigations to prevent errors that could result from performing those tasks, and

(3) fully documented the rationale used to justify related assumptions in the hazard analysis required by [Title] 14 *Code of Federal Regulations* 437.55.

We note that you have an active rulemaking project to rewrite the experimental permit regulations in Part 437 because of difficulties in applying the first generation rule, particularly in the hazard analysis requirements. We further note that you are initiating a review of the human factors regulations in Part 460. We support these actions to satisfy Safety Recommendation A-15-20. Pending their completion, the recommendation is classified “Open—Acceptable Response.”

#### A-15-21

Develop a process to determine whether an experimental permit applicant has demonstrated the adequacy of existing mitigations to ensure public health and safety as well as safety of property before granting a waiver from the human error hazard analysis requirements of [Title] 14 *Code of Federal Regulations* 437.55.

We acknowledge your point that the waiver issued to Scaled Composites in the SpaceShipTwo accident was a direct result of your inability to issue an equivalent level of safety finding under the provisions of Part 437. Unlike Parts 415 and 417 for launch licensing, Part 437 does not include the ability to incorporate an equivalent level of safety finding, necessitating a waiver. We note that you are engaged in rulemaking that will extend your ability to make equivalent level of safety findings in the commercial space flight industry. Pending completion of that rulemaking, Safety Recommendation A-15-21 is classified “Open—Acceptable Response.”

#### A-15-22

Develop and implement procedures and guidance for confirming that commercial space operators are implementing the mitigations identified in a safety-related waiver of federal regulations and work with the operators to determine the effectiveness of those mitigations that correspond to hazards contributing to catastrophic outcomes.

We note that, within your Office of Commercial Space Transportation (AST), the Licensing and Evaluation Division and the Safety Inspection Division (SID) have defined new working arrangements to ensure that the provisions or mitigations contained in waivers are identified and included into the appropriate safety inspection plans (SIP). In addition, the SID will query all other AST divisions for any outstanding or specific items that may require monitoring or verification during safety inspections. We further note that the SID has added a step to review and record such topics into the pre-existing pre-inspection checklist allowing safety inspectors (SIs) to include applicable verifications into the SIP. You plan to add these revised working arrangements to your Safety Inspection Processes and Procedures document (P-008), and to incorporate the revised working arrangements into your P-008 training course. Pending completion of the revisions to the P-008 document, and the P-008 training course, Safety Recommendation A-15-22 is classified “Open—Acceptable Response.”



A-15-23

Develop and issue guidance for experimental permit applicants that (1) includes the information in Advisory Circular [AC] 413-1, "License Application Procedures," and (2) encourages commercial space vehicle manufacturers to begin the consultation process with the Office of Commercial Space Transportation during a vehicle's design phase.

We note that you issued Procedure P-011, "Pre-application Consultation Process," an internal procedure to guide AST staff in the conduct of pre-application consultation with applicants for licenses, safety approvals, and experimental permits issued by AST. We further note that, as part of a review that you conducted of all of your commercial spaceflight regulatory guidance, including AC 413-1, you developed a plan for revising these documents, and that you plan to use the pre-application consultation procedure, with references to the checklists and other guidance, as the basis for issuing a new AC that will replace AC 413-1. This new AC will outline a means of compliance with Part 413.5, "Pre-application Consultation." Pending issuance of the new AC, Safety Recommendation A-15-23 is classified "Open—Acceptable Response."

A-15-24

Develop and implement a program for Office of Commercial Space Transportation inspectors that align them with individual operators applying for an experimental permit or a launch license to ensure that the inspectors have adequate time to become familiar with the technical, operational, training, and management controls that they will inspect.

We issued this recommendation because we found in the SpaceShipTwo accident investigation that AST inspectors had limited time (even with a pre-inspection meeting to prepare for a launch inspection) to understand a permittee's or licensee's training, procedures, and operations before conducting the inspections specified in the SIP. Because the AST inspectors for the accident flight did not have any significant experience with Scaled, they lacked ongoing knowledge of Scaled's operations and procedures and missed the change to the simulator software and the inconsistencies between the flight test data card and the SpaceShipTwo's pilot operating handbook. In addition, even though the SIPs were designed to ensure compliance with federal regulations and the representations made in the experimental permit application, none of the AST inspectors for the accident flight, or for the two preceding test flights, verified whether Scaled was performing the mitigations involving the simulator and chase planes that were identified in the waiver that was issued by AST of two federal regulations.

