

**BUSINESS AVIATION**

# FAA Releases Part 135 Fatigue Recommendations

by [Kerry Lynch](#)

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The FAA recently released a [77-page report](#) from a government/industry group recommending that the agency adopt an alertness management program (AMP) concept for Part 135 operations to protect against pilot fatigue. While not made public until this month, the report containing the recommendations of the Part 135 Pilot Duty and Rest Aviation Rulemaking Committee (ARC) was submitted to the FAA in July 2021.

Under the ARC concept, an AMP would provide for fatigue monitoring and mitigations to enable an operator to increase duty times and/or reduce rest times. The complexity of the program would depend on the type of operation, the ARC noted, but it said that for AMPs to be effective they must be comprehensive and enforceable and an advisory circular should be issued defining the requirements.

The ARC envisioned AMPs that could be scalable from single-pilot operators to increased levels that would include customized flight, duty, and rest limits. The AMP should be accepted by a principal operations inspector if it meets set criteria. For operators choosing not to adopt an AMP, the ARC recommended strengthened limits that are “deliberately

more restrictive to avoid the potential for unmitigated fatigue but are sufficient for many operations that limit most operations to hours of the day.”

While unclear on whether the recommendations would be adopted, the FAA has included a flight, duty, and rest update as part of its list of future rulemakings. Also, in releasing the report, it noted that the agency “incorporated the ARC’s recommendations in the safety management systems notice of proposed rulemaking” that had been released the day before for on-demand and air tour operators, as well as manufacturers.

That proposal referenced the report and said that as part of a safety management program, “the identification of hazards through SMS may include analyzing the potential risk associated with crewmember fatigue when compounded by variations in individual [Part] 135 operations, such as scheduling variances, frequency of operations, distance, and number of pilots.”

#### **REGULATIONS AND GOVERNMENT**

<https://www.aionline.com/aviation-news/business-aviation/2023-01-25/faa-releases-part-135-fatigue-recommendations>

**Part 135 Pilot Rest and Duty Rules**  
**Aviation Rulemaking Committee**

***Report from the Part 135 Rest and Duty Rules ARC***

July 2, 2021

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## Executive Summary

The Part 135 Pilot Rest and Duty Aviation Rulemaking Committee (ARC) was tasked to identify the effectiveness and deficiencies of the current part 135 regulatory framework, in the context of the Federal Aviation Administration's (FAA) tiered level of safety; and to consider the need to accommodate the diversity of operations conducted under part 135, including unique duty and rest time requirements of air ambulance flightcrew members. The FAA asked the ARC to provide specific consensus comments and recommendations to assist the FAA in future rulemaking activity in this area.

Issues with the current part 135 framework identified by the ARC include deficiencies with regard to enforceability, prospective scheduling of rest, and aspects of the duty and rest rules being too permissive to reliably prevent excessive fatigue, especially as related to cumulative sleep loss and exposure to the window of circadian low. After extensive review of the current part 135 framework, other regulatory frameworks in use in the US and abroad, the part 135 operational context, the relevant fatigue science, opportunities and challenges of using duty and rest regulations to help manage fatigue, and possible costs and benefits associated with regulatory change, the ARC derived – with unanimous consent – a set of core principles as a foundation for recommendations regarding the part 135 pilot rest and duty regulations.

This report contains the ARC's findings which, while aiming to minimize the overall economic impact, include specific recommendations regarding recordkeeping and rest scheduling provisions. This report also contains a detailed proposal for regulating duty and rest with a solution for a subset of part 135 certificate holders with inherently low fatigue-related risk; and a more comprehensive rule set for part 135 certificate holders more likely to be exposed to fatigue-inducing circumstances, including specific provisions for air medical operations, with additional fatigue mitigations codified in an Alertness Management Program for which guidelines are provided.

# 1. Part 135 Pilot Rest and Duty Rules ARC Charter

## 1.1. Original ARC Charter

Effective Date: May 21, 2019

**SUBJECT: Part 135 Pilot Rest and Duty Rules Aviation Rulemaking Committee**

1. **PURPOSE.** This charter establishes the Part 135 Pilot Rest and Duty Rules Aviation Rulemaking Committee (ARC), according to the Administrator's authority under Title 49 of the United States Code (49 U.S.C. § 106(p)(5)). The sponsor of the ARC is the Associate Administrator for Aviation Safety. This charter outlines the ARC's organization, responsibilities, and tasks.
2. **BACKGROUND.** Section 315, Aviation Rulemaking Committee for Part 135 Pilot Rest and Duty Rules, of the FAA Reauthorization Act of 2018 (Pub. L. 115-254) requires the following:

*(a) IN GENERAL.—Not later than 180 days after the date of enactment of this Act, the Administrator shall convene an aviation rulemaking committee to review, and develop findings and recommendations regarding, pilot rest and duty rules under part 135 of title 14, Code of Federal Regulations.*

*(b) DUTIES.—The Administrator shall—*  
*(1) not later than 2 years after the date of enactment of this Act, submit to the appropriate committees of Congress a report based on the findings of the aviation rulemaking committee; and*  
*(2) not later than 1 year after the date of submission of the report under paragraph (1), issue a notice of proposed rulemaking based on any consensus recommendations reached by the aviation rulemaking committee.*

*(c) COMPOSITION.—The aviation rulemaking committee shall consist of members appointed by the Administrator, including—*  
*(1) representatives of industry;*  
*(2) representatives of aviation labor organizations, including collective bargaining units representing pilots who are covered by part 135 of title 14, Code of Federal Regulations, and subpart K of part 91 of such title; and*  
*(3) aviation safety experts with specific knowledge of flight crewmember education and training requirements under part 135 of such title.*

*(d) CONSIDERATIONS.—The Administrator shall direct the aviation rulemaking committee to consider—*  
*(1) recommendations of prior part 135 rulemaking committees;*  
*(2) accommodations necessary for small businesses;*  
*(3) scientific data derived from aviation-related fatigue and sleep research;*  
*(4) data gathered from aviation safety reporting programs;*  
*(5) the need to accommodate the diversity of operations conducted under part 135, including the unique duty and rest time requirements of air ambulance pilots; and*  
*(6) other items, as appropriate.*

**3. OBJECTIVE OF THE ARC.** The ARC will review and develop findings and recommendations regarding pilot rest and duty rules under Title 14, Code of Federal Regulations (14 CFR) Part 135.

**4. TASKS OF THE ARC.** The tasks of the ARC are:

- a. Review the FAA's current part 135 pilot rest and duty rules.
- b. Review other related commercial pilot rest and duty rules, to include those of the International Civil Aviation Organization (ICAO) and 14 CFR part 121.
- c. Identify the effectiveness and deficiencies of the current part 135 framework.
- d. Evaluate the current regulatory framework in the context of the FAA's tiered level of safety and provide specific consensus comments and recommendations to assist the FAA in developing future rulemaking activity in this area. For any recommendation to change regulatory requirements, the ARC will provide cost and benefit estimates.
- e. Consider the provisions under Section 315, paragraph D of Pub. L. 115-254.
- f. Within 16 months from the first meeting after the effective date of the charter, submit a recommendation report.
  - i. The Industry Co-Chair sends the recommendation report to the Associate Administrator for Aviation Safety and the Director of the Office of Rulemaking.
  - ii. The Associate Administrator for Aviation Safety determines when the recommendation report and records, pursuant to paragraph (8), will be made available for public release.

**5. ARC PROCEDURES.**

- a. The ARC acts solely in an advisory capacity by advising and providing written recommendations to the Associate Administrator for Aviation Safety.
- b. The ARC may propose related follow-on tasks outside the stated scope of the ARC to the FAA Co-Chair.
- c. The ARC may reconvene following the submission of the recommendation report for the purposes of providing advice and assistance to the FAA, at the discretion of the FAA Co-Chair, provided the charter is still in effect.

**6. ARC ORGANIZATION, MEMBERSHIP, AND ADMINISTRATION.** As directed by Pub. L. 115-254, the committee shall consist of members appointed by the Administrator, including representatives of industry; representatives of aviation labor organizations, including collective bargaining units representing pilots who are covered by 14 CFR part 135, and subpart K of part 91 of such title; and aviation safety experts with specific knowledge of flight crewmember education and training requirements under part 135.

The FAA will set up a committee of up to 20 members. Membership will be balanced in viewpoints, interests, and knowledge of the topics addressed in the committee's objectives and scope. Subject matter experts may be requested to participate as Observers and/or to provide technical support to the ARC members.

The provisions of the August 13, 2014 Office of Management and Budget (OMB) guidance, "Revised Guidance on Appointment of Lobbyists to Federal Advisory Committees, Boards, and Commissions" (79 FR 47482), continues the ban on registered lobbyists participating on Agency Boards and Commissions if participating in their "individual capacity." The revised guidance allows registered lobbyists to participate on Agency Boards and Commissions in a "representative capacity" for the "express purpose of providing a committee with the views of a nongovernmental entity, a recognizable group of persons or nongovernmental entities (an industry, sector, labor unions, or environmental groups, etc.) or state or local government." For further information, refer to the OMB Guidance at 79 FR 47482.

Membership is limited to promote discussion. Attendance, active participation, and commitment by members is essential for achieving the objectives and tasks. When necessary, the ARC may set up specialized and temporary working groups that include at least one ARC member and invited subject matter experts from industry and government.

- a. At the request of the sponsor, the Flight Standards Service will appoint the FAA Co-Chair and will:
    - 1) Select and appoint industry and the FAA participants as members,
    - 2) Select the Industry Co-Chair from the membership of the ARC,
    - 3) Ensure FAA participation and support from all affected lines-of-business,
    - 4) Provide notification to the members of the time and place for each meeting, and
    - 5) Receive any status report and the recommendations report.
  - b. The Industry Co-Chair will be appointed from the part 135 operations community. Once appointed, the Industry Co-Chair will:
    - 1) Coordinate required ARC meetings in order to meet the objectives and timelines,
    - 2) Establish and distribute meeting agendas in a timely manner,
    - 3) Keep meeting notes, if deemed necessary,
    - 4) Perform other responsibilities as required to ensure the objectives are met,
    - 5) Provide status reports, as requested, in writing to the FAA Co-Chair, and
    - 6) Submit the recommendation report to the FAA Co-Chair and the Director of the Office of Rulemaking.
7. **PUBLIC PARTICIPATION.** Meetings are not open to the public. Persons or organizations outside the ARC who wish to attend a meeting must get approval in advance of the meeting from the Industry Co-Chair and the FAA Co-Chair.
8. **AVAILABILITY OF RECORDS.** Consistent with the Freedom of Information Act, Title 5, U.S.C., § 552, records, reports, agendas, working papers, and other documents that are made

available to or prepared for or by the ARC will be available for public inspection and copying at the Office of Rulemaking, FAA Headquarters, 800 Independence Ave. SW, Washington, D.C. 20591. Fees will be charged for information furnished to the public according to the fee schedule published in Title 49 of the Code of Federal Regulations, Part 7. You can find this charter on the FAA Committee Database website at: [http://www.faa.gov/regulations\\_policies/rulemaking/committees/documents/](http://www.faa.gov/regulations_policies/rulemaking/committees/documents/).

9. **DISTRIBUTION.** This charter is distributed to the Office of the Associate Administrator for Aviation Safety, the Office of the Chief Counsel, the Office of Assistant Administrator for Policy, International Affairs, and Environment, and the Office of Rulemaking.
10. **EFFECTIVE DATE AND DURATION.** The ARC is effective upon issuance of this charter and will remain in existence for a maximum of 24 months, unless the charter is sooner suspended, terminated, or extended by the Administrator.

## 1.2. ARC Charter Extension

Original Effective Date: May 21, 2019  
Extension Effective Date: April 27, 2021

### **SUBJECT: Part 135 Pilot Rest and Duty Rules Aviation Rulemaking Committee**

- 1. PURPOSE.** This charter establishes the Part 135 Pilot Rest and Duty Rules Aviation Rulemaking Committee (ARC), according to the Administrator's authority under Title 49 of the United States Code (49 U.S.C. § 106(p)(5)). The sponsor of the ARC is the Associate Administrator for Aviation Safety. This charter outlines the ARC's organization, responsibilities, and tasks.

The Part 135 Pilot Rest and Duty Rules ARC has requested this extension so that the ARC can draft its recommendation report. The recommendation report is due on July 5, 2021.

