U S Department of Transportation
Federal Aviation Administration

RESPONSE TO OFFICIAL REPORT OF THE SPECIAL COMMITTEE ON THE FEDERAL AVIATION ADMINISTRATION'S AIRCRAFT CERTIFICATION PROCESS

AVIATION SAFETY APRIL 2020 FINAL REPORT

TABLE OF CONTENTS

EXECUTIVE SUMMARY

This report discusses the Federal Aviation Administration's (FAA) actions, both planned and underway, to address the recommendations in the Official Report of the Special Committee to review the FAA's Aircraft Certification Process (the Committee), delivered to the Secretary of the Department of Transportation on January 16, 2020.

The FAA developed this plan in the context of other recommendations coming from a variety of sources (see Appendix B – Cross-Reference Table of Current Recommendations). The actions described in this report are responsive to all recommendations received and apply to the entirety of the FAA's approach to aircraft certification. The FAA welcomes these recommendations in the spirit of continuous improvement.

Several common themes emerged from the Committee's report, as well as the other reviews of the agency's certification process. Combined, these reviews recommended that the FAA:

1. Approach certification holistically by treating the aircraft as complex systems, with full consideration of how all the elements in the operating system interact.
2. Integrate human factors considerations more effectively throughout all aspects of the design process.
3. Improve the agency's oversight process by ensuring a coordinated and flexible flow of data and information.
4. Focus on the workforce of the future, developing expertise to evaluate technological advances.
5. Continue to improve and refine our certification process.

The FAA recognizes the comprehensive and interdependent nature of the recommendations. International engagement and collaboration are integral to these themes and recommendations, given the global nature of industry and aviation safety. Many of these actions will require coordination with our international partners to maintain harmonization of design and operational standards. We must improve the sharing of knowledge and information to advance global aviation safety. In addition to regular dialogue, we will work with international partners to better understand human factors from a global framework and develop comprehensive standards and means of compliance.

While the Committee's recommendations underscore that our existing strategic safety initiatives are sound, they also provide insight into areas where we have opportunities to improve. This response highlights current and new initiatives, in addition to collaborative efforts needed to complement FAA activities. To this end, we will work with a variety of partners (e.g., industry, international, technical experts, labor) to ensure inclusiveness and transparency in the planning of these companion efforts. Our planned actions, when combined, thoroughly address the Committee's findings and recommendations.

The FAA will assign a senior manager to act as the accountable program manager (PM) to oversee the implementation of all activities. The PM will develop a detailed, integrated program plan to implement all of these changes. Functionally, the PM will report to the Associate Administrator for Aviation Safety, with support from a team of subject matter experts within the aviation safety organization and other FAA offices. The FAA Administrator and the Deputy Administrator will review progress quarterly and will provide direction and guidance as appropriate. The FAA reserves the right to pursue alternatives if we find them reasonable or of increased benefit to safety.

A summary of the Committee's findings and recommendations and a synopsis of the FAA's response to each item appear below. Appendix A contains the detailed Committee findings and the associated recommendations. The Appendix also contains the FAA's comprehensive actions. To ensure our actions are consistent with the common themes mentioned above, we have combined certain recommendations to facilitate execution and alignment of our planned actions.

1. Safety Management Systems

Summary of Findings & Recommendations:
The Committee found that the FAA does not require Safety Management Systems (SMS) for design and manufacturing organizations. The Committee recommended the FAA mandate SMS for those organizations, ensuring a systems approach to safety by linking certification and operations[1]. The Committee also encouraged the integration of Partnership for Safety Plans (PSP), SMS and Organization Designation Authorization (ODA) activities for more effective oversight.

FAA Response:
The FAA is initiating rulemaking to mandate SMS for key aviation sectors, including design and manufacturing organizations. We will seek broad input from industry stakeholders and our international regulatory partners to build better connections and interrelationships with the existing mandatory SMSs of airlines and voluntary SMSs of other carriers, airports, manufacturers, and service providers.

Until we complete the rulemaking, we will continue to foster and expand voluntary adoption of SMS in design and manufacturing, and operations.

The FAA concurs with the integration of PSP, SMS, and ODA activities. The Aircraft Certification Service (AIR) Certification Process Guide (CPG)*, an FAA and industry guide to product certification, promotes a systems approach, encompassing PSP, SMS, and ODA concepts. The FAA and industry recently established a plan to continuously improve and institutionalize the use of the CPG.

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[1] To better align our planned actions, we will address the recommendation to take a systems approach to safety by linking certification and operations per our response to #5, Coordination of the FAA's Aircraft Certification Service and Flight Standards

2. System Safety

Summary of Findings & Recommendations:

The Committee found that System Safety Assessments (SSA) are an essential component of safety risk management that can be expanded to better consider human–machine interaction to provide additional safety value to the FAA's certification process. The Committee recommended the FAA, together with industry:

- Review the precepts pertaining to Human Performance and Error Assessments.
- Consider including skill-related errors associated with manual control of the airplane.
- Ensure systematic human factors analyses are conducted for all safety-critical functions and failure modes associated with a change under the changed product rule.[2]
- Use multiple failure modes and expected crew skills, feeding the result into the safety analysis for the system.
- Provide SSA assumptions and conclusions to operators to inform their SMS programs, and use feedback from operators to validate the SSA.

FAA Response:

The FAA will evaluate existing human-machine interface regulation, policy, and industry standards in cooperation with international partners (including the International Civil Aviation Organization (ICAO), civil aviation authorities (CAA), and domestic/international operators). In coordination with international authorities, we will engage the relevant standards committees to explore ways to improve safety assessments and assessments of human-machine interaction.

The FAA will also enhance our certification and operational policy and guidance to ensure System Safety data is better utilized throughout the certification process to enhance safety. This includes validating assumptions made in the system safety assessments and review of flight crew recognition in single and multiple failure scenarios. The focus and overarching goals will ensure the FAA more effectively communicates SSA data to operational personnel to reduce risk through training and procedures mitigations.

Requiring inclusion of skill-related errors associated with manual control of the airplane might be perceived as driving manufacturers toward a single solution – a fully autonomous aircraft. The FAA seeks to avoid unnecessarily limiting the range of potential solutions. We plan to address this aspect of the recommendations through a comprehensive assessment of operational and design requirements.

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[2] To better align our planned actions, we will address the recommendation to ensure systematic human factor analyses are conducted for all safety-critical functions and failure modes associated with a change under the changed product rule per our response to #8, Amended Type Certificates.

3.Consideration of Operational Environment during Type Certification (Globalization)

Summary of Findings & Recommendations:

The Committee recognized the FAA as a world leader in aviation safety. However, the Committee found that industry growth and globalization are presenting challenges and that the FAA has no mechanism in place to ensure the effectiveness of maintenance and pilot training requirements for U.S. products operating under other CAAs. The Committee recommends the FAA:

- Change its aircraft certification system to consider differences in operations, training, and oversight between U.S. State of Design (SoD) and foreign State of Registry (SoR).
- Include operational requirements as part of the Type Certificate.
- Expand its global engagement to foster improvements in international safety standards and practices for certification, operations and maintenance.

FAA Response:

The current FAA system has successfully served domestic operators and resulted in the unprecedented safety record of the air transportation system in the United States. Any changes to our processes aimed at improving safety in other countries must be done in full consultation with U.S. operators and must not result in unintended consequences domestically or internationally. Therefore, we have tasked the Air Carrier Training Aviation Rulemaking Committee (ACT-ARC)* to examine how we can improve our processes to consider the total operational environment during the type certification process.

We continue to engage the international community through ICAO and other multi-national forums. Specifically, the FAA will actively participate on a new ICAO personnel training and licensing panel, when established, to improve global standards and guidance for pilot training. During the 40th ICAO Assembly in 2019, the United States proposed this new panel to examine pilot training systems for manual handling skills and commercial operational policies regarding automation*.

Lastly, we will develop an engagement plan to communicate proposed changes to the FAA's certification processes and international aircraft certification systems to all of our partners. The plan will address the need for the SoR to have the standards, tools, and training necessary to oversee the global fleet.

4. Data

Summary of Findings & Recommendations:

The Committee found that the FAA should improve its gathering, analysis, use, and accessibility of safety data, making use of machine learning and artificial intelligence (AI) to identify emerging safety issues where possible. The Committee highlighted proactive identification of issues and an agile process of mitigation as critical to avoiding future events. The committee recommended that the FAA:

- Gather data into a single repository [existing Aviation Safety Information Analysis and Sharing (ASIAS) system as an example].
- Propose international data sharing to ICAO.
- Integrate de-identified and confidential data across safety organizations.
- Continue working with NASA to develop an in-time aviation SMS.

FAA Response:

In the short term, the FAA will continue to use mature analytic tools such as the ASIAS System, a government-industry collaboration that facilitates the open exchange of safety data across the aviation community by providing access to it in a single repository. The system's governance models and de-identification protocols enable it to gather data representing 99 percent of operations in the National Aerospace System (NAS). Safety issues identified are shared across FAA and the aviation community.