Your letter described that, in 2012 (long before the SpaceShipTwo accident), you had initiated an approach that assigns a dedicated safety inspector (SI) to support each individual program at the inception of each license and permit application, beginning in the pre-application process phase. That same SI continues through the completion of the application evaluation in order to provide appropriate input and feedback to both the operator and the FAA evaluation team, while the SI is also learning all pertinent inspectable operational items, mitigations, and special terms and conditions associated with a specific operator's planned activities and



processes. The SI assigned to each evaluation program incorporates all applicable inspectable items into a comprehensive SIP, which SIs other than the one assigned to the operator use to verify compliance once inspections begin for that operator. In this approach, any SI may monitor any licensed or permitted operation to verify operator compliance and ensure public safety. Thus, the SI may not be the one who is most familiar with the operation.

In your letter, you indicated that, although assigning specific SIs to each operator's program works over the course of an extensive pre-application coordination and evaluation review, you do not believe it is either feasible or desirable in an operational environment. You described three specific concerns: (1) the size of the credentialed AST SI workforce, (2) the dynamic nature of launch operations scheduling, and (3) the central role of launch sites in the public safety aspects of commercial space flight operations. You believe that you have effectively addressed this recommendation and consider your actions complete.

You believe that you have effectively addressed this recommendation, but you described a system similar to the one that did not prevent the SpaceShipTwo accident. We therefore conclude that you have not addressed the recommendation. Before we close it, however, we ask that you describe what actions you have taken that address the problems that we found in our investigation. Pending an acceptable answer to that question, Safety Recommendation A-15-24 is classified "Open—Unacceptable Response."

#### A-15-25

Direct Office of Commercial Space Transportation (AST) management to work with AST technical staff to (1) develop clearer policies, practices, and procedures that allow direct communications between staff and applicants, (2) provide clearer guidance on evaluating commercial space transportation permits, waivers, and licenses, and (3) better define the line between the information needed to ensure public safety and the information pertaining more broadly to ensuring mission success.

We are concerned by your statement that AST technical staff members have always been engaged in direct communications with applicants on technical matters. We found the opposite in our investigation of the SpaceShipTwo accident. We issued this recommendation because we found that, at the time of the evaluation of Scaled's experimental permit applications, AST management underutilized AST evaluators' expertise, even though the AST staff understood the risks associated with commercial space flight. AST management appeared to be more concerned with ensuring that the FAA's authority was not being exceeded beyond defined limits and maintaining the timeframe in which to approve experimental permit applications. Further, we found that the filtering of questions and the lack of direct communication between AST technical staff and Scaled technical staff impeded Scaled's ability to take advantage of AST's safety expertise. We note that you recently developed and issued new internal operating procedures P-011 covering pre-application coordination with prospective applicants, and that you revised P-002 for conducting reviews and issuing licenses and experimental permits. You indicated that each of these procedures provides comprehensive guidance for the composition, management, and responsibilities of AST teams working in these areas, including such areas as coordination



and communications within the team and with an applicant. The procedures also define the statutory basis and procedures used for conducting licensing and permit evaluations. The procedures also discuss the resolution of technical issues within the team, and the elevation of these issues to AST management if they cannot be resolved at the team level.

Although these procedures address issues in this recommendation, we are concerned that the procedures may institutionalize the procedures and practices that we found in the SpaceShipTwo investigation. We ask that you describe how P-011 and P-002 address the “filtering” and “scrubbing” of questions and the lack of direct communication between AST technical staff and the applicant’s technical staff, as well as the pressure on AST technical staff to complete their evaluation within 120 days even when there are unanswered technical questions that need to be answered before an appropriate evaluation can be completed.

In your letter, you indicated that AST is conducting a comprehensive upgrade of its safety management system (SMS). In our report about the SpaceShipTwo accident, we said that we were encouraged by AST’s progress in implementing SMS and we believed that, if SMS principles were followed, they would constitute an effective means for enhancing the regulatory oversight of the commercial space industry and would satisfy this recommendation. However, we are concerned by your statement that you are developing your SMS for AST because “it is critical that all AST staff members understand the FAA’s statutory authority is limited to the protection of public safety and property, national security and foreign policy interests of the United States.” In our report, we discussed that the dividing line between the questions that need to be asked to determine the risk to the public and those to assess mission objectives is not always apparent because certain aspects of a vehicle’s design and operation could impact *both* public safety *and* mission safety assurance. Therefore, AST technical staff needs to fully understand the factors that might be critical to public safety, such as system failure modes and their effects, the potential for human errors that could contribute to a divergence from operating area containment boundaries, and hazard causes and controls. We are concerned that the purpose of AST’s SMS will be to limit AST’s review to a narrowly defined interpretation of your statutory authority, and that such a narrow interpretation will not be consistent with our recommendation to better define the line between the information needed to ensure public safety and the information pertaining more broadly to ensuring mission success.