- 2. BACKGROUND.** Section 315, Aviation Rulemaking Committee for Part 135 Pilot Rest and Duty Rules, of the FAA Reauthorization Act of 2018 (Pub. L. 115-254) requires the following:

*(a) IN GENERAL.—Not later than 180 days after the date of enactment of this Act, the Administrator shall convene an aviation rulemaking committee to review, and develop findings and recommendations regarding, pilot rest and duty rules under part 135 of title 14, Code of Federal Regulations.*

*(b) DUTIES.—The Administrator shall—*

*(1) not later than 2 years after the date of enactment of this Act, submit to the appropriate committees of Congress a report based on the findings of the aviation rulemaking committee; and*

*(2) not later than 1 year after the date of submission of the report under paragraph (1), issue a notice of proposed rulemaking based on any consensus recommendations reached by the aviation rulemaking committee.*

*(c) COMPOSITION.—The aviation rulemaking committee shall consist of members appointed by the Administrator, including—*

*(1) representatives of industry;*

*(2) representatives of aviation labor organizations, including collective bargaining units representing pilots who are covered by part 135 of title 14, Code of Federal Regulations, and subpart K of part 91 of such title; and*

*(3) aviation safety experts with specific knowledge of flight crewmember education and training requirements under part 135 of such title.*

*(d) CONSIDERATIONS.—The Administrator shall direct the aviation rulemaking committee to consider—*

- (1) recommendations of prior part 135 rulemaking committees;*
- (2) accommodations necessary for small businesses;*
- (3) scientific data derived from aviation-related fatigue and sleep research;*
- (4) data gathered from aviation safety reporting programs;*
- (5) the need to accommodate the diversity of operations conducted under part 135, including the unique duty and rest time requirements of air ambulance pilots; and*
- (6) other items, as appropriate.*

**3. OBJECTIVE OF THE ARC.** The ARC will review and develop findings and recommendations regarding pilot rest and duty rules under Title 14, Code of Federal Regulations (14 CFR) Part 135.

**4. TASKS OF THE ARC.** The tasks of the ARC are:

- a. Review the FAA’s current part 135 pilot rest and duty rules.
- b. Review other related commercial pilot rest and duty rules, to include those of the International Civil Aviation Organization and 14 CFR part 121.
- c. Identify the effectiveness and deficiencies of the current part 135 framework.
- d. Evaluate the current regulatory framework in the context of the FAA’s tiered level of safety and provide specific consensus comments and recommendations to assist the FAA in developing future rulemaking activity in this area. For any recommendation to change regulatory requirements, the ARC will provide cost and benefit estimates.
- e. Consider the provisions under Section 315, paragraph D of Pub. L. 115-254.
- f. Submit a recommendation report on July 5, 2021.
  - i. The Industry Co-Chair sends the recommendation report to the Associate Administrator for Aviation Safety and the Executive Director of the Office of Rulemaking.
  - ii. The Associate Administrator for Aviation Safety determines when the recommendation report and records, pursuant to paragraph (8), will be made available for public release.

**5. ARC PROCEDURES.**

- a. The ARC acts solely in an advisory capacity by advising and providing written recommendations to the Associate Administrator for Aviation Safety.
- b. The ARC may propose related follow-on tasks outside the stated scope of the ARC to the FAA Co-Chair.
- c. The ARC may reconvene following the submission of the recommendation report for the purposes of providing advice and assistance to the FAA, at the discretion of the FAA Co-Chair, provided the charter is still in effect.

**6. ARC ORGANIZATION, MEMBERSHIP, AND ADMINISTRATION.** The organization, membership, and administration remain unchanged. As directed by Pub. L. 115-254, the committee shall consist of members appointed by the Administrator, including representatives of industry; representatives of aviation labor organizations, including collective bargaining units representing pilots who are covered by 14 CFR part 135, and subpart K of part 91 of such title; and aviation safety experts with specific knowledge of flight crewmember education and training requirements under part 135.

The FAA will set up a committee of up to 20 members. Membership will be balanced in viewpoints, interests, and knowledge of the topics addressed in the committee’s objectives and scope. Subject matter experts may be requested to participate as Observers and/or to provide technical support to the ARC members.

The provisions of the August 13, 2014 Office of Management and Budget (OMB) guidance, “Revised Guidance on Appointment of Lobbyists to Federal Advisory Committees, Boards, and Commissions” (79 FR 47482), continues the ban on registered lobbyists participating on Agency Boards and Commissions if participating in their “individual capacity.” The revised guidance allows registered lobbyists to participate on Agency Boards and Commissions in a “representative capacity” for the “express purpose of providing a committee with the views of a nongovernmental entity, a recognizable group of persons or nongovernmental entities (an industry, sector, labor unions, or environmental groups, etc.) or state or local government.” For further information, refer to the OMB Guidance at 79 FR 47482.

Membership is limited to promote discussion. Attendance, active participation, and commitment by members is essential for achieving the objectives and tasks. When necessary, the ARC may set up specialized and temporary working groups that include at least one ARC member and invited subject matter experts from industry and government.

- a. At the request of the sponsor, the Flight Standards Service appoints the FAA Co-Chair and will:
  - 1) Select and appoint industry and the FAA participants as members;
  - 2) Select the Industry Co-Chair from the membership of the ARC;
  - 3) Ensure FAA participation and support from all affected lines-of-business;
  - 4) Provide notification to the members of the time and place for each meeting; and
  - 5) Receive any status report and the recommendations report.
  
- b. The Industry Co-Chair is appointed from the part 135 operations community. The Industry Co-Chair will:
  - 1) Coordinate required ARC meetings in order to meet the objectives and timelines;
  - 2) Establish and distribute meeting agendas in a timely manner;
  - 3) Keep meeting notes, if deemed necessary;
  - 4) Perform other responsibilities as required to ensure the objectives are met;
  - 5) Provide status reports, as requested, in writing to the FAA Co-Chair; and

- 6) Submit the recommendation report to the FAA Co-Chair and the Executive Director of the Office of Rulemaking.
7. **PUBLIC PARTICIPATION.** Meetings are not open to the public. Persons or organizations outside the ARC who wish to attend a meeting must get approval in advance of the meeting from the Industry Co-Chair and the FAA Co-Chair.
8. **AVAILABILITY OF RECORDS.** Consistent with the Freedom of Information Act, Title 5, U.S.C., § 552, records, reports, agendas, working papers, and other documents that are made available to or prepared for or by the ARC will be available for public inspection and copying at the Office of Rulemaking, FAA Headquarters, 800 Independence Ave. S.W., Washington, D.C. 20591. Fees will be charged for information furnished to the public according to the fee schedule published in Title 49 of the Code of Federal Regulations, Part 7. You can find this charter on the FAA Committee Database website at: [http://www.faa.gov/regulations\\_policies/rulemaking/committees/documents/](http://www.faa.gov/regulations_policies/rulemaking/committees/documents/).
9. **DISTRIBUTION.** This charter is distributed to the Office of the Associate Administrator for Aviation Safety, the Office of the Chief Counsel, the Office of Assistant Administrator for Policy, International Affairs, and Environment, and the Office of Rulemaking.
10. **EFFECTIVE DATE AND DURATION.** The ARC is effective upon issuance of this charter and will remain in existence for a maximum of 12 months, unless the charter is sooner suspended, terminated, or extended by the Administrator.

## 2. Part 135 ARC Membership

The Part 135 Pilot Rest and Duty Rules Aviation Rulemaking Committee (ARC) membership included representation from a wide spectrum of stakeholders and represented varying expertise, interests, and viewpoints. The industry could not be represented on the ARC in its entirety due to the diversity of the industry; single pilot operators holding OpSpec A040 authorization in particular were not directly represented. The conversations of the ARC focused primarily, but not exclusively, on on-demand passenger operations, and the recommendations in this report reflect those conversations. The ARC called on subject matter experts to better understand some of industry segments that were not directly represented by the ARC membership. Table 1 shows the names and organizations of the members of the ARC.

**Table 1.** Members of the Part 135 ARC.

<b>Name</b>	<b>Organization</b>	<b>ARC Title</b>
Kent S. Jackson	Jetlaw, LLC	Industry Chair
Daniel Carey	FAA, Part 135 Air Carrier Operations Branch	Designated Federal Official
Alex Beringer	Fair Wind Air Charter	Member
Tony Bonham	Air Evac Lifeteam	Member
Bill Cush	Cape Air	Member
Lauri Esposito	CAPA	Member
Dennis Florian	Flexjet	Member
Michael Hanson	NJASAP	Member
John W. Hazlet	RACCA	Member
Chris Hill	HAI	Member
Steven R. Hursh	IBR	Member
Tom Klassen	Halo-Flight	Member
Brian Koester	NBAA	Member
Eric McCarty	NetJets	Member
Bill McDonald	A4A	Member
Jessica Naor	Grandview Aviation	Member
Brian Noyes	ALPA	Member
Marilyn Rhude	IBT	Member
W. Ashley Smith, Jr.	Jet Logistics, Inc.	Member
Hans P.A. Van Dongen	Washington State University	Member
Sally Veith	AMOA	Member
Ryan Waguespack	NATA	Member
Eric Walter	Bemidji Aviation	Member

### **3. Part 135 ARC Objective**

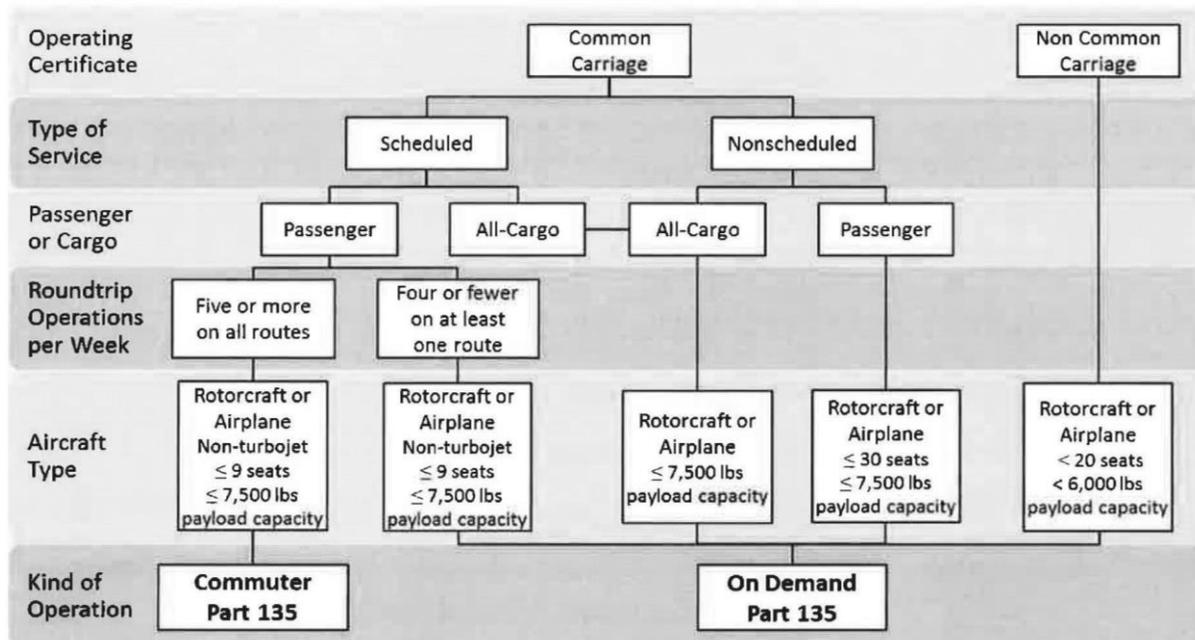
Consistent with its Charter (see section 1), the objective of the Part 135 ARC was to recommend revisions to the applicable regulatory framework to achieve the following:

- Reduce the potential for excessive fatigue across the complexity of part 135 operations.
- Provide a tiered approach with options for effective management of fatigue that fits a variety of business models and operational fatigue risks.
- Improve the enforceability of part 135 regulations.
- Minimize the economic impact of the ARC's recommendations.
- Ensure the continued provision of air medical services within a consistent fatigue risk management framework.
- Create additional protections for flightcrew members flying during or through the window of circadian low (WOCL).

## 4. Rationale and Science

### 4.1. Complexity of the Part 135 Industry

The FAA tasked the Part 135 ARC to consider the need to accommodate the diversity of operations conducted under part 135, including the unique duty and rest time requirements of air ambulance flightcrew members. Covering more than 1,900 certificate holders, the regulatory framework of part 135 reflects the industry's unique needs, which are diverse in terms of size, scope, and mission. See Figure 1.



**Figure 1.** Overview of part 135 operations. Source: Study of Operators Regulated under Part 135, Federal Aviation Administration, April 2016.

Some *on-demand* part 135 operators with “air feeder” operations elect to use the *scheduled* regulations (14 CFR § 135.265), as the nature of their flying makes that section of the regulations most practicable for them. The repetitive nature of such operations, with schedules set by their large integrator customers (e.g., FedEx, UPS) provides opportunities for fatigue mitigation through predictable rest and often also provides a significant mid-day sleep opportunity.