Looking ahead, we are leveraging AI technologies to improve the ASIAS program. These technologies will allow ASIAS to move toward a more predictive capability. Additionally the FAA's Safety Data and Analysis Team (SDAT) is working with our Chief Data Office's (ADO) Enterprise Information Management (EIM) initiative, and Data Governance groups to develop a central repository with curated data to facilitate safety insights and advanced analytics.

We remain actively engaged in global data sharing and are involved in a number of efforts to advance international collaboration in this area. In addition to sharing safety information with international operators through ASIAS, we are supporting the work of CAAs and aviation organizations around the world to encourage the development of similar capabilities globally. Our focus is on harmonizing key safety metrics to allow the international community to collaborate more effectively on common safety issues, especially in regions where safety-enhancing activity will have the most benefit. We continue to promote global data sharing through international forums and presented papers on the issue at ICAO conferences in 2018 and 2019.

Finally, we are collaborating with NASA to support the development of proactive, in-time safety monitoring techniques to support the establishment of more effective SMS. Through the System-wide Safety (SWS) Research Transition Team (RTT)*, the FAA and NASA are collaborating to identify common critical safety assurance goals, coordinate research efforts, and facilitate transition of technologies, tools, and knowledge to the FAA. The NTSB is an observer on the RTT.

5. Coordination between the FAA's Aircraft Certification & Flight Standards Functions

Summary of Findings & Recommendations:

The Committee acknowledged the distinct roles that the Aircraft Certification Service (AIR, as the overall lead) and Flight Standards (AFX, as a critical contributor) organizations have in the product certification process; however, the Committee found that guidance to direct the interface between the two organizations is lacking. They recommended that the FAA review the working relationship between AIR and AFX to ensure early and sufficient engagement of the Aircraft Evaluation Group (AEG) in the certification process.

FAA Response:

In response to this recommendation, the FAA launched a joint AIR/AFX Integrated Program Management (IPM) project to improve the coordination for type certification and operational evaluation in design approvals and entry into service. The project team will review all AIR/AFX interfaces – or gaps in interfaces – and update related policy and guidance as needed, while also clarifying roles and responsibilities. The team will explore different methods to ensure a unified approach between AIR and AFX (and specifically AEG) from project intake to completion. Areas of team consideration will include expediting decisions at the agency level, facilitating innovation, and adding a consistent focus on training and operations throughout the project.

The recent AIR and AFX transformations to organize by regulatory and administrative functions supports the success of the IPM project by enabling streamlined integration, better collaboration and communication, and greater efficiency and standardization.

Other expected benefits from this project are the designation of single certification project managers for AIR and AFX, which will provide a seamless interface for stakeholders, integrated awareness of changes throughout a project, and optimization of completion of AFX and AIR activities in parallel.

6. Personnel

Summary of Findings & Recommendations:

The Committee found that the FAA cannot accommodate the growth and complexity in certification workload without effectively understanding and managing its personnel requirements and adapting the workforce to the changing nature of the work. Identifying and developing skills and attracting talent are among the priorities the Committee highlighted, although they recognized that current funding levels might be insufficient. The Committee recommended that the FAA:

- Launch a recruiting campaign, highlighting student hires and update desired skillsets to focus on systems thinking.
- Update and expand workforce development activities to keep pace with the global aviation industry.

FAA Response:

The FAA's goal is to recruit, hire, maintain, and retain a workforce with the technical expertise, capabilities, and adaptability needed to continue to meet the safety needs of a rapidly-evolving

aerospace system. To this end, the FAA is implementing several initiatives to better target personnel requirements, foster cultural change, and advance workforce development. Among these are a new program to hire and mentor college graduates and a partnership with academia and industry to enhance and deliver training for new and existing employees. We have also adapted our recruitment and hiring campaigns to attract Aviation Safety Inspectors who specialize in operations.

We will focus our personnel initiatives on approaching aircraft certification activities holistically. Our efforts will ensure that we are able to hire and retain the right people with the right skills and mindset, engaged at the right time, with systemic coordination between certification and operational suitability.

7. Delegation

Summary of Findings & Recommendations:

The Committee examined the full range of manufacturers under the FAA's risk-based delegation system and found that it is appropriate and effective for conducting aircraft certification. Delegation processes, including the Organization Designation Authorization (ODA), provide space for innovation and technical expertise while enabling the FAA to maintain its oversight processes and safety standards. The delegation system is effective when it stems from a solid regulatory and guidance framework, with appropriate controls to guard against undue pressure on the ODA unit from company business interests.

The Committee recommended that the aviation community recognize the value of and support the FAA's delegation system. The Committee advised that the FAA should work with industry to address concerns about the potential for undue pressure on the ODA unit and ensure personnel involved in oversight are trained in systems thinking.[3] The Committee further suggested that the FAA should provide clarification and guidance on communication between FAA technical specialists and ODA members.

FAA Response:

The FAA acknowledges the Committee's endorsement of delegation as an effective and efficient method to enhance safety. As directed by the FAA Reauthorization Act of 2018, the FAA has established the AVS ODA Office to help improve performance and consistency in the ODA program, including consistent delegation decisions. The FAA is in the process of permanently staffing the AVS ODA office and will use the office to:

- Promote actions that result in consistent delegation determinations based on standardized risk methodologies.
- Inform and oversee the implementation of a consistent FAA ODA program strategy.
- Promote ODA personnel understanding of undue pressure and actions to take if it occurs.
- Further clarify the communication expectations between FAA and ODA personnel.
- Systemically address any actual undue pressure on ODA personnel.

We have also established an expert panel, in accordance with Section 213 of the FAA Reauthorization Act of 2018, to survey existing ODAs and recommend ways to enhance the oversight processes and make the ODA program more effective.

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3 To better align our planned actions, we will address the recommendation to ensure personnel involved in oversight are trained in systems thinking per our response to #6, Personnel

8. Amended Type Certificates

Summary of Findings & Recommendations:

The Committee found the FAA's structured process for approving a changed design (i.e. Amended Type Certificate (ATC)) is the same as for a new Type Certificate (TC), although the applied airworthiness standards may be different. While both processes produce a safe product, the Committee expressed concern over whether the level of safety of the changed design, embodied in the version of the airworthiness standards it complies with, is as high as practicable. For ATC projects, the Committee recommended that the FAA:

- Ensure policy and guidance include an evaluation of cross-system change(s) (equipment, human, and environment).
- Update existing guidance to highlight potential vulnerabilities around multiple adaptations of existing systems to capture the unique challenges associated with system integration.
- Clarify roles and responsibilities of the applicant and the FAA in assessing the assumptions used to determine what constitutes a significant change, in particular, assessing cross-functional interface assumptions.

FAA Response:

The changed product rule (CPR) and guidance have evolved over the past two decades and have been harmonized with the guidance used by other CAAs. CPR balances economic impacts of new standards with the safety enhancements that come from the use of new standards. Application of new airworthiness standards, in some circumstances, can increase costs. Increased costs can decrease the economic incentive to bring safety enhancing equipment into the fleet. CPR balances these economic and safety outcomes. CPR requires the applicant to apply any new safety standard to the changed product when that product would be unsafe without that new standard, regardless of cost.

A team chartered by the Certification Management Team (CMT), composed of certification directors from the United States, Europe, Canada, and Brazil, was responsible for continuous improvement of the guidance and implementation of CPR. The FAA plans to re-charter the CMT CPR Continuous Improvement Team (CIT). In the nearly 20 years since the CPR was issued, this team has formed four times to collaborate and standardize the application of the CPR rule and associated guidance. International collaboration will ensure a consistent global approach to safety through similar evaluation and treatment of design changes. International consistency is needed since aerospace products are globally traded.

The objective of the team is to develop a consensus-based set of recommendations to address regulatory and/or policy gaps related to changed products. The recommendations will include proposed policy for assessing how design changes to one system may affect other unchanged systems.

9. Innovation

Summary of Findings & Recommendations:

The Committee found that AIR's Policy & Innovation Division should prioritize safety and certification process innovations. The Committee focused on the development of AIR's Center for Emerging Concepts and Innovation (the Center). They recommended that the FAA provide employees and industry with guidance on the Center's operation and ensure the Center includes review of innovative methods of compliance to previously certified systems. The Committee also recommended that FAA use the Center's Research and Development (R&D) portfolio to stay abreast of new concepts and technologies. Additionally, the Committee recommended that the FAA continue to use performance-based regulations for the adoption of new technologies.

FAA Response:

The FAA values innovation because it can improve safety, develop and deploy new technologies, or facilitate improvements in operational efficiency. To that end, the FAA is establishing the Office of Innovation to more effectively and efficiently address the surge of new users and technologies in aviation. For its part, AIR is standing up the Center, which will foster industry innovation and expedite coordinated FAA/industry compliance approaches with clear safety and compliance expectations for innovative technologies, modernized production methods, and unique development approaches. The Center will not only establish early engagement and provide a documented review process, but also will leverage consensus-based standards and performance-based regulations and identify R&D priorities to support emerging technologies. Early FAA involvement will allow for a more effective certification process of new technologies and aircraft in the future.