As we discussed in our report, the development and use of an effective SMS will satisfy this recommendation. We ask that you respond to our concerns regarding P-011 and P-002, and the new SMS. Pending your responses to those concerns, and completion of the SMS for AST, Safety Recommendation A-15-25 is classified “Open—Acceptable Response.”

#### A-15-26

In collaboration with the commercial space flight industry, continue work to implement a database of lessons learned from commercial space mishap investigations and encourage commercial space industry members to voluntarily submit lessons learned.



We note that you performed an internal feasibility study for voluntary safety data sharing between industry and the FAA that examined data sharing in the commercial aviation industry, and that the results of your study highlighted several challenges that need to be addressed. Among these challenges is the de-identification and protection of proprietary data, creating a non-punitive reporting environment, and the availability of needed data mining and analysis tools to identify safety issues and lessons learned. With the completion of your study you have initiated the following activities:

1. You have requested a research budget line item in your fiscal year 2016 budget for research to examine extending to commercial space flight operations the tools developed in the commercial aviation industry for voluntarily sharing, and the mining of, safety data.
2. You plan to encourage the development and use of SMS by commercial spaceflight manufacturers and operators. This encouragement will include the development and use of programs similar to Flight Operations Quality Assurance and Aviation Safety Action Programs currently used successfully in the commercial aviation industry.
3. You intend to work with Congress to identify any needed legislative reforms necessary to implement the non-punitive reporting and data sharing necessary for the programs identified above.
4. You plan to work with the commercial spaceflight industry on these issues and to discuss these activities and developments at your regular meetings with the industry.

Pending completion of these actions, Safety Recommendation A-15-26 is classified "Open—Acceptable Response."

Please submit additional updates at [correspondence@ntsb.gov](mailto:correspondence@ntsb.gov) regarding these recommendations, and do not submit both an electronic and a hard copy of the same response.

Sincerely,



**Christopher A. Hart**  
Chairman

*Approved for Electronic Transmittal  
No Hard Copy Will Follow*

cc: Ms. Barbara McCann, Director  
Office of Safety, Energy, and  
Environment  
Office of the Under Secretary for Policy

**From:** Correspondence  
**Sent:** 10 Feb 2017 16:54:27 +0000  
**To:** Barbara.McCann;Deirdre Breithaupt;Forest Rawls;NTSB-Follow-On@faa.gov  
**Subject:** NTSB SAFETY RECOMMENDATIONS A-15-022, -024, -025, A-15-019, -020, -021, -023 and -026 (201600906/56214)  
**Attachments:** 56214 201600906\_Out.pdf

Please find the attached correspondence from the National Transportation Safety Board regarding Safety Recommendations A-15-022, -024, -025, A-15-019, -020, -021, -023 and -026.



Correspondence - LRM  
National Transportation Safety  
Board  
490 L'Enfant Plaza East, SW  
Washington, DC 20594  
If needed, please reply to us  
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[correspondence@ntsb.gov](mailto:correspondence@ntsb.gov)

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# National Transportation Safety Board

Washington, DC 20594

Office of the Chairman

February 10, 2017

The Honorable Michael P. Huerta  
Administrator  
Federal Aviation Administration  
Washington, DC 20591

Dear Administrator Huerta:

Thank you for your December 6, 2016, letter to the National Transportation Safety Board regarding Safety Recommendations A-15-19 through -26. We issued these recommendations to the Federal Aviation Administration (FAA) on August 4, 2015, as a result of our investigation of the October 31, 2014, in-flight break up during a test flight of a SpaceShipTwo reusable suborbital rocket operated by Scaled Composites LLC, near Koehn Dry Lake, California.