Part 135 operators vary widely in size, both by the number of employees and management personnel required by part 119 and the size of aircraft used in their operations. Operations range in size from a single-engine piston aircraft to several hundred turbojet aircraft. Notably, the Small Business Administration (SBA) measures the part 135 industry by the number of employees. A “small business” has a maximum of 1,500 employees for:

- Scheduled passenger air transportation
- Scheduled freight air transportation
- Nonscheduled chartered passenger air transportation
- Nonscheduled chartered freight air transportation

According to the FAA's Air Operator Information Table,<sup>1</sup> part 135 operators range in size up to 4,500 employees. Currently, only three operations would not qualify as a small business as defined by SBA. Less than 10% of part 135 certificate holders employ more than 50 people, and the average is 30 employees. More than 300 operators employ only a single person, so that the single employee must run the business as well as accomplish all the tasks typically assigned to a flightcrew member. These tasks include, but are not limited to:

- Administrative duties
- Aircraft servicing
- Aircraft stocking
- Customs coordination (as required)
- De-icing (as required)
- Exterior cleaning/detailing
- Flight planning
- Flight plan filing
- Flying the aircraft
- Interior cleaning/detailing
- Loading and unloading of baggage/cargo
- Passenger requests
- Pre-flight inspections
- Post-flight inspections

Part 135 operations vary by scope. Scope ranges from single pilot operators holding OpSpec A040 authorization flying single-engine piston-powered aircraft that carry only one or two passengers to large ultra-long-range multi-engine turbine-powered aircraft able to seat up to 300 passengers. It is also worth noting that part 135 includes fixed-wing and rotor-wing operations, which may fly very short legs dozens of times per day.

The industry uniquely accommodates commercial on-demand missions. Missions are not limited to large airports; rather, part 135 operators may take passengers or cargo to non-towered airports, buildings, oil rigs, ships, or mountainsides. Some operate on a fixed schedule, repeatedly flying the same routes which are known well in advance. On the other hand, many missions may occur without regularity or on short notice, such as air ambulance missions.

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<sup>1</sup> [https://av-info.faa.gov/dd\\_sublevel.asp?Folder=%5CAirOperators](https://av-info.faa.gov/dd_sublevel.asp?Folder=%5CAirOperators)

Airplane and helicopter air ambulance operations are considered an essential service for the communities they serve. Congress, the FAA, and the Cybersecurity and Infrastructure Security Agency have recognized the need for these 24-hour services, which provide critical life-saving care to their passengers. The emergency nature of their mission often requires air ambulance operations to dispatch with only a few minutes notice to save lives. Because these missions are often life-critical, they were afforded due consideration throughout the ARC's discussions.

Other part 135 operator missions may include, but are not limited to:

- Private passenger transportation
- Cargo transportation
- Aerial Inspection
- Construction
- Firefighting
- Aerial advertising
- Surveillance
- Oil and gas offshore transport
- Air ambulance
- Transport of emergency personnel
- Organ transplant transportation

## **4.2. Effectiveness and Deficiencies of the Current Part 135 Framework**

### **4.2.1. Effectiveness**

The current part 135 regulations for pilot rest and duty, which became effective October 1, 1986, differentiate between the rest and flight time limitations for scheduled operations, on-demand operations, and medical emergency flights. This differentiation allows an operator to adopt the rest schemes best suited to the conditions under which it will operate, as found in Title 14 of the Code of Federal Regulations (14 CFR) part 135 subpart F (§§ 135.261 through 135.273).

Although these operations and the associated regulatory rest and flight time limits may vary by type of operation, they are relatively simple in nature and apply equally among certificate holders, regardless of size or complexity. Additionally, these simple regulations allow flightcrew members and operators to track regulatory compliance without memorizing a complex set of regulations.

The duty and flight time limitations of part 135 seek to prevent cumulative fatigue, which occurs after multiple, successive periods of extended wakefulness. The current part 135 framework is effective in that regard for day operations. This is acceptable for many operators, particularly those that fly exclusively during the day or only occasionally fly at night, which accounts for a significant percentage of certificate holders. Limiting time on duty to 14 hours

and requiring 10 hours of rest for day operations helps to place sleep opportunities for flightcrew members in the WOCL, which contributes to preventing cumulative fatigue from diminishing flightcrew member performance.

#### **4.2.2. Deficiencies**

Fatigue science has advanced significantly since the current regulations were established. Many certificate holders take advantage of the flexibility provided by the part 135 rule set, which sometimes puts them in situations of potential fatigue that would not be recommended based on current science. For operators conducting flights on short notice, at night, across multiple time zones, or with extended range enabled by modern aircraft, the regulations can be improved by adding additional clarity and incorporating scientific advancements. The part 135 rest and duty regulations would also benefit from enhancing provisions that require rest to be assigned prospectively, adding clarity to reduce or eliminate the need for chief counsel interpretations, adopting performance-based measures, incorporating protections for flightcrew members flying through the WOCL and/or across multiple time zones, addressing crew rest facilities, and creating mechanisms to enable enforcement.

Since the current regulations pertaining to rest and duty for part 135 became effective, the FAA Office of the Chief Counsel has published more than four dozen opinions and legal interpretations to help operators and inspectors understand operators' regulatory obligations. This large number of interpretations illustrates that a pared-down regulation may not be clear enough to allow for consistent practical application of the regulation. Thus, a simple regulation may make it difficult for operators to understand their responsibilities fully without significant research and indicates the regulations could benefit from additional context and clarity.

Current part 135 regulations apply equally to all operations within each subpart, requiring the same restrictions no matter the fatigue risk to an operation. By contrast, tiered regulations would allow operators to apply the mitigations necessary to meet the required safety levels. Less risky operations would necessitate fewer mitigations, while more risky operations would require more mitigations to reach the same level of safety.

At the time the current part 135 regulations were developed, fatigue science was limited in scope and understanding of the biological processes underlying fatigue. These biological processes and their interactions with operationally relevant circumstances are now much better understood, contributing to a greater understanding of fatigue risks and effective mitigations for flightcrew members. It is clear that there is a need to address previously unforeseen risks associated with a variety of part 135 operations.

Deficiencies in existing part 135 regulations include:

- No requirement for an operator to document duty time, rest time, or the time at which assignments are made. This makes enforcement impossible for safety inspectors. Prospective rest is a legal requirement per 14 CFR § 135.267, with multiple letters of interpretation addressing the issue of rolling rest (Orellana 2015, Kidd 2017, Jimenez

2011, etc.). “Rolling rest” is the illegal and widespread practice of requiring a crew member to be in rest on a rolling (continuing) basis without assigning an end to the rest period. In a rolling rest operation, crew members complete a duty period and are then left “in rest” indefinitely until called in for a new duty assignment, leaving them in a constant “on call” state with no ability to plan sleep adequately. It is widely known among the part 135 community that some operators, either intentionally or unknowingly, use rolling rest.

- No accounting for additional risks associated with flying through the WOCL. Current flight and duty limits apply equally around the clock. Modern science tells us that each person’s level of fatigue ebbs and flows throughout a 24-hour day. Fatigue is high and alertness is low during the WOCL, which is around 0200–0600 (in the time zone to which they are acclimated) for most individuals. Regulations should account for the additional safety risks of increased fatigue during this period.
- No mitigations for flights across multiple time zones. Flightcrew members’ circadian rhythm is tied to their acclimated location; when flightcrew members travel across multiple time zones, daylight and the internal drive to sleep are not aligned. Obtaining recuperative sleep at night in the new time zone is therefore difficult.
- Insufficient definition for adequate sleeping facilities. Under the current regulations, operations using an augmented crew must be conducted on aircraft equipped with adequate sleeping facilities. Varying degrees of isolation, size, darkness, and comfort, depending on what is allowable in different parts of the country, results in a competitive advantage for some operators and poor-quality rest for some flightcrew members.

These deficiencies have possible solutions based in scientific evidence, which are already implemented to some degree by various part 135 operators and have also found widespread use in other operational settings in aviation, other modes of transportation, and other industry sectors.

#### **4.2.3. Review of other related commercial pilot rest and duty rules**

Commensurate with the tasks assigned to the ARC, the committee commenced a review of the pilot rest and duty rules of multiple regions and countries. The foci of review were 14 CFR part 121, 14 CFR part 117, Canadian Aviation Regulations (CARs), European Union Aviation Safety Agency (EASA) regulations, and documents from the International Civil Aviation Organization (ICAO) including Standards and Recommended Practices (SAPRs), Document 9966, the Fatigue Management Guide (FMG) for General Aviation Operators of Large and Turbojet Airplanes, and the FMG for Helicopter Operators.

Further, the ARC honored ICAO guidance stating that the regulations shall be based upon scientific principles, knowledge, and operational experience with the aim of ensuring flightcrew members are performing at an adequate level of alertness. ICAO also states that the regulations

shall establish prescriptive limits for flight time, duty period limitations, rest period requirements, and, where authorized, the use of a Fatigue Risk Management System (FRMS).

The ARC noted that, under ICAO and other foreign regulatory frameworks, all commercial operations are required to follow a single set of regulations. The FAA's regulatory framework takes a more risk-based approach and bifurcates the regulations for commercial operations into two parts: part 121 for large, scheduled operations and part 135 for on-demand and commuter operations.

All foreign rest and duty rules recognize the WOCL and limit of allowable duty times, as well as maintain cumulative limits to address cumulative fatigue. Additionally, the ARC felt keeping hard limits on allowable flight time remained consistent with past practice and current regulations. The ARC membership believes the recommendations of the ARC meet these standards, have adopted the best practices reviewed, and are inclusive of allowing FRMS-based regulations (see section 6).

### **4.3. Scientific Concepts Governing Fatigue and Alertness**

The fatigue associated with duty and rest schedules, and the mitigation thereof, is scientifically well understood (Dinges et al., 1996; Rosekind et al., 1996; Caldwell et al., 2009; Van Dongen & Hursh, 2011; Van Dongen et al., 2017) and has previously been described in the 2010 FAA Advisory Circular 120-100. Scientific evidence is more limited regarding the fatiguing effects of workload (e.g., Honn et al., 2016) and the rate of dissipation of fatigue after time zone changes (e.g., Powell et al., 2010), but extensive operational experience provides some knowledge on these topics. For the purposes of this report, the following is a reasonable summary of the relevant knowledge base:

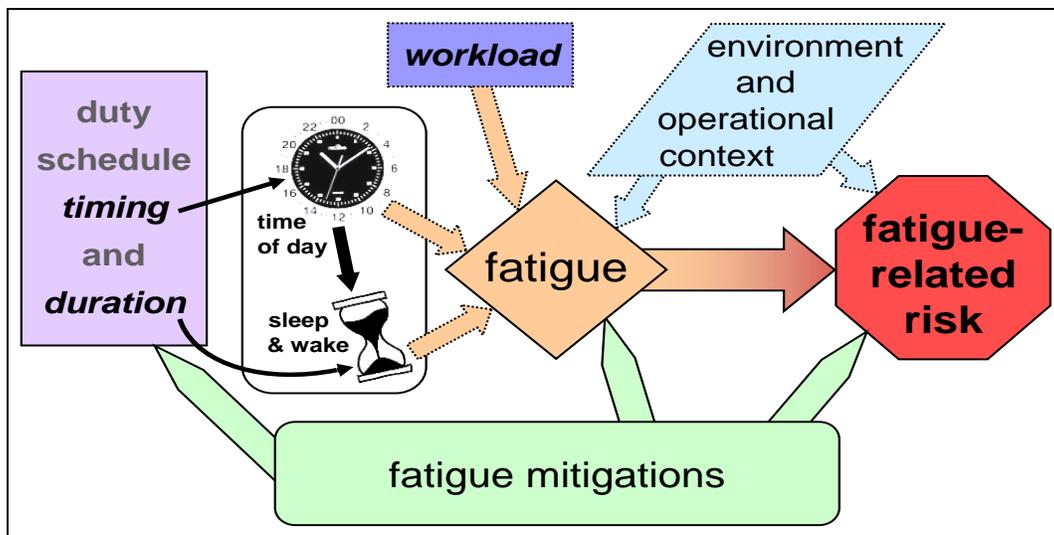
- The average adult needs at least 7 hours of recuperative sleep per day (Watson et al., 2015).
- Loss of sleep relative to this daily sleep need induces fatigue.
- Repeated loss of sleep across consecutive days leads to a progressive build-up of fatigue.
- Catch-up sleep is needed to recover from prior sleep loss.
- Recovery from sleep loss is relatively quick (1–2 days of unrestricted sleep) after a single bout of acute sleep loss, but takes multiple days after repeated exposure to sleep loss.
- Consolidated sleep is most efficient for recovery. Napping can partially compensate for lost sleep.
- The biological clock promotes alertness during the afternoon and early evening, and fatigue during the night and early morning.