10. Existing Recommendations

Summary of Findings & Recommendations:

The Committee found that prior certification and delegation reports exist with open recommendations. The Committee recommended that the FAA review all recommendations and prioritize those that enhance the safety and efficiency of the certification process. Additionally, the Committee recommended that the FAA develop procedures to more quickly amend and adopt policy and regulation.

FAA Response:

The FAA collectively analyzed all previous and current recommendations, grouped them into categories and identified themes that will help us prioritize responsive initiatives and maximize safety (see Appendix B). Some activities that are responsive to previous recommendations are already underway.

In accordance with Section 202 of the FAA Reauthorization Act of 2018*, the FAA will work to improve issuance of policy and regulatory documents by means of the recently established Safety Oversight and Certification Advisory Committee (SOCAC)*. The SOCAC is charged with, among other things, advising the Secretary with policy and guidance recommendations, as well as expediting rulemaking and giving priority to rules related to safety. The SOCAC can assist in identifying barriers and opportunities to further expedite the process.

Appendix A – FAA Detailed Responses and Plans

1. Safety Management Systems

Committee Findings:

The FAA requires Safety Management Systems (SMS) for Part 121 air carriers; however, there is no requirement for SMS for design and manufacturing organizations. Expanding SMS regulations to include design and manufacturing organizations would create better connections and management of functional and operational safety risk.

The FAA has many robust processes to oversee each phase in a product's life cycle; however, the various oversight mechanisms are unique and independent, and not adequately linked to one another to ensure a complete, system wide approach to aviation safety from design to operation.

Partnership for Safety Plan (PSP), Safety Management Systems (SMS), and delegation are critical structures that are related, but not sufficiently integrated.

Committee Recommendations:

1A) The FAA currently requires an SMS only for Part 121 operators. The FAA must mandate implementation of SMS for design and manufacturing organizations, thereby ensuring connection and interrelationship with the existing SMSs of airlines, airports, and service providers.

1B) The FAA should take the necessary steps to ensure a total system approach to safety, linking all safety requirements from type certification to pilot training, and operational performance of the product.*4*

1C) The FAA should encourage the integration of Partnership for Safety Plan (PSP), SMS, and ODA activities to create an effective oversight process between manufacturers and the FAA to better manage safety and certification issues.

Recommendation Response Plan:

The FAA agrees with the intent of the recommendations related to SMS. The Committee established a goal of advancing safety through an SMS data-sharing network of operators, airports, service providers, and relevant design and manufacturing organizations.

In response, the FAA is initiating rulemaking, in part to mandate SMS for key aviation sectors, including design and manufacturing organizations. In this rulemaking, we will seek input from the public, industry, and international regulatory partners on which entities should be required to implement SMS. We want to maximize the safety benefits of SMS, with consideration of costs to industry and FAA resource needs. This approach is consistent with the Part 21 SMS Aviation Rulemaking Committee (ARC) report, dated July 3, 2014, which concluded that the scope of applicability for SMS for design and manufacturing organizations should be based on safety risk.

We will be expanding on the Committee's recommendation by including certain operators and maintenance facilities in our planned SMS rulemaking effort.

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4 To better align our planned actions, we will address the recommendation to take a systems approach to safety by linking certification and operations per our response to #5, Coordination of the FAA's Aircraft Certification Service and Flight Standards

Until a rule is adopted, we will continue to foster voluntary adoption of SMS. The FAA has 12 industry participants in voluntary design and manufacturing SMS programs and 233 industry participants in voluntary aircraft operations SMS programs. We anticipate limited changes to voluntary SMS programs will be needed once rulemaking is completed. By FAR Operational Part, the voluntary SMS organizations are:

- Part 135 – 176 (Charter operations)
- Part 145 – 39 (Repair stations)
- Part 141 – 13 (Flight schools)
- Part 142 – 1 (Flight schools – simulators)
- Part 137 – 3 (Agricultural operations)
- Part 125 - 1 (Large airplanes not in common carriage)

The FAA concurs that the integration of PSP, SMS, and ODA activities support an effective oversight process between manufacturers and the FAA. The FAA and industry collaborated to develop the AIR CPG. The CPG, an FAA and industry guide to product certification, promotes a systems approach, encompassing PSP, SMS, and ODA concepts. The FAA and industry recently developed a plan to continuously improve and institutionalize the use of the CPG.

- **Prime Goal:** Implement scalable SMS, involving all stakeholders.
- **Implementation Impact:** We anticipate changes to regulations, orders, policies, and required training to mandate SMS.
- **Timeline:** We anticipate publishing the Notice of Proposed Rulemaking (NPRM) by December 2021. Rulemaking could take two to four years, given the potential for new requirements and the associated costs for the industry. In the interim, we will continue to promote voluntary adoption of SMS within design, manufacturing, and aircraft operations organizations.

2. System Safety

Committee Findings:
The fundamental building blocks of system safety include the human, the equipment, and the environment. As part of design, evaluation, oversight, and day-to-day operations, it is necessary to understand what must go right (performance and design specifications), what could go wrong (human and equipment failure modes), what can prevent things from going wrong (controls and barriers), and the combination of events and scenarios in which the human–equipment system must function.

System Safety Assessments (SSAs) are an essential component of safety risk management that can be expanded to better consider human factors in order to provide additional safety value to the FAA's aircraft certification process.

Committee Recommendations:
2A) The FAA and industry should review requirements and guidance materials to promote more consistent use of systematic analysis of Human Performance and Error Assessments to complement SSAs in aircraft certification.

2B) The FAA should consider removing exclusions for skill-related errors associated with manual control of the airplane and ensure crew interaction with automated systems active in manual flight are systematically assessed.

2C) Current guidelines recommend that human factors be considered when the system is new or novel, complex and/or integrated. In the future, the FAA should enhance standards to ensure that systematic human factor analyses are conducted for all safety critical functions and failure modes associated with a change under the changed product rule (14 CFR 21.101).*5*

2D) Test and evaluation should include multiple failure mode scenarios and involve trained pilots who reflect the anticipated end-users of the product. Resulting data should be fed back into the overall safety assessment of the total system. Significant changes to safety assumptions or performance levels should be tracked.

2E) A summary document explaining SSA assumptions and conclusions relevant to safe operation should be communicated throughout the development process and to end-users of the product as reference data for an operator's SMS program. End users should be required to monitor leading indicators to validate the assumptions of the SSA once the product enters service.

Recommendation Response Plan:

The FAA will evaluate existing regulation, policy, and industry standards in aircraft certification, relative to the human-machine interface and interaction, in cooperation with international partners.

The FAA will work with system safety assessment and human factors standards committees (e.g. SAE G10 Aerospace Behavioral Engineering for Human Factors-Related Standards, SAE S18 Aircraft and System Development and Safety Assessment Committee for Industry Standards for System Safety Analysis) in coordination with international authorities to explore improved safety assessment methodologies and improved tools and methods to assess human-machine interactions, including manual flight operations and interaction with automated systems.

The planned new and/or updated guidance and standards will address issues such as validating assumptions made in the system safety assessments concerning trained flight crew recognition of single and multiple failures, tracking and validating changes to key safety related assumptions, and coordinating the manufacturer's SMS program with an operator's SMS program. Through this coordination, and with FAA oversight, the manufacturer will monitor the validity of their assumptions and communicate risk controls that will be transferred to the operator.

The FAA will also enhance its certification and operational policy and guidance to ensure System Safety data is better utilized throughout the certification process to increase safety. The focus and overarching goals will be ensuring that the FAA more effectively communicates SSA data to operational personnel to reduce risk through training and procedures mitigations. In a related effort, the FAA will prioritize ongoing rulemaking to revise 14 CFR 25.1309, standardizing the criteria for conducting safety assessments for systems, including flight controls and power plant installations, installed on transport category airplanes.

Requiring inclusion of skill-related errors associated with manual control of the airplane might be viewed as driving manufacturers toward a single solution – a fully autonomous aircraft. The FAA seeks to avoid unnecessarily limiting the range of potential solutions. We plan to address this aspect of the recommendations through a comprehensive assessment of operational and design requirements.

- **Prime Goal:** Re-evaluate our approach to the human-machine interface and interaction, and incorporate new rules, policy and associated training across the FAA and internationally to better integrate human factors-related evaluation and system safety assessment methodologies.

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5 To better align our planned actions, we will address the recommendation to ensure systematic human factor analyses are conducted for all safety -critical functions and failure modes associated with a change under the changed product rule per our response to #8, Amended Type Certificates

- **Implementation Impact:** We anticipate changes to regulations, guidance, policy, and standards to accomplish the goals of this initiative. We also plan to conduct training, outreach and communications to domestic and international organizations.

- **Timeline:** We will launch the policy review team by June 2020. We will also prioritize an ongoing rulemaking project concerning system safety assessment with the intent to publish a NPRM by November 2020.