## A-15-19

In collaboration with the Commercial Spaceflight Federation [CSF], develop and issue human factors guidance for operators to use throughout the design and operation of a crewed vehicle. The guidance should address, but not be limited to, the human factors issues identified during the SpaceShipTwo accident investigation.

## A-15-20

Implement steps in your evaluation of experimental permit applications to ensure that applicants have (1) identified single flight crew tasks that, if performed incorrectly or at the wrong time, could result in a catastrophic hazard, (2) assessed the reasonableness, including human factor considerations, of the proposed mitigations to prevent errors that could result from performing those tasks, and (3) fully documented the rationale used to justify related assumptions in the hazard analysis required by [Title] 14 *Code of Federal Regulations* [CFR] 437.55.

We note that you are collaborating with CSF and the Commercial Space Transportation Advisory Committee (COMSTAC) Standards Working Group to develop consensus standards, and that, as part of this work, CSF issued a contract to ASTM International. We further note that you continue to work on your rulemaking project to revise Title 14 CFR Part 437, "Experimental Permits," particularly focusing on the hazard analysis requirements in section 437.55. In addition, you are currently evaluating the need to revise the regulations addressing human factors contained in Title 14 CFR Part 460. We were pleased to note that Congress appropriated funds in your fiscal year 2016



budget to develop and implement a research and development program for commercial space transportation, and that the new program will include a project for developing human factors best practices.

Pending completion of the human factors guidance for operators, Safety Recommendation A-15-19 remains classified “Open—Acceptable Response.” Pending revisions to Part 437 that address the hazard analysis requirements in section 437.55, and revisions to Part 460 addressing human factors, Safety Recommendation A-15-20 remains classified “Open—Acceptable Response.”

#### A-15-21

Develop a process to determine whether an experimental permit applicant has demonstrated the adequacy of existing mitigations to ensure public health and safety as well as safety of property before granting a waiver from the human error hazard analysis requirements of [Title] 14 *Code of Federal Regulations* 437.55.

We note that on June 1, 2016, you published a notice of proposed rulemaking (NPRM) titled, “Updates to Rulemaking and Waiver Procedures and Expansion of the Equivalent Level of Safety Option.” This NPRM addresses several issues, including findings of equivalent levels of safety. Pending issuance of a final rule based on this NPRM that addresses Safety Recommendation A-15-21, it remains classified “Open—Acceptable Response.”

#### A-15-22

Develop and implement procedures and guidance for confirming that commercial space operators are implementing the mitigations identified in a safety-related waiver of federal regulations and work with the operators to determine the effectiveness of those mitigations that correspond to hazards contributing to catastrophic outcomes.

We note that on September 28, 2015, you revised your internal procedure P-008, “Safety Inspection Processes and Procedures,” to address this recommendation, and that after this revision, you trained your staff on the updates. These actions satisfy Safety Recommendation A-15-22, which is classified “Closed—Acceptable Action.”

#### A-15-23

Develop and issue guidance for experimental permit applicants that (1) includes the information in Advisory Circular [AC] 413-1, “License Application Procedures,” and (2) encourages commercial space vehicle manufacturers to begin the consultation process with the Office of Commercial Space Transportation [AST] during a vehicle’s design phase.

We note that the COMSTAC’s Operations Working Group is currently reviewing your AC 413-1 draft revisions. Pending issuance of AC 413-1 revisions that satisfy Safety Recommendation A-15-23, it remains classified “Open—Acceptable Response.”

A-15-24

Develop and implement a program for Office of Commercial Space Transportation inspectors that align them with individual operators applying for an experimental permit or a launch license to ensure that the inspectors have adequate time to become familiar with the technical, operational, training, and management controls that they will inspect.

Our previous letter restated our findings from the SpaceShipTwo accident investigation that were the basis for this recommendation. In our investigation, we found that AST inspectors had limited time in which to understand a permittee's or licensee's training, procedures, and operations before conducting the inspections specified in the safety inspection plan (SIP). Because the AST inspectors for the accident flight did not have any significant experience with Scaled, they lacked ongoing knowledge of Scaled's operations and procedures. Consequently, they overlooked the simulator software change and the inconsistencies between the flight test data card and SpaceShipTwo's pilot operating handbook. In addition, although the SIPs were designed to ensure compliance with federal regulations and the representations made in the experimental permit application, none of the AST inspectors for the accident flight, or for the two preceding test flights, verified whether Scaled was performing the mitigations involving the simulator and chase planes that were identified in the waiver of two federal regulations issued by AST. On January 11, 2016, we replied that, although you believed that you had effectively addressed this recommendation, the system that you described in your October 30, 2015, letter was similar to the one that did not prevent the SpaceShipTwo accident. We therefore concluded that you had not addressed the recommendation. Before we closed Safety Recommendation A-15-24, we asked what actions you had taken to address the problems that we found in our investigation.