- The fatigue-inducing and sleep-promoting effect of the biological clock is strongest during the primary WOCL, approximately between 0200 and 0600 (in the reference time zone).
- There is a secondary fatigue-inducing and sleep-promoting WOCL in the afternoon, approximately between 1500 and 1700 (in the reference time zone), which is moderately conducive to a daytime nap.
- Sleep loss amplifies the fatigue-inducing effect of the primary WOCL and the afternoon secondary WOCL.
- The quality and quantity of sleep obtained during a rest opportunity is greatest during the physiological night, when the biological clock does not promote alertness. For most people, this includes the period from 0100 to 0700 (in the reference time zone).
- Sleep outside the physiological night tends to have less recuperative value.
- The rhythm of the biological clock, and thereby the physiological night and the WOCL, is relatively robust to travel across time zones over the short term (up to 2 days), staying anchored to the reference time zone.
- Across a longer stay in a new time zone, the biological clock gradually adapts, and the new time zone becomes the reference time zone. The time it takes for the biological clock to adapt to the new time zone depends on multiple factors and is not well understood; in the context of managing fatigue, 3 days is a reasonable estimate as a rule of thumb.
- Whether high workload has a fatigue-inducing effect per se is not well understood. However, high workload exposes fatigue built up across consecutive days due to sleep loss and/or WOCL exposure.
- Other variables related to the operational context – e.g., ambient light and temperature, time pressure, delays, weather, crowded airspace, air traffic control interactions – can also expose fatigue built up across consecutive days due to sleep loss and/or WOCL exposure.
- Self-assessment of fatigue is not a reliable gauge of the actual, objective state of fatigue.
- Fatigue increases risk of errors, which may contribute to incidents and accidents.
- This fatigue-related risk may be alleviated or enhanced by the environment and the operational context.
- A variety of fatigue mitigations is available to help manage fatigue-related risk. These include duty and rest schedule interventions (e.g., nap opportunities), fatigue countermeasures (e.g., caffeine), and safety measures (e.g., flight augmentation).

The timing and duration of duty and rest periods dictate when crewmembers must be awake or have opportunities to sleep and for how long. There is thus a direct relationship between duty and rest schedules and fatigue-related risk; see Figure 2 for an illustration. Scheduling practices may increase fatigue, but – with an understanding of the underlying principles – can also be harnessed to address fatigue. Because factors in the environment and the operational context may affect fatigue during duty periods and sleep during rest periods in ways that are not

necessarily related to the schedule, other fatigue controls (e.g., pre-flight risk assessments, fatigue reporting) are also needed. With such additional tools in place, however, science-based duty and rest regulations can help manage fatigue-related risk.

Even so, the relationship between duty and rest scheduling and fatigue-related risk is multifactorial. Moreover, because fatigue outcomes depend on time of day and prior sleep debt, the relationship between duty and rest scheduling and fatigue-related risk is history-dependent and non-linear. This relationship may even be non-monotonic (i.e., changing direction); for example, a longer period of wakefulness may in some cases be associated with reduced fatigue, like when the wake extension falls in the late afternoon when the biological clock promotes alertness (Honn et al., 2019). These challenges clarify why the part 135 ARC charter called specifically for addressing WOCL exposures and cumulative fatigue. They also explain why duty and rest regulations aiming to address fatigue must either consider only a limited set of scheduling possibilities (where the impact of these issues can be known to be limited); or incorporate a degree of regulatory complexity and codify the use of other fatigue controls through an Alertness Management Program (AMP). This is further explained in section 4.5.



**Figure 2.** Schematic of scientific principles underlying the relationship between duty and rest scheduling and fatigue-related risk during part 135 operations.

#### 4.4. Core Principles Guiding the Development of Recommendations

With careful consideration of the diversity of operations and the potential sources of fatigue in the part 135 industry, the ARC unanimously agreed upon the following core principles to guide the development of regulatory recommendations based on the available science of fatigue:

- A. Recognize that the two primary factors that modulate alertness are the circadian rhythm and sleep drive. Fatigue is controlled by:
  - a. Managing the timing of duties relative to the circadian function; and
  - b. Managing the opportunities for sleep (rest) to minimize excessive sleep debt.

*Hence, the ARC concluded that the prescriptive limits should do the following:*

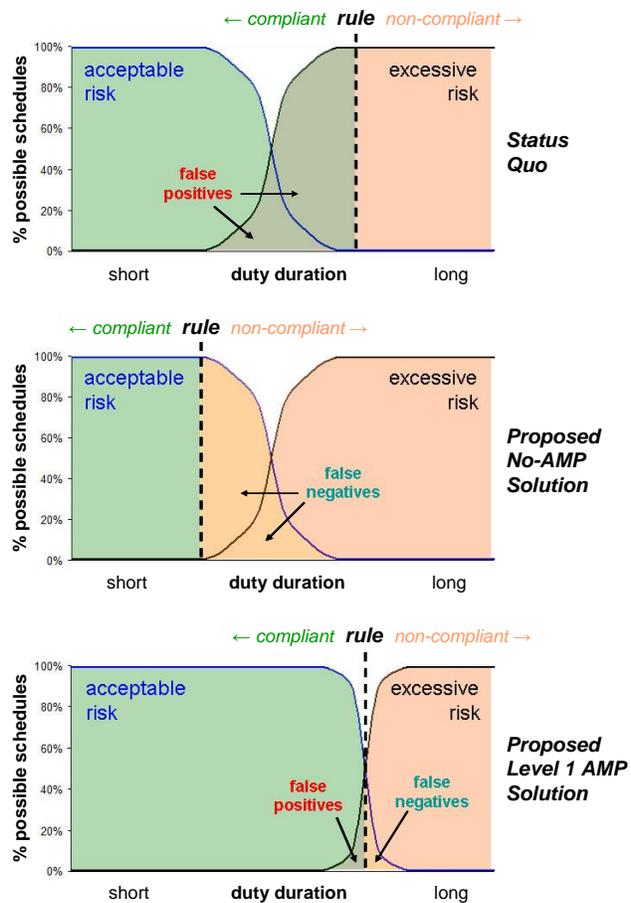
- B. Limit exposure to unmitigated WOCL duties.
- C. Limit cumulative fatigue that results from consecutive unmitigated WOCL exposures.
- D. Protect sleep opportunities (or rest) as the primary mitigation for fatigue.
- E. Prevent rolling rest and require that rest be assigned prospectively.
- F. Encourage sleep opportunities during duty that can serve to mitigate fatigue. When beneficial sleep opportunities are provided during a duty, allow for additional duty time to accommodate that rest time as a function of time of day.
- G. Recognize that the recuperative value of a sleep opportunity is based on circadian physiology and that there are two times in the day when sleep propensity is optimal.
- H. Recognize that consistency in rest and duty scheduling improves the ability of flightcrew members to plan sleep opportunities so as to be more rested and fit for duty.
- I. Recognize that many activities are part of duty in part 135 operations, and those duties may occur prior to, during, and after flight time and limit opportunities for sleep.
- J. From a safety perspective, eliminate “tail-end ferries” that function like additional duty time beyond allowable limits and reduce sleep opportunities.
- K. Accommodate the diversity of part 135 operations.
- L. Recognize the unique nature of air medical operations serving a life-saving function.
- M. Create hard limits and requirements that are enforceable. Require recordkeeping regarding the scheduling of both duties and prospective rest.
- N. Recognize that Fitness for duty is a joint responsibility between flightcrew members and operators.
- O. Provide a low-cost and simple-to-implement alternative for relatively small operations that operate mostly during the day and have limited fatigue-inducing WOCL exposures.

- P. Provide for the use of an AMP that increases operational flexibility and provides additional opportunities to operate into the WOCL.
- Q. Accommodate international operations that move across theaters, while considering the physiology of circadian adjustment. Recognize that currently many part-135 flightcrew members do not have a defined home base that serves as a constant time zone reference.
- R. Recognize that flight time (independent of duty time) is a workload factor. While there is minimal science to guide flight time limits, flightcrew experience can be relied upon to guide those limits.
- S. Recognize that the impact of flight time on safety is amplified when in a state of reduced alertness such as during operations in the WOCL.

## **4.5. Framework of Recommendations**

### **4.5.1. Scientific basis for regulatory approach**

Science- and data-based development of effective regulations for duty and rest to help minimize fatigue and manage fatigue risk involves a balancing act between (1) schedules that are highly fatigue-avoiding but too restrictive to be workable in day-to-day operations versus (2) schedules that are operationally flexible but too permissive to reliably address fatigue (Honn et al., 2019). Complicating this endeavor is the fact that the relationship between duty and rest duration on the one hand, and fatigue and fatigue-related risk on the other hand, is non-linear and non-monotonic – meaning that sometimes more duty time does not lead to increased fatigue, and sometimes more rest time does not lead to reduced fatigue, as co-determined by time of day (through circadian rhythm) and other factors (see section 4.3 on the science of fatigue). As such, finding an optimal rule set is inherently an exercise in compromise, as illustrated in Figure 3.



**Figure 3.** Balancing between being too restrictive versus being too permissive in the development of duty and rest rules to address fatigue risk. Each graph shows the percentage of possible schedules of a given duty duration with either acceptable risk (blue curve) or excessive risk (black curve), plotted as a function of duty duration (short to long). For regulations to be effective at addressing fatigue, there needs to be a high level of congruence between acceptable risk (blue curve) and rule compliance (green background) on the one hand, and excessive risk (black curve) and rule non-compliance (orange background) on the other hand, so that compliance may be expected to engender low risk. However, because of the non-linear and non-monotonic relationship of duty and rest durations to fatigue (e.g., more duty time does not always lead to greater fatigue, depending on time of day and other factors), the separation between acceptable versus excessive risk based on rule compliance is not perfect. There can be “false positives” (brownish area under the curve), which are schedules that are rule compliant but would be associated with excessive risk); and there can be “false negatives” (yellow area under the curve), which are schedules that

are non-compliant even though they would have acceptable risk). In general, the fewer false positives (i.e., conditions that are legal but create excessive risk), the more effective the regulatory framework for addressing fatigue. These concepts are illustrated here for a given rule prescribing a particular duty duration limit as part of a larger rule set. *Top panel:* In this simplified representation of the current part 135 duty and rest regulations (status quo), the rules are too permissive, which allows for considerable scheduling flexibility – but not all rule-compliant schedules have acceptable risk, with too many false positives that undermine regulatory effectiveness in avoiding fatigue risk. *Middle panel:* One way to reduce the number of false positives is to purposely set comparatively restrictive duty and rest limitations in order to prohibit any schedules that might include false positives. This comes at the cost of increasing false negatives (i.e., prohibiting schedules that would have had acceptable risk) and thus less scheduling flexibility, but would be suitable for operations that do not require much scheduling flexibility (e.g., operations that are limited predominantly to schedules that avoid the WOCL, with only occasional short schedules that infringe on the WOCL). This approach to addressing fatigue risk is straightforward to implement without requiring an AMP to address false positives, yet still improves regulatory effectiveness in addressing fatigue risk. *Bottom panel:* Another way to reduce the number of false positives is to institute a more elaborate rule set and incorporate fatigue countermeasures, coupled with an AMP to address false positives. This approach actually accomplishes three things: a greater subset of schedules would have acceptable risk, there are fewer false positives and false negatives, and the AMP is a secondary barrier to address the occasional false positive. That is, by embracing a degree of complexity in the rule set and specifying the implementation of preselected fatigue countermeasures in a Level 1 AMP (see section 6.2), a high level of scheduling flexibility can be retained while simultaneously improving regulatory effectiveness in addressing fatigue risk.

A priority in the development of effective regulations for duty and rest is to prevent schedules that are rule-compliant but do not sufficiently address fatigue risk (“false positives”), which is considered to be a problem with the current part 135 duty and rest regulations; see the top panel of Figure 3. One way to improve regulatory effectiveness is through a prescriptive rule set that is purposely restrictive, so that false positive cases are ruled out while accepting an increase in false negative cases. This approach emphasizes fatigue-avoidance over flexibility, as illustrated in the middle panel of Figure 3. This would not be suitable across the full range of circumstances that characterize the diversity of part 135 operations, but it could be readily used in a subset of operations for which fatigue risk is generally low and the relationship between duty and rest durations and fatigue is approximately linear – such as operations that predominantly work daytime schedules. Such operations could be effectively regulated with a small and straightforward set of rules that is comparatively restrictive by design, and need not be burdened with overhead from extensive scheduling or fatigue mitigation requirements. With maximal overlap between rule compliance and acceptable risk, such a simple prescriptive rule set is expected to be intrinsically safe most of the time. This notion provides a basis for the no-AMP duty and rest requirements proposed in section 7.1.