3. Consideration of Operational Environment during Type Certification (Globalization)

Committee Findings:

The U.S. system for aircraft certification is robust and proven, and the FAA is a leader in augmenting aviation safety worldwide. This system also allows the United States to lead the world in the development and implementation of innovative products in order to enhance safety.

Industry growth and globalization are among several factors challenging the FAA's current product certification system, resulting in new technology and innovative U.S. State of Design products being delivered to operators in States whose aviation authorities function at varying levels of maturity.

Globalization drives the need to harmonize requirements, regulations, and standards in commercial aviation. Although U.S. products are operating worldwide, the FAA has no mechanism in place to ensure the maintenance and pilot training requirements for U.S. products operating under another CAA.

Committee Recommendations:

3A) The FAA should acknowledge the international profile of operators of U.S. State of Design aircraft and implement the necessary changes for its aircraft certification system to consider differences in operations, training, and oversight across States.

3B) Some members of the international community are using the Flight Standardization Board (FSB) reports intended for U.S. operators as the foundation for their operational programs, which was not their intended purpose. The FAA, therefore, should consider including operational requirements as part of the type certificate to better communicate minimum standards and promote advanced training and qualification programs. This would allow transfer of operational and training requirements through the validation process.

3C) The FAA should expand its engagement, policies, technical assistance, and training efforts to foster higher international safety standards and practices for aircraft certification, operations, and maintenance.

Recommendation Response Plan:

Recognizing that United States-designed aircraft operating abroad fall under the jurisdiction and regulatory standards of other partner CAAs, the FAA will engage the international community through ICAO and other multi-national cooperation forums. Specifically, the FAA will actively participate on a new ICAO personnel training and licensing panel, when established, to improve global standards and guidance for pilot training. During the 40th ICAO Assembly in 2019, the United States proposed this new panel to examine pilot training systems for manual handling skills and commercial operational policies regarding automation. In addition, the FAA will continue to engage key CAAs through participation on the multi-lateral CMT, Maintenance Management Team,

FAA-EASA Certification Oversight Board (COB) and the International Operational Evaluation Practices Board. FAA engagement with and leadership of these forums will enhance the international aviation community's ability to establish the appropriate and effective operating environment for certified aircraft. This would include requirements for pilot type rating and considerations for qualifications, experience and training strategies as well as operational suitability. In addition, the FAA will develop an engagement plan to communicate any proposed changes to the FAA certification system and recommend corresponding changes to partner CAA systems and ICAO standards and recommended practices. The plan will emphasize SoR standards, tools, and training necessary to oversee the global fleet.

We will task the ACT-ARC to examine how we can improve the FSB process and product (FSB report) to meet all stakeholder needs. An ACT-ARC workgroup is already active, comprised of experts from manufacturers, pilot labor associations, training centers, air carriers and aircraft operators. To date, the workgroup has delivered 11 recommendations, with additional recommendations scheduled for August 2020 delivery. We will task the workgroup to consider rulemaking to add operational requirements to the TC.

The FAA participates in a number of international organizations and forums and provides targeted technical assistance to other CAAs and ICAO. The FAA will develop an engagement plan to communicate proposed changes to the FAA and international aircraft certification systems. The plan will address the need for the SoR to possess the necessary competencies, standards, tools, and training to oversee the global fleet. The plan will include engagement through existing multi-national forums (e.g., CMT, Asia Pacific Bilateral Partners Meeting, FAA-EASA International Aviation Safety Conference, Commercial Aviation Safety Team, and ICAO). Through these forums, the FAA will support the development of regional strategies for targeted technical assistance and regional training workshops.

The FAA will continue to meet its SoD responsibilities by providing foreign CAAs, upon request, with information and technical assistance necessary for the authority to oversee the initial aircraft introduction to service, safe operations and continued airworthiness of U.S. products within their unique regulatory and operational environments.

- **Prime Goals:** Re-evaluate the approach to the human-machine interface in consideration of global flight crew profiles, incorporate new policy and training across the FAA and other CAAs, share lessons learned, and ensure that a strong infrastructure exists to support the introduction of new aircraft designs into the global fleet.

- **Implementation Impact:** We anticipate changes to orders and policy to accomplish the goals of these initiatives.

- **Timeline:** The FAA plans to complete most activities associated with this project by March 2022. The timeline for any rulemaking activities recommended through these initiatives will depend on the scope and impact of the change.

4. Data

Committee Findings:
Better data gathering, targeted analysis by experts, and the use of all available data to develop and implement corrective actions to mitigate risk would bolster aviation safety.

A vast array of operational safety data is generated by various stakeholders in the global aviation system that can provide valuable input to inform design, production, and continued airworthiness initiatives. Regulators, manufacturers, and operators all collect important data, yet the amount of

aviation data available is expansive, and the systems for analyzing data are incomplete. Many of these systems, even those within the FAA itself, are independent of each other and lack the ability to communicate with each other. While usable data exists, it is often disparate in nature and accessibility of the data to the appropriate decision makers at the right time remains challenging. Timely access to relevant data in a meaningful form is lacking. Fully implementing SMS is not possible without this integration of data sources.

In the future, once data sources are consolidated and integrated, big data analytics can make use of AI to identify trends and precursors to allow the safety community to address them before an accident materializes. In any safety system, unforeseen issues are likely to materialize as a normal part of the process. Early, proactive identification of issues and an agile process of recovery are critical to avoiding future events.

Committee Recommendations:

4A) Operational data needs to be made available in a single repository for analysis. To this end, the FAA and industry stakeholders of the certification system should continue to develop a means for expeditious gathering and analyzing, and acting on large quantities of operational data and reporting de-identified results to the aviation community, using ASIAS as an example.

4B) The FAA should propose to the ICAO the sharing of operational data internationally, to enhance safety initiatives.

4C) The FAA should find a way to integrate de-identified and confidential data sources so that the aircraft certification workforce, Flight Standards inspectors and other safety organizations can focus on near-time risk factors as part of their continued operational safety activities.

4D) The FAA should continue working with NASA to develop an in-time aviation safety management system that can be used both by the regulator and industry.

Recommendation Response Plan:

With regard to the recommendation for a single repository for operational data, the FAA will continue to use mature analytic tools such as the ASIAS System in the short term. ASIAS is a collaboration between government and industry that brings together critical safety data across the aviation community into a single repository. The establishment of governance models and de-identification protocols have enabled ASAIS to gather data from operators representing more than 99% of the operations in the NAS. Data from voluntary safety programs have enabled the community to proactively identify and mitigate risks in the NAS. ASIAS governance models enable the FAA and other industry members to leverage the data repository to gain insight into safety issues at a national level.

Looking ahead, we will continue to improve ASIAS, expanding participation, and exploiting data fusion and advanced analytical tools to leverage AI technologies. These technologies will allow ASIAS to move toward a more predictive capability.

The FAA has placed a special emphasis on sharing actionable information with its workforce, versus direct interaction with these data systems, because they require specialized skill sets and tools. Safety issues identified through the ASIAS program are shared with the FAA workforce and the aviation community.

Additionally the FAA is working on improving access to data and analytical capabilities for its workforce under the Strategic Initiative, Risk-Based Decision Making. The FAA established the SDAT to lead the FAA's Strategic Initiative, Data Standardization, and Governance. SDAT is focused on improving data integrity and availability across FAA Lines of Business (LOBs) and Staff Offices

(S/Os) to support personnel in making data-informed decisions based on risk.

Key planned future actions in this area include:

- ASIAS (2021-22) – Add rotorcraft to the database: additional data analysis using air traffic voice data.
- ASIAS (2023) - Encourage innovation: controlled, curated data enclaves where external parties (academia, private technology companies) can conduct analysis.
- ASIAS (2024-25) - Vulnerability management: discover and prioritize hazards and advance ASIAS analytical capabilities to improve safety analysis.
- SDAT - Through the FAA SDAT, in collaboration with the FAA ADO EIM initiative, establish curated data repositories and shared analytical tools that are available to users across FAA LOBs and S/Os to improve safety.

The FAA agrees with the Committee's recommendation to engage ICAO in promoting international sharing of safety data. The ASIAS program represents a world-class capability that is being emulated by authorities and aviation organizations around the world. ASIAS is working in collaboration with these organizations by sharing knowledge and experience to ensure that the systems are compatible. The initial focus is on harmonization of key safety metrics. These metrics, using common definitions, will enable a standard industry language thereby improving the quality of information and communication. With this common language, the international aviation community's capacity to focus on common safety issues will be greatly enhanced. The FAA believes this initiative will prove beneficial in the short-term while longer-term initiatives will focus on data/information sharing at the international level. These challenges will take considerable time and effort to ensure that critical safety data is not used in a punitive manner or against U.S. interests. The sovereign legal systems of the various states play a significant role in the ability of the U.S. to share proprietary data, which is protected under U.S. law.