In your most recent letter, you described the actions completed in response to Safety Recommendation A-15-22 that improved the linkage between your license and permit evaluation outcomes and the safety inspection procedures in P-008. You believe that the procedures used with the revised P-008 ensure that information related to waivers and processes is incorporated into SIPs. In addition to the procedural steps described in P-008 and in your previous letter, you continue to strengthen your inspector workforce and align it with the areas of highest activity. You have taken these steps as AST's workload continues to significantly increase. You indicated that during the past year, the number of unique applicants seeking FAA authorization has grown by roughly one-third, and you are working projects with approximately 45–50 unique companies at any given time. In 2016, you added four additional safety inspectors to the previous staff of 14 credentialed inspectors.

The improvements that you have made to P-008 address Safety Recommendation A-15-22, but do not address Safety Recommendation A-15-24. Increasing the number of inspectors was needed, particularly considering the inspectors' workload and the rate at which it is increasing. However, Safety Recommendation A-15-24 asks that there be a single inspector throughout the life of an experimental permit or launch application, and the actions you have taken are not an acceptable alternative. Because you consider your actions complete and do not plan to take any further action, Safety Recommendation A-15-24 is classified "Closed—Unacceptable Action."



A-15-25

Direct Office of Commercial Space Transportation (AST) management to work with AST technical staff to (1) develop clearer policies, practices, and procedures that allow direct communications between staff and applicants, (2) provide clearer guidance on evaluating commercial space transportation permits, waivers, and licenses, and (3) better define the line between the information needed to ensure public safety and the information pertaining more broadly to ensuring mission success.

In your previous letter, you indicated that to address this recommendation, you had developed two policy documents, P-002, “License and Permit Application Reviews and Issuance Procedures,” and P-011, “Pre-Application Consultation Process.” Although these procedures addressed the issues in this recommendation, we were concerned that they may institutionalize the procedures and practices that we found in our investigation of the SpaceShipTwo accident, and we asked that you describe how P-002 and P-011 address those issues, including the “filtering” and “scrubbing” of questions, the lack of direct communication between AST technical staff and the applicant’s technical staff, and the pressure on AST technical staff to complete their evaluation within 120 days, even when technical questions remained unanswered despite being needed to complete an appropriate evaluation. In your current letter, you describe the meetings and procedures, as well as the composition of the various teams involved in pre-application coordination and license or permit evaluations. These procedures include discussing issues such as question filtering and scrubbing and communication between AST technical staff and the applicant’s technical staff, as well as safeguards to prevent pressure from management to complete an evaluation within 120 days, even when technical questions remain unanswered.

In your previous letter, you also indicated that AST was comprehensively upgrading its safety management system (SMS). In our report about the SpaceShipTwo accident, we said that we were encouraged by AST’s progress in implementing SMS and we believed that this recommendation would be satisfied if SMS principles were followed. However, in our January 11, 2016, letter, we said that we were concerned by the statement in your October 30, 2015, letter that you were developing your SMS for AST because “it is critical that all AST staff members understand the FAA’s statutory authority is limited to the protection of public safety and property, national security and foreign policy interests of the United States.” In our report about the SpaceShipTwo accident, we discussed that the dividing line between the questions that need to be asked to determine public risk and those to assess mission objectives was not always apparent; certain aspects of a vehicle’s design and operation could impact *both* public safety *and* mission safety assurance. We were concerned that the purpose of AST’s SMS would be to limit its review to a narrowly defined interpretation of your statutory authority, and that such a narrow interpretation would not be consistent with our recommendation. Your current letter included a copy of the December 2015 version of the AST’s SMS manual. We reviewed Appendix A, “Public Safety During Commercial Space Operations,” of this manual, and it addresses our concerns; therefore, Safety Recommendation A-15-25 is classified “Closed—Acceptable Action.”

A-15-26

In collaboration with the commercial space flight industry, continue work to implement a database of lessons learned from commercial space mishap investigations and encourage commercial space industry members to voluntarily submit lessons learned.