While a prescriptive rule set that is purposely restrictive should be effective in addressing fatigue, it would limit access to some scheduling options that are not expected to be particularly fatiguing and, moreover, it would severely limit scheduling for operations that may be inherently fatiguing due to WOCL infringement, repeated exposure to sleep loss, and/or other fatigue factors. Some operations, therefore, may need to (or wish to) manage fatigue differently – not through a purposely restrictive rule set, but rather through implementation of science- and data-based fatigue mitigations that reduce risk overall (i.e., put more scheduling options into the realm of acceptable risk) and bring about a better separation between schedules with acceptable versus unacceptable risk. Such mitigations could include more elaborate duty and rest rules that account for time of day, cumulative effects, and other fatigue factors; in combination with a range of preselected fatigue countermeasures, which would be specified in an AMP. The added complexity leads to more scheduling options and greater congruence between compliance and acceptable risk, thereby keeping a high level of scheduling flexibility while improving effectiveness of the regulatory framework, as illustrated in the bottom panel of Figure 3. This concept provides a basis for the Level 1 AMP duty and rest requirements proposed in sections 7.2 through 7.6 (in addition to section 7.1), with the Level 1 AMP requirements described in section 6.2.

Because of the considerably non-linear relationship between duty and rest hours and fatigue, as well as the effects of fatigue countermeasures, even an elaborate rule set and the implementation of selected fatigue countermeasures would leave some scheduling options classified as non-compliant while not excessively risky. (These are the remaining false negatives in the bottom panel of Figure 3.) Opening up these schedules for use in operations through an even more elaborate rule set or a wider selection of fatigue countermeasures is possible in principle based on science and data (Gurubhagavatula et al., 2021), but to codify this generically across the wide variety of part 135 operations would result in an unacceptable level

of regulatory complexity. However, doing so in a more limited fashion, specific for any given operation, is feasible; this provides a basis for the Level 2 AMP option proposed in section 6.3.

The relatively simple, more restrictive no-AMP approach and the more elaborate, less restrictive AMP-based approach combine to form a tiered approach to regulations, thereby fulfilling one of the criteria laid out in the ARC's charter.

#### **4.5.2. Regulatory and practical implementation**

The prescriptive rule sets described in section 7 and the AMP requirements described in section 6 can be implemented in regulatory language and operational practice in various different ways. The most straightforward is in the form of a set of separate provisions that are either met or not met – regulatory compliance is achieved when the applicable provisions are all met. This is the way the proposed rules are described in this report, taking the form of tables for the duty and rest requirements and (check)lists for the AMP requirements. The intent of the ARC was to recommend a process whereby, with proper recordkeeping, compliance should be readily verifiable and enforceable, whether by flightcrew members, operators, or regulators, or through the use of computer software.

One alternative implementation that was proposed involves a point-based scoring system, rather than a strictly rule-based system, to capture and prevent the occurrence of excessive fatigue. Biomathematical models of fatigue, which compute expected fatigue levels based on a given duty and rest (or wake and sleep) schedule, represent a science-based variation of this idea. Biomathematical models of fatigue capture the non-linear relationships between duty and rest on the one hand, and fatigue on the other hand, through mathematical equations reflecting the known science of fatigue (Hursh et al., 2016). In principle, these equations could be mimicked through a point-based scoring system, but to work reliably, such a system would need to be so fine-grained as to be nearly unworkable (or more effectively done with a biomathematical model). That complication aside, a primary difference between a rule-based system and a point-based scoring system to manage fatigue lies in the approach to information gathering. An efficient implementation of a rule-based system would call for just enough information (e.g., planned duty length, prior rest duration) to make a determination on the applicable rules, until either one encounters a rule that is not met (meaning non-compliance) or all applicable rules are met (meaning compliance). A point-based scoring system, by design, would require information on each of the items being scored, which would have to form a sufficiently rich data set to cover the diversity of part 135 operations. The sum (or some other algebraic function) of the scores obtained would then be compared to a predefined threshold that should differentiate scenarios with acceptable risk from scenarios with excessive risk, similar to the illustration in the bottom panel of Figure 3. This process could potentially be reduced to a single decision point for determining regulatory compliance for a given schedule, which curbs complexity on that end.

A point-based scoring system could also be implemented to constitute a performance-based regulatory approach to managing fatigue (Honn et al., 2019), rather than a prescriptive regulatory approach like that considered in this report. In a performance-based regulatory

approach, compliance is not judged based on whether *duty* and *rest* meet certain criteria deemed to be associated with acceptable risk, but rather whether *fatigue* as an outcome stays below a certain threshold deemed to represent acceptable risk. It is important to note that in this context, fatigue would have to be measured objectively and not just by self-report, as subjective fatigue assessments based on self-report cannot be relied upon to accurately reflect objective fatigue (Van Dongen et al., 2003; Honn et al., 2016; Sparrow et al., 2016). Yet, in operational settings where there is evidence that, at least in principle, objective fatigue could be measured relatively easily and reliably, such as commercial motor vehicle driving (Sparrow et al., 2019), a performance-based regulatory approach to managing fatigue could be effective. A key obstacle to implementation is the problem that, strictly speaking, regulatory compliance can be verified only retrospectively or in the moment – that is, based on measurements obtained during actual operations. This issue can be overcome with the use of biomathematical modeling of fatigue, which may be used to make prospective assessments of the expectation of performance-based regulatory compliance of schedules yet to be executed, to subsequently be verified retrospectively with actual measurements obtained during operations. It should be noted that no modes of transportation in the United States are currently regulated on such a basis. While promising conceptually, a performance-based regulatory approach would be considerably more complex than the rule-based approach proposed in this report.

## 5. ARC Recommendations for Definitions

### 5.1. Rationale for Proposed Definition Changes

For the purpose of the recommendations provided in sections 5 through 8 of this report, this section describes definitions used in the current part 135 regulations or in 14 CFR parts 91, 117, or 121 that need to be clarified, updated, or changed.

Notably, in line with the typical duties of flightcrew members in part 135 operations, the definition of *duty* is such that it includes pre- and post-flight duties and other tasks performed as required or directed by the certificate holder, and no reference is made to *flight duty period* (FDP) as defined in 14 CFR part 117.

As part of the definition review process, the ARC looked at the differences between an FDP and the duty period definitions as set forth in part 117. During that review, the ARC members acknowledged the diverse duties that flightcrew members are tasked with in part 135 operations that are not necessarily present in part 121 operations. These additional duties (see section 4.1) comprise a significant portion of the time and attention of a part 135 flightcrew member and are not accurately represented within an FDP.

Because of the critical nature of the additional duties imposed on a part 135 flightcrew member, the ARC determined that a duty period limit would provide for the best fatigue mitigation and management, and more accurately reflects the nature of part 135 operations. Duty limits (rather than FDP limits) would be an appropriate and more accurate mechanism to limit the available duty period for a flightcrew member, and for this reason the ARC intentionally chose to recommend duty time as a limiting factor for a flightcrew member, and not a FDP. This decision was critical to the subsequent discussions pertaining to (and provided the foundation for) the duty limits contained in all tables in the proposed recommendations (see section 7).

Further, the ARC recommends introducing the term *Reference Time Zone* to help regulate duties that cross multiple time zones. Because flightcrew members in part 135 operations do not necessarily have an assigned home base or other anchor point that would unambiguously specify the time zone to which they are adjusted, provisions specified in part 117 such as acclimated time zone for the regulation of duties that cross multiple time zones need modification to be applicable. The definition for Reference Time Zone provided here is functionally similar to that of acclimated time zone in part 117 without requiring an assigned base and without dependence on specifics of the part 117 rest provision. The ARC concluded that 56 hours in a new theater was sufficient to establish a new Reference Time Zone, rather than 72 hours as specified in part 117, because 56 hours would encompass two Physiological Nights' Rest plus an allowance for time zone changes. Importantly, the Reference Time Zone determines the timing of physiological night's rest and WOCL and thereby the applicability of rest and duty limitations proposed in section 7 of this report.

## 5.2. Recommended Definitions

The ARC recommends that the following definitions be adopted for part 135.

*Alertness Management Program (AMP):* A program further described in section 6 of this report, and acceptable to the administrator, wherein a certificate holder puts forth key elements (policies and procedures) addressing and mitigating specific operational risks in order to follow provisions contained in sections 7 and 8 of this Recommendation while providing an equivalent level of safety against fatigue-related accidents or incidents.

*Augmented Flightcrew:* Additional, qualified flightcrew members, in excess of pilot-in-command and second-in-command, assigned to the same duty period to operate the aircraft to allow a flightcrew member to be replaced to have in-flight rest.

*Calendar Day:* Any 24-hour period from 0000 through 2359 using Coordinated Universal Time or local time.

*Certificate Holder:* A person who holds or is required to hold an air carrier certificate or operating certificate issued under part 119.

*Deadhead Transportation:* Transportation of a flightcrew member as a passenger or non-operating flightcrew, by any mode of transportation, as required by the certificate holder, excluding Transportation Local in Nature. All time spent in Deadhead Transportation is considered duty and is not rest.

*Duty:* Any task that a flightcrew member performs as required or directed by the certificate holder, including, but not limited to, a duty with flight duty (including pre- and post-flight duties), administrative work, training, Deadhead Transportation, Logistical Ferry Flight, aircraft positioning on the ground, aircraft loading, and aircraft servicing.

*Fatigue:* A physiological state of reduced mental or physical performance capability resulting from lack of sleep, increased physical activity, or circadian misalignment that can reduce a flightcrew member's alertness and the ability to safely operate an aircraft and perform safety-related duties.

*Fit for Duty:* Physiologically and mentally prepared and capable of performing assigned duties at the highest degree of safety.

*Flight Duty:* A period that begins with the Report Time when a flightcrew member is required to report for duty – with the intention of conducting a flight, series of flights, in-aircraft training flights, logistical ferry flights, positioning flight, or maintenance, or being available to conduct a flight – and ends at the release time. A flight duty includes the duties performed by the

flightcrew member on behalf of the certificate holder that occur before or between flight segments without a required intervening rest period.

*Flightcrew Member:* A pilot properly trained, certificated, and qualified in accordance with a specific certificate holder's approved training program, and the general requirements of part 135, to conduct operations assigned by that certificate holder.

*Home Base:* The location designated by a certificate holder where a flightcrew member normally begins and ends his or her duty periods. Designation of a home base is optional and not a requirement.

*Logistical Ferry Flight:* Any flight segment under the operational control of a certificate holder without carrying passengers or cargo for remuneration or hire (including training flights in aircraft and/or maintenance test/check flights).

*Physiological Night:* The time period that encompasses 0100 to 0700 in a flightcrew member's Reference Time Zone.

*Physiological Night's Rest:* A period consisting of a minimum of 10 consecutive hours of rest that encompasses the hours of 0100 and 0700 in the flightcrew member's Reference Time Zone.

*Reference Time Zone:* A flightcrew member's local time zone when starting any new duty:

- a) Within a theater, after at least 36 consecutive hours free of duty has elapsed;
- b) After entering a new theater, if 36 consecutive hours free of duty occurs in the new theater; or at least 56 hours has elapsed since ending the first duty in the theater unless returning to the original theater within 56 hours.

Note that this definition under b) does not require that the flightcrew member be in a single time zone for 56 hours.

*Release Time:* The time that the certificate holder releases a flightcrew member to begin a rest period.

*Report Time:* Constitutes a) the end of a rest period and b) the prospectively assigned time that the certificate holder requires a flightcrew member to report for duty.

*Rest Facility:* A bunk or seat accommodation installed in an aircraft that provides a flightcrew member with a sleep opportunity.

- 1) *Class 1 rest facility:* A bunk or other surface that allows for a flat sleeping position and is separate from both the flight deck and passenger cabin in an area that is temperature-controlled, allows the flightcrew member to control light, and provides isolation from noise and disturbance.
- 2) *Class 2 rest facility:* A seat in an aircraft cabin that allows for a flat or near flat sleeping position; is separated from passengers by a minimum of a curtain to provide darkness and

some sound mitigation; and is reasonably free from disturbance by passengers or flightcrew members.

- 3) *Class 3 rest facility*: A seat in an aircraft cabin or flight deck that reclines at least 40 degrees and provides leg and foot support.

*Rest Period*: Continuous time interval that (a) precedes a duty (and any required post-duty rest), which is prospectively determined, or (b) follows a duty – assigned by the certificate holder – during which the flightcrew member is entirely free from restraint by the certificate holder, including freedom from present responsibility for work should the occasion arise.

*Suitable Accommodation*: A temperature-controlled facility with sound mitigation and the ability to control light that provides a flightcrew member with sleep opportunity either in a bed, a bunk, or a chair that allows for flat or near flat sleeping positions. Suitable accommodation applies only to ground facilities and does not apply to a rest facility.

*Theater*: A geographical area in which the distance between the flightcrew member's Reference Time Zone at the departure point and arrival point differs by no more than 60 degrees longitude.

*Transportation Local In Nature*: Transportation between a flightcrew member's residence and respective home base as well as transportation between an intermediate layover location and a suitable accommodation, excluding Deadhead Transportation.