As other international systems mature, the FAA envisions much closer collaboration with the global community, which would lead to a broader exchange of information. Currently ASIAS is expanding participation to international operators. This is a challenging task because data protections and legal framework of sovereign states must be taken into consideration to ensure that it does not jeopardize the data in the ASIAS program. As ASAIS makes progress in this area, it would improve the program's ability to identify risks that may not be present in U.S. operations.

In October 2018, the FAA presented a position paper to ICAO titled "Facilitating International Safety Data Sharing for Effective Risk Management" In the paper, the FAA urged ICAO to encourage activities that facilitate global reporting of data and to review and develop guidance to facilitate the sharing of safety data between operators and the SoD. The FAA has been participating in a variety of activities to build consensus and momentum around safety data sharing. Activities include participation on the Continued Operational Safety Evaluation Team, which is working on enhancement of worldwide safety data reporting to type design holders; representation on the Global Aviation Safety Plan Study Group, which has identified the importance of timely reporting of safety information at the regional, national and international levels; and support of Annex 19, which promotes data collection, analysis and sharing by all ICAO members.

The FAA recognizes formalized international safety data sharing will be a long-term project, tackling issues such as data protections, data ownership, and proprietary and legal matters. At the next ICAO Assembly (or other major ICAO event), the FAA will present another data sharing paper, urging ICAO and member states to address the challenges to international data/information sharing, and work with international authorities and industry to gain support for the initiative.

Near term FAA actions in this area include:

- Continuing to share key safety metric algorithms and lessons learned with Regional Safety Groups to promote international safety.
- Sharing best practices learned through the ASIAS program with other international safety data sharing initiatives such as Data for Safety.
- Continuing to share and receive international safety recommendations with states and bilateral partner CAAs, including recommendations regarding aircraft design and continued operational safety.

Longer term planned actions include:

- Pursuing data/information sharing at the international level, working through legal and governance hurdles that hinder broader collaboration.
- Expanding international operator participation in the ASIAS program.

Concerning the recommendation on data integration, in collaboration with the FAA's ADO, the FAA SDAT is working closely with the EIM initiative and Data Governance groups to develop an agency-wide central data repository via the EIM Platform and Data Governance Framework. This overarching data infrastructure will support data integration, and ensure consistent and proper handling of data and tools across the FAA to facilitate business insights, as well as the sharing of advanced analytical techniques.

Near term FAA actions in this area include:

- Establishing and implementing safety data governance agency-wide. This will support conformity across the enterprise and lead to improved data management and standardization.
- Making operational safety analysis programs available across the FAA such as the Airport Surface Anomaly Investigation Capability.

Long term FAA actions include:

- Migrating agency information/data sources into a centralized platform to improve access to data and to enable development of advanced analytical capabilities that support risk-based decisions across the agency.
- Developing a Safety Data Catalog to serve as an informational portal that will provide details on the description, ownership, and availability of safety data sets, metadata, and systems agency-wide.

Finally, we are collaborating with NASA to develop proactive, in-time safety monitoring techniques that will support the establishment of more effective SMS through the SWS RTT. The goal of the RTT is to identify common critical safety assurance goals, coordinate research efforts, and facilitate transition of technologies, tools and knowledge to the FAA. The NTSB is an observer on the RTT. Through continued inter-organizational collaboration, the FAA and NASA will develop capabilities to support an in-time aviation SMS.

The SWS RTT has three goals and is divided into three sub-teams. First, the Data Tools and Prognostics group focuses on the development and maturation of techniques for identifying NAS-level anomalies, hazards and precursors to safety incidents. Second, the Human Performance group emphasizes sharing of research technologies and techniques to support human operator performance and monitoring. Finally, the Verification and Validation of Complex Systems group provides support for alternative paths to certification to benefit the FAA and the industry by developing and transitioning qualified tools that reduce cost and increase confidence in complex

systems. Each working group meets in person to identify new areas of collaboration, establish joint goals and deliverables, and monitor progress of ongoing activities.

- **Prime Goals:** Leverage state-of-the-art safety information sharing initiatives such as the ASIAS program to improve aviation safety worldwide, make FAA data and analysis tools available through an EIM system, improve data sharing internationally, and work with NASA to develop an in-time aviation SMS

- **Implementation impact:** We anticipate changes to orders and policy to accomplish the goals of this data sharing initiative as well as costs associated with increasing data capabilities.

- **Timeline:** FAA near term data sharing plans will complete by the end of 2021, with long terms initiatives complete by 2025.

5. Coordination between the FAA's Aircraft Certification and Flight Standards Functions

Committee Findings:

While the product certification process is developed, managed, and implemented by the Aircraft Certification Service (AIR), personnel from Flight Standards (AFX) participate in the process and have a well-defined role through the five regional Aircraft Evaluation Groups (AEG). While both under the Aviation Safety (AVS) organization, AIR and AFX are separate organizations, each with its own policies, guidance materials, leadership, and culture. Much of the guidance material for AEG personnel resides within AIR, and precise guidance to direct the continuing interface between the two organizations is lacking, which could lead to a disconnect between product design and operational requirements.

Committee Recommendations:

5A) The FAA should review and clarify the roles and responsibilities of the Aircraft Evaluation Group (AEG) in the product certification process to define objectives, precise engagement, and timing throughout the process. This should include a review of the working relationship between AFX and AIR to ensure that AEG representatives are engaged early enough in the certification process to review operational safety requirements and oversee assessments of design features and assumptions affecting operations. The AEG should have sufficient engagement throughout the process to be aware of any design changes that occur after the first certification plan is executed. Clarifications should be reflected in policy and guidance materials, which also should be evaluated to determine which organizations should be responsible for them.

1B) The FAA should take the steps necessary to ensure a total system approach to safety, linking all safety requirements from type certification to pilot training, and operational performance of the product.

Recommendation Response Plan:

In response to this recommendation, the FAA launched a joint AIR/AFX IPM project to improve the coordination for type certification and operational evaluation in design approvals and entry into service. The project team will review all AIR/AFX interfaces or gaps in interfaces, update related policy and guidance as needed, and clarify roles and responsibilities. The team will explore different methods to ensure a unified approach between AIR and AFX (and specifically AEG) from project intake to completion. Areas of team consideration will include expediting agency level of involvement decisions, facilitating innovation, and adding a consistent focus on training and operations throughout the project.

The recent AIR and AFX transformations to organize staff by regulatory and administrative functions supports the success of the IPM project by enabling streamlined integration, better collaboration and communication, and greater efficiency and standardization.

Other expected benefits from this project are the designation of single certification project managers for AIR and AFX, which will provide a seamless interface for stakeholders, integrated awareness of changes throughout a project, and optimization of completion of AFX and AIR activities in parallel.

- **Prime Goals:**
  - o Reinforce established expectations and adopt new norms through leadership and employee communication while improving early AIR-AFX engagement.
  - o Connect design and operational requirements throughout the project.
  - o Clarify roles and responsibilities between AIR and AFX.

- **Policy Impact:** We can make substantial improvements using existing orders and policy. For end state full integration of AIR and AFX, we anticipate changes to orders and policy.

- **Timeline:** Within 60 days of the date of this plan, engage the workforce through an AVS-1 memo to reinforce expectations; by the end of FY20 identify and capture early opportunities to improve collaboration and increase integration; and by the end of 2021 institutionalize new norms through policy changes and completion of AIR and AFX reorganizations.

6. Personnel

Committee Findings:
The FAA cannot accommodate the growth and complexity in certification workload without effectively understanding and managing its personnel requirements and influencing cultural changes in the workforce to adapt to the changing nature of the work. Current funding levels may be insufficient to support effective resource management. Priorities include proper skill identification, skill development, and attracting talent.

Committee Recommendations:
6A) The FAA should plan an aggressive recruitment campaign to encourage students to pursue careers at the FAA. The FAA should re-evaluate its current position descriptions and desired skill sets – especially as they relate to covering systems and process knowledge – to ensure that personnel with the right range of skills occupy safety-critical positions so that the agency can meet evolving industry needs.

6B) Workforce planning is not just about hiring new people; it is also about filling the gaps between what the FAA currently has and what it needs and making effective use of current staff. AVS should re-evaluate its workforce strategy to ensure it is sufficient to accomplish the AIR transformation and adapt with ever-changing global aviation industry.

7D) The FAA should ensure that its personnel involved in overseeing designees evolve in step with the delegation system. Oversight of a delegated organization is not the same as oversight of a delegated individual, and requires a specific skill set related to systems thinking. A continued focus on change management is needed to empower FAA staff and enable them to adapt to a changing work landscape.

Recommendation Response Plan:
The FAA's goal is to recruit, hire, maintain, and retain a workforce with the technical expertise, capabilities, and adaptability required to continue to meet the safety needs of a rapidly-evolving

aerospace system. To this end, the FAA is implementing several initiatives to better target personnel requirements, foster cultural change, and advance workforce development. Among these are a new program to hire and mentor college graduates and a partnership with academia and industry to enhance and deliver training for new and existing employees. We have also adapted our recruitment and hiring campaigns to attract Aviation Safety Inspectors who specialize in operations.