We note that you are pursuing several activities to satisfy this recommendation, including having discussions with commercial spaceflight operators who are interested in extending tools developed to improve safety in commercial aviation to commercial space applications. In addition, you briefed the COMSTAC of your goals and plans in this area, and are working with it to implement the recommended program. We further note that you will study the benefits of extending the tools developed for your Aviation Safety Action Program, which is used in commercial aviation, to commercial space applications. Pending completion of the activities that satisfy Safety Recommendation A-15-26, it remains classified "Open—Acceptable Response."

Please submit additional updates at [correspondence@ntsb.gov](mailto:correspondence@ntsb.gov) regarding Safety Recommendations A-15-19 through -21, -23, and -26, and do not submit both an electronic and a hard copy of the same response.

Sincerely,



**Christopher A. Hart**  
**Chairman**

*Approved for Electronic Transmittal  
No Hard Copy Will Follow*

cc: Ms. Deirdre Breithaupt  
OST NTSB Liaison  
Office of the Undersecretary for  
Transportation Policy

**From:** Correspondence  
**Sent:** 16 Feb 2017 15:19:32 +0000  
**To:** eric.stallmer((b)(6))  
**Subject:** NTSB SAFETY RECOMMENDATIONS A-15-027 and -028(201600797/37912)  
**Attachments:** 201600797\_Out.pdf

Please find the attached correspondence from the National Transportation Safety Board regarding Safety Recommendations A-15-027 and -028.



Correspondence - LRM  
National Transportation Safety  
Board  
490 L'Enfant Plaza East, SW  
Washington, DC 20594  
If needed, please reply to us  
at  
[correspondence@ntsb.gov](mailto:correspondence@ntsb.gov)

Our network limits attachments to 10MB total. Please email us at [correspondence@ntsb.gov](mailto:correspondence@ntsb.gov) for instructions on how to submit larger documents.





# National Transportation Safety Board

Washington, DC 20594

Office of the Chairman

February 16, 2017

Mr. Eric Stallmer  
President  
Commercial Spaceflight Federation  
500 New Jersey Ave. NW, Ste. 400  
Washington, DC 20001

(b)(6)

Dear Mr. Stallmer:

Thank you for your October 20, 2016, letter to the National Transportation Safety Board regarding Safety Recommendations A-15-27 and -28. We issued these recommendations to the Commercial Spaceflight Federation on August 4, 2015, as a result of our investigation of the October 31, 2014, accident in which the SpaceShipTwo reusable suborbital rocket, operated by Scaled Composites LLC, broke up during a rocket-powered test flight and impacted terrain over a 5-mile area near Koehn Dry Lake, California.

## A-15-27

Advise commercial space operators to work with local emergency response partners to revise emergency response procedures and planning to ensure that helicopter and other resources are appropriately deployed during flights.

We note that you have advised your member companies to work with local emergency response partners to review their emergency response procedures, planning, training, and readiness tests to ensure that helicopter and other resources are appropriately deployed during flights. Accordingly, Safety Recommendation A-15-27 is classified "Closed—Acceptable Action."

## A-15-28

Work with the Federal Aviation Administration [FAA] to develop and issue human factors guidance for operators to use throughout the design and operation of a crewed vehicle. The guidance should address, but not be limited to, the human factors issues identified during the SpaceShipTwo accident investigation.

We note that you intend to work with the FAA to develop and issue supplemental human factors guidance for operators to use throughout the design and operation of a crewed vehicle. We point out, however, that existing human factors guidance for new systems was developed for civilian and military aviation and for government aerospace industries, not for the commercial

space flight industry, and because the commercial space flight industry is relatively new, no such guidance exists that is specific to it. We believe that such guidance could help ensure that human factors issues are fully addressed during a commercial space vehicle's design, and also during its operation, by acknowledging human factors limitations in written guidance and simulator training. Pending the development of human factors guidance that addresses the concerns discussed above, Safety Recommendation A-15-28 is classified "Open—Acceptable Response."

Please submit updates electronically at [correspondence@ntsb.gov](mailto:correspondence@ntsb.gov) regarding your actions to address Safety Recommendation A-15-28, and do not submit both an electronic and a hard copy of the same response.

Sincerely,



**Christopher A. Hart**  
**Chairman**

*Approved for Electronic Transmittal  
No Hard Copy Will Follow*