*Unforeseen Operational Circumstance*: An unplanned event of insufficient duration to allow for adjustments to schedules, including unforecast weather, equipment malfunction, or air traffic delay, that is not reasonably expected.

*Window of Circadian Low (WOCL)*: A period of high sleepiness that occurs between 0200 and 0559 during a Physiological Night.

*WOCL Duty*: A duty period that infringes upon any portion of, or encompasses in its entirety, the period from 0200 to 0559 in a flightcrew member's Reference Time Zone.

## 6. ARC Recommendation for Alertness Management Program Concept

The ARC recommends that the FAA adopt the concept of an Alertness Management Program (AMP) as part of revised part 135 regulations. As elaborated in Section 4.5 and Figure 3, the use of an AMP provides a central component of the recommended regulatory approach detailed in section 7. For the AMP to be an effective tool for promoting alertness and protecting against fatigue, it must be comprehensive and enforceable. It is recommended that the FAA develop an Advisory Circular (AC) defining the requirements for a part 135 AMP.

Overall, the purpose of the AMP is to promote flightcrew member alertness by providing fatigue monitoring and fatigue mitigations, which allows an operator to increase duty times and/or reduce rest times relative to operations without an AMP. The complexity of the AMP and the mitigations included will depend on the type of operation, as specified in the limitations contained in the tables for different kinds of operation (see section 7). A Level 1 AMP defines approved flight, duty, and rest limits for specific kinds of operations (defined in the tables of section 7), provided the operation is conducted under an accepted AMP that also defines the necessary fatigue mitigations.

An AMP should be accepted by a principal operations inspector if an operator meets the requirements set forth in the above-mentioned AC. The guidance in the AC should be scalable such that a single pilot operator holding OpSpec A040 authorization could still realize the safety benefits of an AMP. Despite not being required to have manuals, these single pilot operators are intended to be able to develop an AMP and have it accepted by the FAA.

A Level 2 AMP defines a customized set of flight, duty, and rest limits accompanied by an expanded AMP that defines the mitigations necessary for that operation. Level 2 AMPs are described below and would require approval at the FAA headquarters level.

The specific sections of an AMP are similar to those defined in FAA Information for Operators (InFO) 10017SUP. Appendix B contains details of the recommended components of an AMP combined with the flight and duty limits exercised by the operation. The following sections are the minimum required elements of an AMP (see Appendix B):

1. Senior Level Management Commitment to Reducing Fatigue and Improving Flightcrew Member Alertness
2. AMP Scope and Applicable Fatigue Management Policies and Procedures
3. Fatigue Risk Management and Mitigation
4. Safety Assurance and Fatigue Reporting Policy
5. Fatigue Incident Reporting Process
6. System for Monitoring Flightcrew Member Fatigue
7. The Organization's AMP Evaluation Program
8. Fatigue Education and Awareness Training Program

## 9. Prescriptive Flight Time and Duty Period Limitations and Mitigations

### **6.1. Operations without an Alertness Management Program**

The ARC recommends that a set of duty, flight, and rest limits be made available for operations that do not have or need an AMP. Those limits are deliberately more restrictive to avoid the potential for unmitigated fatigue but are sufficient for many operations that limit most operations to hours of the day that do not infringe on or encompass the WOCL. This tier of regulations is designed to reduce complexity and cost for many operations that can fit within that simple framework. See section 7.1.

### **6.2. Operations with a Level 1 AMP within Prescriptive Limits**

It is recommended that the FAA develop an AC defining the requirements for a part 135 AMP. Overall, the purpose of the AMP is to promote flightcrew member alertness by providing a set of fatigue monitoring and fatigue mitigations that allow an operator to increase duty times and reduce rest times relative to operations without an AMP. The complexity of the AMP and the mitigations included will depend on the type of operation, as specified in the limitations contained in the tables for different kinds of operation.

Level 1 AMP operations are conducted in conjunction with defined flight, duty, and rest limits for specific kinds of operations (described in the tables), provided the operation is conducted under an accepted AMP that also defines the necessary fatigue mitigations. The level of acceptance would be the principal operations inspector based on the requirements set forth in the AC. A detailed description of the required elements of a Level 1 AMP can be found in Appendix B.

### **6.3. Operations with a Level 2 AMP with Customized Limits**

A Level 2 AMP defines a customized set of flight, duty, and rest limits accompanied by an expanded AMP that defines the mitigations necessary for that operation. A Level 2 AMP is required to exceed any of the table limits for Level 1 AMPs as described in sections 7.2 through 7.6. The ARC recommends that the FAA issue an AC to define the Level 2 AMP application and approval process using a standardized format.

The purpose of a Level 2 AMP is to extend the applicability of the proposed rules to as many cases as possible, without excessively complicating the limitations specified for Level 1 AMP operations or requiring an extensive exemption and validation process such as that currently used to obtain an approved Fatigue Risk Management System under part 117. The reason to avoid such an approach is that part 135 operations, by their nature, encounter exceptional

operational conditions very infrequently, which limits the ability to conduct a statistically valid study to validate an equivalent level of safety.

Instead, it is envisioned that a Level 2 AMP would require the following elements, in addition to the standard AMP elements:

- Prior operational experience with verifiable safety indicators, fatigue modeling, and/or prior studies that demonstrate that the proposed duty pattern is safe.
- Additional mitigations to offset additional flight and/or duty time or reduced rest.
- Provisions to address protection of sleep during physiological nights' rest and prevention of cumulative fatigue and excessive workload.
- Periodic and ongoing fatigue risk assessment and fatigue monitoring to ensure that the mitigations support alertness.

Structured appropriately, and coupled with an effective feedback mechanism, ongoing fatigue monitoring can substitute for a scientific study to establish safety equivalence to operations conducted within the approved limits. Elevated fatigue indicators under the increased limits relative to operations within the original limits would be reported and mitigated through alteration of the Level 2 AMP duty limits to return fatigue to acceptable levels.

Due to the critical nature and potential ramifications of a certificate holder seeking a deviation from the prescriptive limits contained within this recommendation, the ARC believes that a higher level of approval is required for a Level 2 AMP. The ARC recommends that a Level 2 AMP would require approval at the FAA headquarters level and would be operator-specific.

## 7. ARC Recommendations for Duty, Flight, and Rest Requirements

Based on its review of the part 135 industry, the current part 135 regulations and other regulatory frameworks, the science of fatigue, and the core principles embraced by the ARC with unanimous consensus (see section 4), the ARC recommends that the FAA adopts revised duty, flight, and rest requirements for part 135.

In this section, the ARC details recommendations regarding maximum duty and flight times and minimum rest (prior to and after duties, as appropriate) categorized by type of operation in subsections, limits on transitioning between kinds of operation (prerequisites), applicable mitigations associated with each kind of operation, and allowable duty and flight time extensions. The recommended maximum duty and flight times and minimum rest requirements are divided into two parts: Operations without an AMP, and Operations with an AMP (see section 6). Each subsection below begins with a list of core principles relevant to that subsection (by reference to the master list in section 4.4). Following the core principles is a narrative justification for the recommended limits and a discussion of any recommendations with alternative points of view. Finally, each subsection concludes with a table that summarizes the recommended limits and mitigations. The tables are to be used based on a flightcrew member's Reference Time Zone.

Although the ARC did not specifically define separate duty and flight time limits or rest requirements for scheduled versus unscheduled operations, the ARC recommends retaining the following cumulative flight time limits as a useful mechanism to minimize the cumulative effects of flight time workload:

- Previous cumulative *scheduled* flight time limits under § 135.267 remain applicable:
  - 34 hours/7 consecutive days
  - 120 hours/calendar month
  - 1,200 hours/calendar year
  - Each certificate holder shall relieve each flightcrew member engaged in scheduled air transportation from all further duty for at least 24 consecutive hours during any 7 consecutive days.
  
- Previous cumulative *unscheduled* flight time limits under § 135.267 remain applicable:
  - 500 hours/calendar quarter
  - 800 hours/2 consecutive calendar quarters
  - 1,400 hours/calendar year
  - The certificate holder must provide each flightcrew member at least 13 rest periods of at least 24 consecutive hours in each calendar quarter.

### 7.1. Operations without an AMP

*Applicable core principles from section 4.4: A–E, G, I, K, M–O, R, S.*

For part 135 operations without an AMP, consistent with the part 135 ARC charter, a distinction was made between *non-WOCL operations* and *WOCL operations* because they involve different levels of physiological alertness, and WOCL operations interfere with the prime opportunity for sleep. As a result, WOCL duties imply that the prior and subsequent sleep will occur at a less-than-ideal time for sleep, but this is not a problem expected for non-WOCL operations. Based on this, the duty period (which includes preparation for flight and activities after flight) during the non-WOCL day is permitted to be as long as 14 hours because it leaves 10 hours available for an 8-hour sleep opportunity at night, considering the time necessary to transition to and from a sleep environment. The prior rest period, therefore, can be as short as 10 hours if it includes the time for optimal sleep provided by a physiological night's rest, or 12 hours if it does not totally include a physiological night's rest.

Given the many activities that must occur during duty in addition to flight, flight time is necessarily less than the permitted duty time. For two pilots, the workload of 10 hours of flight time is considered the maximum allowable outside the WOCL. For only one pilot, the workload of 8 hours of flight time is considered the maximum allowable outside the WOCL. Both limits are identical to current part 135 limits. Duties that infringe on or encompass the WOCL may or may not include flight time that infringes on or encompasses the WOCL. When operating into the WOCL when alertness is impaired, flight time is reduced to 8 hours for two pilots and is reduced to 7 hours for one pilot when flight time infringes on or encompasses the WOCL, and 8 hours when it does not.

It is recognized that successive duties that infringe on or encompass the WOCL create the potential for cumulative sleep debt. Since those impacts are not managed here with an AMP, consecutive WOCL duties are not permitted and WOCL duties are limited to three in any 168-hour period. The requirement for a physiological night's rest prior to any WOCL duty ensures that such duties cannot be performed consecutively and it ensures an optimal opportunity for sleep prior to WOCL duties.

The pre-duty rest requirement is increased from 10 hours to 12 hours when it does not include the optimal time for sleep, i.e., a physiological night's rest. The ARC recognizes that the proposed rest and duty limits do not always sum to a 24-hour day. That was done deliberately to allow flexibility and to accommodate the diversity of the part 135 industry. In particular, consecutive non-WOCL duties that start between 0600 and 0700 would, in practice, be limited to 12 hours of duty.

In the absence of an AMP to manage flightcrew member fatigue, no duty extensions are permitted prior to takeoff. Similarly, duties must remain within a single theater without an AMP to manage the fatigue induced by time zone changes.

The recommended limits for operations without an AMP are summarized in Table 2.

**Table 2.** Flight operations without an AMP.

Crew Complement	Duty Period (maximum hours)	Flight Time (maximum hours)	Prior Off-Duty Period (minimum hours)
One Pilot	14	8	12
Two Pilots	14	10	10, if physiological night's rest included
WOCL Duty – one pilot	10	7 hours if flight period infringes on or encompasses the WOCL; otherwise, 8 hours	<ul style="list-style-type: none"> <li>• A physiological night's rest in prior 24 hours</li> <li>• No more than three such periods in a 168-hour period</li> </ul>
WOCL Duty – two pilots	10	9	
Pre-takeoff flight time extension not allowed.			
Duty time extension: no extension prior to takeoff.			
No operations permitted that include duties operating into more than one theater.			

## 7.2. Operations with a Level 1 AMP That Do Not Infringe on the WOCL

*Applicable core principles from section 4.4: A, D, F–H, K, M, N, P–R.*

### 7.2.1. Non-WOCL duties without sleep opportunities

For operations with a Level 1 AMP, a distinction was made between *non-WOCL operations* and *WOCL operations* because they involve different levels of physiological alertness and WOCL operations interfere with the prime opportunity for sleep. For non-WOCL duties, the prior and subsequent sleep are expected to occur at a more ideal time for sleep. Based on this, the duty period during the day is permitted to be as long as 14 hours because it leaves 10 hours available for an 8-hour sleep opportunity at night, considering the time necessary to transition to and from a sleep environment. While this provision does not guarantee a full physiological night's rest prior to such duties, it does provide for rest during the WOCL, and the AMP will provide additional protections to mitigate fatigue.

Given the many activities that must occur during duty in addition to flight, flight time is necessarily less than the permitted duty time. For two pilots, the workload of 10 hours of flight time is considered the maximum allowable outside the WOCL. For only one pilot, the workload of 8 hours of flight time is considered the maximum allowable outside the WOCL. Both limits are identical to current part 135 limits. While the duty and flight time limits are identical to operations without an AMP, the provision of an AMP permits the use of pre-takeoff duty extensions for unforeseen circumstances and to operate into multiple theaters.

The recommended limits for non-WOCL duties without sleep opportunities, with an AMP, are summarized in Table 3.