We will focus our personnel initiatives on holistically approaching aircraft certification activities. Our efforts will ensure we are able to hire and retain the right people with the right skills and mindset, engaged at the right time, with systemic coordination between certification and operational suitability.

- **Prime Goals:**
  - o Meet new FAA hiring targets in safety-critical positions by launching recruitment programs and using hiring incentives as necessary.
  - o Hire the right people by updating position descriptions for safety-critical positions (including oversight staff) to include new technology and systems thinking focus.
  - o Define the workforce needs for the FAA to fulfill its safety responsibilities (including ODA oversight) without incurring undue delays for industry.
  - o Deliver improved training opportunities by collaborating with academia and industry on curriculum development and delivery, to include technical and foundational skills (e.g., systems thinking, communications, and project management).

- **Implementation Impact:** No specific order or policy updates are required for the Workforce Development project. However, the FAA expects new or revised orders and policy will emphasize and drive a scalable systems approach that is adaptive and able to keep pace with industry.

- **Timeline:** FAA will complete all actions associated with this project by September 2021.

7. Delegation

Committee Findings:
The FAA's use of delegation to exercise its discretionary authority is an appropriate and effective means for conducting product certification. It relies on effective standards, oversight, and communication between stakeholders.

The structured, safety-focused delegation system bolsters aviation safety and encourages innovation, efficiency, and industry growth. Delegation processes, including ODA, provide space for innovation and technical expertise while enabling the FAA to maintain its oversight processes and maintain established safety standards.

By making use of delegation, the FAA is able to use a risk-based approach to focus its attention on the most critical certification areas. The use of delegation in certification has been consistently endorsed by the agency, industry, and Congress as a means of ensuring safety and efficiency in the certification process while leveraging industry expertise. The delegation system is based upon a solid regulatory framework, with formal guidance and expectations for both designees and FAA employees conducting oversight of them. Controls are in place to require independent decision making within an ODA Unit, which ensures that the ODA functions as designed and guards against undue pressure on the ODA Unit from the business interests of the company.

Committee Recommendations:
7A) The aviation community, including the FAA, industry, stakeholders, and Congress, should

recognize that the delegation system allows U.S. industry and innovation to thrive, while allocating FAA resources to derive the greatest safety benefit.

7B) The FAA should continue to make use of the current delegation system, which is solidly established, well controlled, and promotes safety through effective oversight.

7C) The FAA and industry should work together to address concerns about potential undue pressure on an ODA Unit in order to maintain the independent decision-making structure of the ODA and ensure that the ODA fulfills its requirement to serve as a representative of the FAA Administrator.

7D) The FAA should ensure that personnel involved in overseeing designees evolve in step with the delegation system. Oversight of a delegated organization is not the same as oversight of a delegated individual, and requires a specific skill set related to systems thinking. A continued focus on change management is needed to empower FAA staff and enable them to adapt to a changing work landscape.[6]

7E) The FAA should provide clarification and guidance on how and when FAA technical specialists and ODA unit members communicate directly regarding technical concerns.

Recommendation Response Plan:

The FAA acknowledges the support from the Committee on the value and benefit of delegation as an effective and efficient method to enhance safety. As required by the FAA Reauthorization Act of 2018, the FAA has established the AVS ODA Office to lead performance improvements and consistency efforts in the ODA program, including consistent delegation decisions. Activities will include overseeing the review of ODA holder's limitations, reviewing requirements for ODA holder corrective actions, and the identification of FAA and ODA holder performance improvement opportunities. The office will also lead strategic efforts to develop a more consistent approach to ODA program oversight in the context of the broader delegation system, and address concerns regarding the potential for undue pressure on ODA units. As part of our continuous improvement, we intend to conduct periodic evaluations of the ODA office structure and processes. The FAA plans to issue two policy memos, one to address ODA holder personnel understanding and responsibility to report undue pressure, and another to clarify expectations for communication between the ODA Unit Members and the FAA. In addition, the FAA is revising Order 8100.15, ODA Procedures, to clarify undue pressure reporting and communication. These policy updates will support a more proactive stance on undue pressure, with additional focus during FAA audits and increased attention from ODA holders on their internal processes.

We have also initiated an expert panel, in accordance with Section 213 of the FAA Reauthorization Act of 2018, to survey existing ODAs and make recommendations to enhance the oversight processes and make the ODA program more effective.

- **Prime Goals:** Use the new AVS ODA Office to oversee the implementation of a consistent FAA ODA program strategy; promote ODA personnel understanding of what constitutes undue pressure and actions to take if it occurs; further clarify the communication expectations between FAA and ODA personnel; and systemically and proactively address undue pressure.

- **Implementation Impact:** We anticipate the order and policy changes listed above, and we will require ODA unit member training.

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[6] To better align our planned actions, we will address the recommendation to ensure personnel involved in oversight are trained in systems thinking per our response to #6, Personnel.

- **Timeline:** We anticipate issuing the policy memos by December 2020 and the Order revision by December 2021.

8. Amended Type Certificates

Committee Findings:

The FAA evaluates a product submitted for certification through an amended type certificate (TC) using the same structured process outlined in the regulations and Orders as for a new TC. The underlying issue related to new and amended TCs should not be whether a product is produced under a new type certificate or a changed one. Rather, the issue is whether the level of safety of the product, embodied in the airworthiness standards it complies with, is as high as practicable.

Committee Recommendations:

2C) Current guidelines recommend that human factors be considered when the system is new or novel, complex and/or integrated. In the future, the FAA should enhance standards to ensure that systematic human factor analyses are conducted for all safety-critical functions and failure modes associated with a change under the changed product rule (14 CFR 21.101).

8A) The FAA should work to ensure FAA policy and guidance are updated to include cross-system (equipment, human, and environment) evaluation of changes.

8B) The FAA should update existing guidance to highlight the vulnerabilities that can develop around multiple adaptations of existing systems, where transfer of historical assumptions may not be appropriate or may require specific validation. This can be relevant to new TC programs, but is more likely relevant to amended TC programs where system integration can have unique challenges.

8C) The FAA should clarify roles and responsibilities of the applicant and FAA in assessing cross-functional interface assumptions in determining what constitutes a significant change.

Recommendation Response Plan:

Today's CPR and guidance has evolved over the past two decades and has been harmonized with key international partners. A team chartered by the CMT, composed of certification directors of U.S., Europe, Canada, and Brazil, was responsible for continuous improvement of the guidance and implementation of the CPR. The FAA plans to re-charter the CMT CPR CIT. In the nearly 20 years since the CPR was issued, the CMT CPR CIT has formed four times to collaborate and standardize the application of the CPR rule and associated guidance. In order to ensure a consistent global approach to safety through similar evaluation and treatment of design changes, we need to work through the CMT on this effort.

The objective of the team is to develop a consensus-based set of recommendations to address regulatory and/or policy gaps related to changed products. The recommendations will include proposed policy for assessing how design changes to one system may affect other unchanged systems.

Also of relevance is that the Joint Aviation Technical Review team, which includes CMT members from the European Union and Brazil, also made recent recommendations to FAA following the Boeing 737 MAX accidents concerning CPR. The FAA will propose that the CMT CPR CIT consider all MAX accident-related CPR recommendations, addressing regulatory and policy gaps.

- **Prime Goal:** Create a consensus-based set of recommendations for implementation by FAA and other CMT members to address regulatory and/or policy gaps associated with changed products.

- **Implementation Impact:** We anticipate changes to orders and policy to accomplish the goals of this initiative.

- **Timeline:** The FAA will propose to re-charter the CMT within 6 months of the date of this plan.

9. Innovation

Committee Findings:
AIR Policy and Innovation Division Research & Development (R&D) focuses on guidance, standards, and regulations to support new products, and should also prioritize safety and certification process innovations.

Committee Recommendations:
9A) Since the Innovation Center is a recently adopted concept, AIR should provide guidance expeditiously to both its employees and the industry on how the center will operate and expectations for success.

9B) The Innovation Center must include and encourage review of innovative methods of compliance to previously certified systems.

9C) The Innovation Center R&D portfolio should include and prioritize changes to the certification process and regulatory framework so that the FAA's certifying system can keep up with concepts and technologies in the products it certifies.

9D) FAA should continue implementation of performance-based regulations for the adoption of new technologies that do not stifle future innovations.

FAA Plan:
The FAA values innovation because it can improve safety, develop and deploy new technologies, or facilitate improvements in operational efficiency. To that end, the FAA is establishing the Office of Innovation to more effectively and efficiently address the surge of new users and technologies in aviation. For its part, AIR is standing up the Center, which will foster industry innovation and expedite coordinated FAA/industry compliance approaches with clear safety and compliance expectations for innovative technologies, modernized production methods and unique development approaches. As the FAA implements the Center, we have started reaching out to industry to foster innovative new technology in design and production processes, as well as new methods for demonstrating compliance. The principals we will institute through the Center are currently being used in the existing organization. The Center will also coordinate with other services and lines of business across the FAA in the introduction of new design development approaches, operating models, and integration of unique aircraft into the NAS.