**Table 3.** Flight operations with a Level 1 AMP that do not infringe on or encompass the WOCL.

Crew Complement	Duty Period (maximum hours)	Flight Time (maximum hours)	Prior Off-Duty Period (minimum hours)
One Pilot	14	8	10
Two Pilots	14	10	
Pre-requisites for using these provisions: An AMP.			
Flight time extension not allowed in accordance with section 7.7.2.			
Duty period extensions allowed in accordance with section 7.7.1:			
<ul style="list-style-type: none"> <li>• Pre-takeoff duty extension for unforeseen circumstances permitted up to 2 hours of duty for two-pilot operations; limited to 1 hour of duty for one-pilot operations.</li> <li>• Minimum of 24 hours free of duty after any duty extension of 30 minutes or longer for two pilots, and any duty extension for one pilot, must be reported to principal operations inspector.</li> <li>• Limit of one pre-takeoff duty extension per 168 hours.</li> </ul>			
Operating in multiple theaters permitted.			

**7.2.2. Non-WOCL duties with sleep opportunities during duty**

Sleep opportunities during duty can be beneficial to offset fatigue. However, the benefits of naps during the day are less than they are at night. Hence, there are two alternative views on the benefits of naps during non-WOCL duties. *One point of view* is that such naps in a suitable accommodation may benefit flightcrew members due to the secondary WOCL and should provide for some increase of maximum duty time, at a ratio of 30 minutes for each hour of sleep. *Another point of view* is that day sleep is difficult to guarantee and obtain, and the provision of such sleep opportunities should not be counted on to justify an increase of the duty limits. In accordance with the first point of view, Table 4 describes how the provision of a day duty with a sleep opportunity would allow for additional duty time. In accordance with the second point of view, Table 4 would be redundant and would not be included.

**Table 4.** Flight operations with a Level 1 AMP that have sleep opportunities during duty and do not infringe on or encompass the WOCL.

Crew Complement	Duty Period (maximum hours)	Flight Time (maximum hours)	Prior Off-Duty Period (minimum hours)
One Pilot	14 or 16*	8	10
Two Pilots	14 or 16*	10	
Pre-requisites for using these provisions: <ul style="list-style-type: none"> <li>• An AMP</li> <li>• A physiological night's rest prior to any such duties.</li> </ul>			
*Maximum duty period: <i>One point of view</i> is to allow an increase by 0.5 hours for each hour in a suitable accommodation, up to a limit of 16 hours. <i>Another point of view</i> is to not allow an increase and to limit the duty period to 14 hours.			
Mitigations: <ul style="list-style-type: none"> <li>• Minimum of 2 consecutive hours of sleep opportunity in a suitable accommodation during duty, measured from the time the flightcrew member reaches the suitable accommodation, starting no sooner than 2 hours after start of duty</li> <li>• Up to 5 long -day duties with rest mitigation allowed in 168 hours</li> <li>• One physiological night's rest prior</li> <li>• One physiological night's rest after</li> </ul>			
Flight time extension not allowed in accordance with section 7.7.2.			
Duty period extensions allowed in accordance with section 7.7.1: <ul style="list-style-type: none"> <li>• Pre-takeoff duty extension permitted up to 2 hours of duty for two-pilot operations, limited to 1 hour of duty for one-pilot operations.</li> <li>• In view of the potential for sleep opportunities to increase such duties to 16 hours, pre-takeoff extensions are limited to an additional 30 minutes beyond 16 hours or a maximum duty duration with extension of 16.5 hours.</li> <li>• Minimum of 24 hours free of duty after any duty extension of 30 minutes or longer for two pilots, and any duty extension for one pilot, must be reported to principal operations inspector.</li> <li>• Limit of one pre-takeoff duty extension per 168 hours.</li> </ul>			
Operating in multiple theaters permitted.			

### 7.3. Operations with a Level 1 AMP That Infringe on or Encompass the WOCL

*Applicable core principles from section 4.4: A–G, I–K, M, N, P–S.*

#### 7.3.1. WOCL duties without sleep opportunities

Consistent with the part 135 ARC charter, a distinction was made between *non-WOCL operations* and *WOCL operations* because they involve different levels of physiological alertness, and WOCL operations interfere with the prime opportunity for sleep. As a result, WOCL duties imply that the prior and subsequent sleep will occur at a less-than-ideal time for sleep. In line with the limitations set forth in section 7.1, therefore, WOCL duties are limited to 10 hours. Furthermore, since duties that infringe on or encompass the WOCL dictate that the prior sleep is during less optimal times or the prior wakefulness since WOCL sleep is long, the rest period is required to be 12 hours.

Given the many activities that must occur during duty in addition to flight, flight time is necessarily less than the permitted duty time. Duties that infringe on or encompass the WOCL may or may not include flight time that infringes on or encompasses the WOCL. When operating into the WOCL (when alertness is impaired), flight time is reduced to 9 hours for two pilots. For one pilot, flight time is reduced to 7 hours when it infringes on or encompasses the WOCL, and 8 hours when it does not. It is acknowledged that the flight time of 9 hours for two pilots is only 1 hour less than maximum duty time. This is possible when the AMP specifies mechanisms to mitigate fatigue to permit this additional flight time compared to operations without an AMP. While the duty and flight time limits are not greatly different from operations without an AMP, the provision of an AMP permits up to three consecutive WOCL duties, use of pre-takeoff duty extensions for unforeseen circumstances and operation across multiple theaters.

It is recognized by the ARC that transitions from a non-WOCL duty to a WOCL duty have the potential to create excessive fatigue because they can place the time for pre-duty rest in a less-than-ideal circadian time. The ARC agreed that additional rest is required prior to transitioning to a series of WOCL duties to minimize this impact. There are two alternative views on the length of additional required rest prior to entering the WOCL duty table (Table 5). *One point of view* is that 14 hours of prior rest is sufficient because, depending on the starting time of the WOCL duty, it should provide an opportunity for either nighttime sleep in the primary WOCL or an afternoon nap during the afternoon secondary WOCL. *Another point of view* is that it is also important to minimize the chances of a day duty immediately prior to the WOCL duty; 16 hours of prior rest more effective in limiting that possibility and also increases the opportunity for sleep during one of the optimal times for sleep.

The reduced alertness during WOCL duties dictates a reduction in the allowable pre-takeoff duty extensions compared to non-WOCL duties because the extended duty is likely to occur during a period of maximal fatigue.

The recommended limits for WOCL duties with an AMP are summarized in Table 5.

**Table 5.** Flight operations with a Level 1 AMP that infringe on or encompass the WOCL.

Crew Complement	Duty Period (maximum hours)	Flight Time (maximum hours)	Prior Off-Duty Period (minimum hours)
One Pilot	10	7 hours if flight period infringes on or encompasses the WOCL; otherwise, 8 hours	12
Two Pilots	10	9	
Pre-requisite for using these provisions: An AMP.			
Pre-requisite for using these provisions when transitioning from a non-WOCL duty: <i>One point of view</i> is 14 hours of rest. <i>Another point of view</i> is 16 hours of rest.			
Limit of three consecutive such duties.			
Flight time extension not allowed in accordance with section 7.7.2.			
Duty period extensions allowed in accordance with section 7.7.1:			
<ul style="list-style-type: none"> <li>• Pre-takeoff duty extension for unforeseen circumstances permitted up to 1 hour of duty for two-pilot operations; limited to 30 minutes of duty for one-pilot operations.</li> <li>• Minimum of 24 hours free of duty after any duty extension of 30 minutes or longer for two pilots, and any duty extension for one pilot, must be reported to principal operations inspector.</li> <li>• Limit of one pre-takeoff duty extension per 168 hours.</li> </ul>			
Operating in multiple theaters permitted.			

**7.3.2. WOCL duties with sleep opportunities**

For duties that infringe on or encompass the WOCL, any scheduled sleep opportunity is likely to be recuperative. Therefore, provided the scheduled sleep opportunity is received, the maximum duty time can be increased based on the amount of that sleep opportunity in a suitable accommodation. With a minimum of 2 consecutive hours of sleep opportunity (measured from the time the flightcrew member reaches the suitable accommodation) scheduled and provided to the flightcrew member, the increase is 1 hour for each hour of sleep opportunity because the opportunity is occurring at an optimal time of day for sleep.

There were two points of view on how much additional duty should be allowed. *One point of view* recognizes the risk that sleep may not occur during the scheduled sleep opportunity. In addition, it is likely that WOCL duties will come after daytime sleep; therefore, a flightcrew member may have sleep debt at the start of the duty such that the additional sleep does not yield the same level of alertness as during a non-WOCL duty. Hence, the maximum allowable duty with sleep opportunity should be 12 hours. *Another point of view* holds that since the sleep is at an optimal time, a maximum duty duration should be allowed up to the duty limit for a non-WOCL duty of 14 hours, as this would incentivize operators to provide mid-duty sleep opportunities. These recommended limits are summarized in Table 6.

**Table 6.** Flight operations with a Level 1 AMP that have sleep opportunities during duty and infringe on or encompass the WOCL.

Crew Complement	Duty Period (maximum hours)	Flight Time (maximum hours)	Prior Off-Duty Period (minimum hours)
One Pilot	10 up to 12 or 10 up to 14*	7 hours if flight period infringes on or encompasses the WOCL; otherwise, 8 hours	12
Two Pilots	10 up to 12 or 10 up to 14*	9	
Pre-requisite for using these provisions: An AMP.			
*Pre-requisite for using these provisions when transitioning from a non-WOCL duty: <i>One point of view</i> is 14 hours of rest. <i>Another point of view</i> is 16 hours of rest.			
<ul style="list-style-type: none"> <li>• Minimum mid-duty sleep opportunity of 2 hours, measured from the time the flightcrew member reaches the suitable accommodation.</li> <li>• Additional duty based on mid-duty sleep opportunity: <i>One point of view</i> is to allow the maximum duty time to be increased by 1 hour for each hour in a suitable accommodation (measured from the time the flightcrew member reaches the suitable accommodation), up to a maximum of 12 hours. <i>Another point of view</i> is to allow the maximum duty time to be increased by 1 hour for each hour in a suitable accommodation (measured from the time the flightcrew member reaches the suitable accommodation), up to a maximum of 14 hours.</li> <li>• Limit of five consecutive such duties in any 168-hour period provided at least two of the first three WOCL duties have minimum 2-hour sleep opportunities and at least three of the five WOCL duties overall have minimum 2-hour sleep opportunities.</li> <li>• The scheduled sleep opportunity should commence no sooner than the first two hours of the start of the duty and be scheduled between 2000 and 0400.</li> <li>• The scheduled sleep opportunity must be received. If the scheduled sleep opportunity is not received, the duty and rest limitations for WOCL duties revert to those provided in section 7.3.1.</li> </ul>			
Flight time extension not allowed in accordance with section 7.7.2.			
Duty period extensions allowed in accordance with section 7.7.1:			
<ul style="list-style-type: none"> <li>• Pre-takeoff duty extension for unforeseen circumstances permitted up to 2 hours of duty for two-pilot operations; limited to 1 hour of duty for one-pilot operations.</li> <li>• Minimum of 24 hours free of duty after any duty extension of 30 minutes or longer for two pilots, and any duty extension for one pilot, must be reported to principal operations inspector.</li> <li>• Limit of one pre-takeoff duty extension per 168 hours.</li> </ul>			
Operating in multiple theaters permitted.			

### 7.3.3. Long WOCL duties without sleep opportunities

The ARC recognized the diversity of potential WOCL duties and that some situations require a long duty duration, but this does not have to be done repeatedly. In order to limit exposure to unmitigated WOCL duties and to limit cumulative fatigue that results from consecutive

unmitigated WOCL exposures, the ARC agreed on the possibility of an operator with an AMP to conduct a single WOCL duty up to 14 hours, provided it is mitigated by a prior minimum 12-hour rest opportunity that includes a physiological night’s rest and by a recuperative rest following that includes a physiological night’s rest.

The recommended limits for long WOCL duties without sleep opportunities are summarized in Table 7.

**Table 7.** Long flight operations with an AMP that infringe on or encompass the WOCL.

Crew Complement	Duty Period (maximum hours)	Flight Time (maximum hours)	Prior Off-Duty Period (minimum hours)
One Pilot	14	7 hours if flight period infringes on or encompasses the WOCL; otherwise, 8 hours	12 hours including a physiological night’s rest, or 16 hours if not physiological night’s rest
Two Pilots	14	10	
Pre-requisite for using these provisions: An AMP.			
Pre-requisite for using these provisions when transitioning from a non-WOCL duty: <i>One point of view</i> is 14 hours of rest. <i>Another point of view</i> is 16 hours of rest.			
Immediately following the duty, must provide the opportunity for a physiological night’s rest.			
<i>One point of view</i> is to limit to two such duties in 168 hours. <i>Another point of view</i> is that no limit is required given the other mitigations provided.			
Flight time extension not allowed in accordance with section 7.7.2.			
Duty period extensions allowed in accordance with section 7.7.1:			
<ul style="list-style-type: none"> <li>• Pre-takeoff duty extension for unforeseen circumstances permitted up to 1 hour of duty for two-pilot operations; limited to 30 minutes of duty for one-pilot operations.</li> <li>• Minimum of 24 hours free of duty after any duty extension of 30 minutes or longer for two pilots, and any duty extension for one pilot, must be reported to principal operations inspector.</li> <li>• Limit of one pre-takeoff duty extension per 168 hours.</li> </ul>			
Operating in multiple theaters permitted.			