- **Prime Goals:**
  o Establish early engagement with applicants on TC/Supplemental TC/Parts Manufacturer Approval projects incorporating new and novel technologies.
  o Document a review process for innovation projects, with emphasis on project integration.
  o Identify emerging rulemaking and policy needs, leveraging consensus-based standards and performance-based regulations.
  o Identify R&D priorities to support emerging technologies.
  o Forecast and document emerging technologies.

- **Implementation Impact:** No policy changes are required. Policy updates will be considered as part of continuous improvement.

- **Timeline:** The FAA will complete initial standup of the Center by the end of 2020.

10. Existing Recommendations

Committee Findings:
Several prior certification and delegation reports exist with open recommendations for potential enhancements relevant to this Committee's work.

Committee Recommendations:
10A) The Committee recommends that the Secretary of Transportation and FAA Administrator conduct a thorough inventory of the more recent recommended actions from industry-government advisory committees and government oversight agencies and prioritize those actions that will enhance the safety and efficiency of the certification process. The Committee specifically endorses and encourages the FAA to expeditiously implement the following recommendations:

- That the FAA undertake a review of FAA workforce certification program management processes. It should review, update, and strengthen the methods, tools, and training for performance-based system safety oversight through the use of effective risk-based resource targeting for project involvement and system safety oversight of delegation programs (Ref SOC-ARC, 21SMS-ARC, DOT-IG reports AV-2016-001 and AV-2011-136).

- That the FAA undertake a review to update 14 CFR part 21 certification procedures to reflect a system safety approach to product certification processes and oversight of industry design organizations. This review should include consideration of minimum qualification and organizational requirements for design approval applicants and holders, including responsibilities and privileges such as implementation of compliance assurance and safety management systems consistent with the Certified Design Organization (CDO) concept (Ref ACPRR, 21SMS-ARC, SOC-ARC).

- That the FAA establish an integrated aircraft program management framework with roles and responsibilities for type certification and operational evaluation to improve coordination between AIR and AFX for project planning and performance of issuance of design approvals and entry into service (Ref SOCARC).

- That the FAA should develop comprehensive implementation plans for certification process improvement initiatives that address: people (knowledge, skills, and abilities [KSA], roles/responsibilities, and culture change), process, tools, training, and implementation (change management). These plans must include a means to track and monitor these initiatives to ensure effectiveness of implementation, including metrics for measuring expected benefits. (Ref ACPRR, SOC-ARC)

10B) The FAA must develop better procedures to quickly amend and adopt FAA orders, policies, and advisory circulars that provide agency personnel guidance on how to implement in the field the changes emanating from these various oversight and advisory committees and to assess effectiveness of implementation.

Recommendation Response Plan:
Per the Committee's endorsement of implementing previous recommendations, we note the following responsive activities that are underway:

- AVS Strategic Plan

- AVS Dashboard
- Compliance Assurance Systems
- Workforce Development
- Integrated Program Management
- AVS ODA Office

Continuous improvement of policy development processes are a priority for the FAA. While we must follow the requirements of various laws, such as the Administrative Procedures Act (which requires that we seek public comment), the Paperwork Reduction Act (which requires us to minimize the paperwork burden to the public), and various Executive Orders, we plan to look for improvements by working through the SOCAC and other mechanisms that help drive consensus. The Secretary established the SOCAC in August of 2019, per the FAA Reauthorization Act of 2018, and they held their first meeting in November of 2019. The SOCAC is charged with, among other things, advising the Secretary with policy and guidance recommendations as well as expediting the rulemaking process and giving priority to rules related to safety. By working this issue through the SOCAC, the FAA will ensure a coordinated effort, focusing on consensus standards, with input from industry, labor organizations, and safety experts. The SOCAC can interface with the FAA/DOT, if needed, to identify barriers and opportunities to expedite issuance of policy and regulatory documents.

Appendix B - Cross Reference Table of Current Recommendations

	Spec Comm (32)	JATR (93)	NTSB (7 - 1 Boeing Only)	KNKT (8)
SMS	1a, 1b, 1c	R6	n/a	n/a
System Safety/Human Factors	2a, 2b, 2c, 2d, 2e	R1, R2, R3, R6, R7, R8, R9, R11	A-19-11, A-19-13, A-19-14, A-19-15, A-19-16	04.R-2018-35-20, 04.R-2018-35.23, 04.R-2018-35.24
International Collaboration	3a, 3b, 3c	R4	A-19-12	04.R-2018-35.27
Data	4a, 4b, 4c, 4d	R12	n/a	n/a
AIR-AFX Collaboration	5a	R4, R9, R10, R11	n/a	04.R-2018-35.25
Personnel & Organization	6a, 6b	R5, R7, R12	n/a	n/a
Delegation & Oversight	7a, 7b, 7c, 7d, 7e	R3, R5, R8	n/a	04.R-2018-35.21
Changed Products (ATC)	8a, 8b, 8c	R1, R2, R4, R8, R9	n/a	n/a
Innovation	9a, 9b, 9c, 9d	R2, R4	n/a	n/a
Regs/Policy/Orders/Existing Design	10a, 10b	R2, R3, R6, R12	n/a	04.R-2018-35-22, 04.R-2018-35.26

Appendix C - Table of Acronyms

ACT-ARC	Air Carrier Training Aviation Rulemaking Committee
ADO	Chief Data Office
AEG	Aircraft Evaluation Group
AFX	Flight Standards Service
AIR	Aircraft Certification Service
ARC	Aviation Rulemaking Committee
ASIAS	Aviation Safety Information Analysis and Sharing
ATC	Amended Type Certificate
AVS	Aviation Safety Organization
BASOO	Boeing Aviation Safety Oversight Office
CAA	Civil Aviation Authorities
CAST	Commercial Aviation Safety Team
CECI	Center for Emerging Concepts and Innovation (the Center)
CPR	Changed Product Rule
CMT	Certification Management Team
CPG	Certification Process Guide
DOT	Department of Transportation
EASA	European Aviation Safety Agency
EUROCAE	European Organization for Civil Aviation Equipment
EIM	Enterprise Information Management
FAA	Federal Aviation Administration
FSB	Flight Standardization Board
ICAO	International Civil Aviation Organization
JATR	Joint Authorities Technical Review
NASA	National Aeronautics and Space Administration
NTSB	National Transportation Safety Board
ODA	Organization Designation Authorization
OTS	Off the Shelf
PSP	Partnership for Safety Plan
R&D	Research and Development
RTCA	Radio Technical Commission for Aeronautics
SAE ARP	SAE International Aerospace Recommended Practice
SDAT	Safety Data and Analysis Team
SMS	Safety Management System
SWSRTT	System Wide Safety Research Transition Team
SoD	State of Design
SOCAC	Safety Oversight and Certification Advisory Committee
SOC-ARC	Safety Oversight and Certification Aviation Rulemaking Committee
SoR	State of Registry
SSA	System Safety Assessment
TC	Type Certificate
TCDS	Type Certificate Data Sheet
UM	Unit Members

Appendix D - Glossary of Terms

Advisory Circular – A publication offered by the Federal Aviation Administration to provide guidance for compliance with airworthiness regulations, pilot certification, operational standards, training standards, etc.

Air Carrier Training Aviation Rulemaking Committee (ACTARC) - Provides a forum for the United States aviation community to discuss, prioritize, and provide recommendations to the FAA concerning operations conducted under parts 121, 135, and 142.

Aircraft Evaluation Group (AEG) - An AFS organization responsible for determining the operational suitability of newly certificated and modified aircraft. Among their duties, AEG plays a critical role in pilot qualifications, flight crew training and continuing airworthiness requirements.

Aircraft Certification Service (AIR) - Part of the Office of Aviation Safety (AVS) and includes more than 1,300 engineers, scientists, inspectors, test pilots and other experts responsible for oversight of design, production, airworthiness certification, and continued airworthiness programs for all U.S. civil aviation products and foreign import products.

Amended Type Certificate (ATC) – FAA approval to modify an aircraft design from its original design. An amended type certificate approves not only the modification, but also how that modification affects the original design.

Aviation Rulemaking Committee (ARC) - A rulemaking committee that provides information, advice and recommendations to the FAA. The FAA has the sole authority to establish and task ARCs. ARCs are formed on an ad hoc basis, for a specific purpose, and are typically of limited duration.

Aviation Safety (AVS) - Responsible for the certification, production approval, and continued airworthiness of aircraft; and certification of pilots, mechanics, and others in safety-related positions. Aviation Safety is also responsible for the certification of all operational and maintenance enterprises in domestic civil aviation; certification and safety oversight of approximately 7,300 U.S. commercial airlines and air operators; civil flight operations, and developing regulations.

Aviation Safety Information Analysis and Sharing (ASIAS) - The ASIAS system enables users to perform integrated safety data queries across multiple databases, search an extensive warehouse of safety data, and display pertinent elements in an array of formats.

Aviation Safety Inspectors (ASI) – Flight Standards personnel, who administer, investigate and enforce safety regulations and standards for the production, operation, maintenance and modification of aircraft.

AVS ODA Office - The FAA Reauthorization Act of 2018 required establishment of a centralized office to be known as the ODA Office, within the Office of Aviation Safety (AVS). Among other functions, this office oversees and ensures the consistency of the FAA's audit functions under the ODA program and also provides guidance and promotes standardization and enhanced coordination for all AVS ODA holder activities.

AVS Strategic Plan - Presents a vision of the United States' aviation safety system, reflecting key elements that positions AVS to enhance aviation safety in an ever-changing environment. It includes strategic themes, supported by initiatives and specific activities.

Commercial Aviation Safety Team (CAST) – A joint FAA/Transport Canada/Industry team working with airlines and international regulatory partners to reduce the worldwide commercial aviation fatal accident rate.

Center for Emerging Concepts and Innovation (CECI) – AIR organizational function which will foster industry innovation and expedite coordinated FAA/industry regulatory compliance approaches. Certification Management Team.

Certification Oversight Board (COB) – The Certification Oversight Board is established under Annex 1 of the US/EU Safety Agreement as a joint technical coordination body responsible for airworthiness and environmental certification, quality management systems and rulemaking.

Certification Process – The process by which the design approval applicant shows, and the FAA finds, that the applicant has shown compliance to the applicable regulations, and is issued a TC or ATC, or STC once the process is complete.

Certification Process Guide (CPG) – A collaborative effort with Industry, the guide clarifies Applicant and FAA responsibilities during the certification process and supporting continued airworthiness following certification.

Certification Management Team (CMT) – A team framework under which the Directors of the Certification Services/Departments of the FAA, EASA, TCCA and ANAC (i.e. the Certification Management Team) manages the technical, policy, and bilateral agreement certification, manufacturing, export and continued airworthiness issues common among the four authorities.

Changed Product Rule (CPR) – Informal name for regulation 14 CFR part 21.101, which establishes the certification standards for changes to a TC and to determine if it will be necessary to apply for a new TC under 14 CFR part 21.19.

Chief Data Office (ADO) – Office focuses on the opportunities, threats, capabilities, and gaps related to managing FAA information as a strategic asset. Manages information for decision-making and operational efficiency, and manages risk inherent in massive and fast changing data resources through effective governance.

Civil Aviation Authority (CAA) – The governing body for civil aviation within a country also referred to as a state.

Compliance Assurance Systems (CAS) – A company-based system for demonstrating regulatory compliance with the same level of certitude as an FAA direct or delegated compliance finding.

Delegation System – A system in place since the 1930's, wherein non-FAA persons are authorized to make compliance findings for the FAA. This can include issuance of design approvals.

European Union Aviation Safety Agency (EASA) - An agency of the European Union with responsibility for civil aviation safety.

Enterprise Information Management (EIM) - An information technology concept that specializes in finding solutions for optimal use of information within organizations (e.g. supporting decision-making processes or day-to-day operations that require the availability of knowledge or data).

Federal Aviation Administration (FAA) - The governmental body of the United States with powers to regulate all aspects of civil aviation.

Flight Standardization Board (FSB) – A Flight Standards group established during a
A certification project primarily to: 1) determine the requirements for pilot type ratings, 2) ensure initial flight crew member competency, 3) develop training objectives for normal and emergency procedures and maneuvers, 4) conduct initial training for the manufacturer's pilots and FAA inspectors, and 5) publish recommendations for FAA inspectors to use in approving an operator's training program.

Flight Standards Service (AFS) – FAA organization that promotes safe air transportation by setting the standards for certification and oversight of airmen, air operators, air agencies, and designees, and also accomplishing aircraft inspection, surveillance, investigation, enforcement, setting regulations and standards.

Human Factors - The application of psychological and physiological principles to the engineering and design of products, processes, and systems.

Human-Machine Interface - The part of the machine that handles the human–machine interaction (e.g. switches, keypads, touchscreens, joysticks, displays, aural sounds).

International Civil Aviation Organization (ICAO) – An agency of the United Nations. It changes the principles and techniques of international air navigation and fosters the planning and development of international air transport to ensure safe and orderly growth.

International Operational Evaluation Practices Board (IOEPB) - Facilitates the cooperation between CAAs conducting operational evaluations in support of a coordinated and efficient use of global resources.

Joint Aviation Technical Review (JATR) – A team chartered by the DOT Secretary to review the Boeing 737 MAX Flight Control System. The team consisted of technical representatives from the FAA, NASA, and civil aviation authorities from Australia, Brazil, Canada, China, Europe, Indonesia, Japan, Singapore, and the United Arab Emirates.

Lines of Business (LOB) – the related aviation-based organizations within FAA or AVS.

Maintenance Management Team (MMT) – A team framework under which the Directors of the Certification Services/Departments of the FAA, EASA, TCCA and ANAC (i.e. the Certification Management Team) manage maintenance requirements and policies.

National Civil Aviation Agency (ANAC) - The civil aviation authority of Brazil

ODA Holder - The organization to which FAA grants ODA authority.

ODA Unit - The group of individuals within the ODA holder that perform the authorized, or delegated functions on behalf of the FAA.

ODA Unit Members – Individual members of the ODA unit appointed to perform functions on behalf of the FAA.

Organization Designation Authorization (ODA) – AVS program by which the FAA grants designee authority to organizations or companies.

Operational Data – Data generated by airlines and maintenance facilities concerning in-service aircraft.

Part 121 - FAA operating rules for scheduled air carriers (i.e. regional and major airlines).

Part 135 - FAA operating rules for commuter and on-demand operations (i.e. corporate, government, helicopters).

Part 142 - FAA rules for pilot training schools using flight simulators.

Part 21 – The FAA regulation that provides the regulatory framework to conduct certification of aircraft products and parts. This includes the engineering, airworthiness, production and quality systems.

Partnership for Safety Plan (PSP) - A written agreement defining the working relationship and mutual expectations between a design and/or production approval applicant and the FAA.

Safety Data and Analysis Team (SDAT) – Team whose mission is to standardize and integrate safety data at the FAA level.

Safety Management System (SMS) - A widely adopted systematic approach to achieving acceptable levels of safety risk for both industries and their regulators. SMS is comprised of four functional components, safety risk management, safety policy, safety assurance and safety promotion.

Safety Research Transition Team (RTT) – Joint FAA/NASA team providing a structured forum for researchers and implementers to constructively work together on a continuing basis, ensure that planned research results will be fully utilized, and will be sufficient to enable implementation of NextGen air navigation services concepts; and provide a forum for the inclusion of all of the NASA and FAA stakeholders who would be involved in the planning, conducting, receiving, and utilizing of the research conducted.

Safety Critical – Of significant impact to safety or potentially of high safety risk.

Safety Oversight and Certification Advisory Committee (SOCAC) – Committee created under the Federal Advisory Committee Act in accordance with the FAA Reauthorization Act of 2018, Public Law 115–254, to provide advice to the

Secretary of Transportation on policy-level issues facing the aviation community that are related to FAA safety oversight and certification programs and activities.

Safety Oversight and Certification Aviation Rulemaking Committee (SOC-ARC) – Committee created prior to the SOCAC, according to the Administrator's authority under Title 49 § 106(p)(5). The SOC ARC provides a forum in which industry may evaluate the aircraft certification and safety oversight system and make recommendations for changes to the current regulations and guidance material. The sponsor of the ARC is the Executive Director of the Aircraft Certification Service. This committee's outcomes inform the SOCAC.

Special Committee - Committee created by the Secretary of Transportation to review the FAA's aircraft certification process. This action was taken in response to the crashes of two Boeing 737 MAX 8 aircraft, which claimed a total of 346 lives.

Staff Offices - Departments responsible for hiring and training and placing employees and for setting policies for personnel management.

State of Design (SoD) - The country or jurisdiction having regulatory authority over the organization responsible for the design and continued airworthiness of a civil aircraft or part.

State of Registry (SoR) - The State or country in which an aircraft is registered for operation.

System Safety Assessments (SSA) – A systematic, comprehensive evaluation of the implemented system to show that the relevant safety requirements are met.

System-Wide Safety (SWS) Project - Activities directed toward building a system of expanded safety awareness that includes increased access to relevant data, integrated analysis capabilities, improved real-time detection and alerting of hazards, full decision support and automated safety mitigation strategies.

Transport Canada (TCCA) - The department within the government of Canada responsible for developing regulations, policies and services of road, rail, marine and air transportation.

Type Certificate (TC) – A design approval issued by the FAA after finding that an applicant's aircraft type design has met the applicable regulations. The type design includes the drawings and specifications, and the airworthiness and operating limitations.

Undue Pressure – An effort to apply an inappropriate or unreasonable amount of persuasion or direction to take an action. Under undue pressure, a person might be concerned about loss of job, loss of respect for technical expertise, and negative impact on pay, performance review or promotions.

Appendix E – References

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