## 7.4. Operations with an AMP that include Early Starts between 0500 and 0600

*Applicable core principles from section 4.4: A–K, M, N, P–S.*

### 7.4.1. Early duties without sleep opportunities

Consistent with the part 135 ARC charter, a distinction was made between *non-WOCL operations* and *WOCL operations* because they involve different levels of physiological alertness, and WOCL operations interfere with the prime opportunity for sleep. As a result, WOCL duties imply that the prior and subsequent sleep will occur at a less-than-ideal time for sleep. While it is

recognized that it is important to protect sleep opportunities (or rest) as the primary mitigation for fatigue, duties that start between 0500 and 0600 are a special case because the duty only partly infringes on the WOCL and impairs the opportunity to obtain sleep. In addition, if repetitions of such duties are arranged to be consistent in start time, it is possible for a person to temporarily, at least, start sleep earlier by several hours to compensate. Under these circumstances, a maximum duty time of 12 hours is proposed. This is more than that the maximum duty time for a WOCL duty without a sleep opportunity and less than that allowed for a non-WOCL duty.

This additional allowable duty time that partially interferes with WOCL sleep opportunities must be accompanied by important mitigations. To allow for adjustment of sleep timing, any series of duties that include any starts between 0500 and 0600 must all be within a 3-hour window, but no earlier than 0500, to ensure regular start times. In addition, to minimize cumulative sleep debt prior to such duties, additional rest is required prior to a series of duties that include early starts between 0500 and 0600. *One point of view* is that 12 hours prior rest is required. *Another point of view* is that 14 hours prior rest is required.

Finally, there must be a limit on the number of duties in this table. *One point of view* is that the opportunities for recuperative rest for early starts must be more frequent to combat cumulative fatigue. This view recommends that in any 168-hour period, the number of such duties should be limited to five. Within any 168-hour period that includes four or five such duties, a minimum of two physiological night's rest is required. *Another point of view* is that there are currently many operations that follow this pattern for 7 to 14 days consecutively, followed by 7 to 14 days of off-duty time. Hence, this view recommends a limit such that in any 384 hours, there must be a minimum of two 24-hour periods free of duty. This provision would effectively set a limit of 14 consecutive early starts followed by 2 days of rest, while not precluding a sequence of seven consecutive early starts followed by one 24-hour period free of duty.

Like other WOCL duties that dictate that the prior sleep is during less optimal times, the rest period is required to be 12 hours. Also, given the many activities that must occur during duty in addition to flight, flight time is necessarily less than the permitted duty time. Early duties that infringe on the last hour of the WOCL are not likely to include flight time that infringes on the WOCL. Therefore, the allowable flight time is identical to that for non-WOCL duties. And since such duties do not include flight time in the WOCL, the allowable duty extensions are identical to those for non-WOCL duties.

The recommended limits for early duties without sleep opportunities are summarized in Table 8.

**Table 8.** Early flight operations with an AMP.

Crew Complement	Duty Period (maximum hours)	Flight Time (maximum hours)	Prior Off-Duty Period (minimum hours)
One Pilot	12	8	12
Two Pilots	12	10	
Pre-requisite for using these provisions: An AMP.			
Pre-requisites for using these provisions when transitioning from a non-WOCL duty: <i>One point of view</i> is 12 hours rest. <i>Another point of view</i> is 14 hours rest prior to a series of duties that include early starts between 0500 and 0600.			
Any series of duties that include any starts between 0500 and 0600 must all be within a 3-hour window, but no earlier 0500, to ensure regular start times.			
Limitation according to <i>one point of view</i> : Maximum of five duty starts under this table in 168 hours, with two physiological night's rest after five consecutive such duties. Limitation according to <i>another point of view</i> : 48 hours free of duty in 384 hours.			
Flight time extension not allowed in accordance with section 7.7.2.			
Duty period extensions allowed in accordance with section 7.7.1:			
<ul style="list-style-type: none"> <li>• Pre-takeoff duty extension for unforeseen circumstances permitted up to 2 hours of duty for two-pilot operations; limited to 1 hour of duty for one-pilot operations.</li> <li>• Minimum of 24 hours free of duty after any duty extension of 30 minutes or longer for two pilots, and any duty extension for one pilot, must be reported to principal operations inspector.</li> <li>• Limit of one pre-takeoff duty extension per 168 hours.</li> </ul>			
Operating in multiple theaters permitted.			

**7.4.2. Early duties with sleep opportunities**

Sleep opportunities during duty can be beneficial to offset fatigue; however, the benefits of naps during the day are less than they are at night. Hence, there are two alternative views on the benefits of naps during non-WOCL duties. *One point of view* is that such naps in a suitable accommodation should provide for some increase of maximum duty time, in a ratio of 30 minutes for each hour of sleep. *Another point of view* is that day sleep is difficult to guarantee and to obtain, and the provision of such sleep opportunities should not be counted on to justify an increase in the maximum duty time. In accordance with the first point of view, the following table describes how the provision of day duties would allow for additional duty time. In accordance with the second point of view, Table 9 would be redundant and would not be included.

To minimize cumulative sleep debt prior to such duties, additional rest is required prior to a series of duties that include early starts between 0500 and 0600. *One point of view* is that 12 hours prior rest is required. *Another point of view* is that 14 hours prior rest is required.

The recommended limits for early duties with sleep opportunities are summarized in Table 9.

**Table 9.** Early flight operations with an AMP and sleep opportunities during duty.

Crew Complement	Duty Period (maximum hours)	Flight Time (maximum hours)	Prior Off-Duty Period (minimum hours)
One Pilot	12 to 14*	8	12
Two Pilots	12 to 14*	10	
<p>Pre-requisite for using these provisions: An AMP.</p> <p>Pre-requisites for using these provisions when transitioning from a non-WOCL duty:  <i>One point of view</i> is 12 hours rest. <i>Another point of view</i> is 14 hours rest prior to a series of duties that include early starts between 0500 and 0600.</p> <p>*Maximum duty period: <i>One point of view</i> is to allow an increase by 0.5 hours for each hour in a suitable accommodation, measured from the time the flightcrew member reaches the suitable accommodation, up to a limit of 14 hours. <i>Another point of view</i> is to not allow an increase and limit the duty period to 12 hours.</p> <p>Any series of duties that include any starts between 0500 and 0600 must all be within a 3-hour window, but no earlier than 0500 to ensure regular start times.</p> <p>Limitation according to <i>one point of view</i>: Maximum of five early starts in 168 hours, with two physiological night's rest after five consecutive early starts.                      Limitation according to <i>another point of view</i>: 48 hours free of duty in 384 hours.</p> <p>Mitigations:</p> <ul style="list-style-type: none"> <li>• Minimum of 2 consecutive hours of rest during duty in a suitable accommodation, measured from the time the flightcrew member reaches the suitable accommodation.</li> </ul> <p>Flight time extension not allowed in accordance with section 7.7.2.</p> <p>Duty period extensions allowed in accordance with section 7.7.1:</p> <ul style="list-style-type: none"> <li>• Pre-takeoff duty extension for unforeseen circumstances permitted up to 2 hours of duty for two-pilot operations; limited to 1 hour of duty for one-pilot operations.</li> <li>• Minimum of 24 hours free of duty after any duty extension of 30 minutes or longer for two pilots, and any duty extension for one pilot, must be reported to principal operations inspector.</li> <li>• Limit of one pre-takeoff extension duty per 168 hours.</li> </ul> <p>Operating in multiple theaters permitted.</p>			

## 7.5. Air Medical and Organ Transport Operations with an AMP

*Applicable core principles from section 4.4: A–G, I–N, P–S.*

The ARC was specifically chartered to give special consideration to air medical operations. Airplane and helicopter air ambulance operations are considered an essential service for the communities for which they serve. The FAA has recognized the need for these 24-hour services and has focused mostly on helicopter air ambulance operations in 14 CFR part 135 subpart L and § 135.271. The ARC recommends revising the § 135.271 rule to include air ambulance operations issued Operations Specifications (OpSpec) A021 and A024 and apply the same duty and flight time and rest limitations as recommended in this section.

The ARC recommends that medical operations that utilize the air medical duty and flight time limits include all air medical transport, including both patient and organ transport, provided such operations are conducted by an operator holding OpSpecs A021 or A024 and operated according to the OpSpec. These operations may include all flights associated with patient and organ transport, performed at the behest of the Certificate Holder. However, flight time extensions are not permitted once the medical transport function is completed, with the exception of § 135.601 helicopter air ambulance operations to allow for repositioning the helicopter away from the medical facility and vacate the landing pad.

In addition, air medical operations will be required to operate with an accepted AMP that will provide an additional layer of fatigue mitigations, similar to the flight risk analysis tools currently used under OpSpec A021 and best practice under OpSpec A024. Here, the provisions for an AMP will be applied to all air medical operations, including fixed wing air medical operations, as well as helicopter medical operations.

The ARC recognizes that organ transport operations and transplant surgical team movements may be performed without OpSpecs A021 or A024. Under this circumstance, such operations would have to comply with the provisions of the non-medical tables in sections 7.1–7.4 and 7.6. However, the ARC does *not* recommend that an air ambulance Operations Specifications (A024) should be required for fixed-wing carriage of human organs or movement of transplant surgical teams. If rulemaking were to be imposed to require OpSpec A024 to carry human organs or transplant surgical teams, there would be fewer than 300 air ambulance carriers with just 1,400 aircraft (Loyd et al., 2020), an 87% reduction in available aircraft compared to the current situation. This would cripple the national organ transplant system and would adversely impact life-saving operations.

### 7.5.1. Air medical operations with sleep opportunities

Sleep opportunities during duty can be beneficial to offset fatigue. Medical air operations often operate from a fixed base, which provides for a suitable accommodation for sleep either at the flightcrew member's home or at a defined facility. Moreover, the on-call nature of medical operations makes it possible for flightcrew members to make use of those facilities. Table 10

describes how the provision of duties would allow for additional duty time. These duties may or may not infringe on or encompass the WOCL.

Air medical operations perform a life-saving function, and the ARC recognizes the need to balance the levels of acceptable risks associated with these duties and the risks associated with not being able to perform these duties when needed to save lives. Hence, some of the allowable duty limits are greater for medical operations. However, they are coupled with fatigue risk assessments within the AMP to ensure that even with these longer duties, flightcrew members are not performing duties when unfit to perform them safely.

The maximum allowable duty period of 14 hours is the same for WOCL and non-WOCL medical duties. This is because of the availability of sleep opportunities during the duties that would mitigate the differences between WOCL and non-WOCL sleep opportunities and the extra allowable duty time. However, to avoid the cumulative fatigue associated with consecutive WOCL duties, the limits on consecutive WOCL duties is similar to non-medical operations. Furthermore, because of the available sleep opportunities, there is no distinction between WOCL and non-WOCL flight times. The prior rest requirement is similar to non-WOCL duties.

Medical operations often encounter unforeseen circumstances necessitated to respond to medical requirements. Hence, the provisions for duty and flight extensions are greater than allowed for non-medical operations to allow for the completion of medical transport functions. The provision for duty and flight extensions makes no distinction between WOCL and non-WOCL duties because of the availability of sleep opportunities during duties. However, the ARC recognizes that duty and flight time extensions may create additional exposure to the WOCL and/or cumulative fatigue that must be mitigated during the operation with on-duty sleep opportunities and following the duties with a physiological night's rest. Therefore, there is a requirement of a post-duty physiological night's rest after any flight time extension. In addition, if a duty that infringes on or encompasses the WOCL is extended, or if the extension infringes on or encompasses the WOCL, one post-duty physiological night's rest is required, unless a 2-hour continuous on-duty sleep opportunity was provided and received.

**Table 10.** Air medical operations with an AMP and sleep opportunities during duty.

Crew Complement	Duty Period (maximum hours)	Flight Time (maximum hours)	Prior Off-Duty Period (minimum hours)
One Pilot	14	8	10
Two Pilots	14	10	
Pre-requisites for using these provisions: An Air Medical OpSpec (either A021 or A024), pre-flight risk assessments, and an AMP.			
<ul style="list-style-type: none"> <li>• Access to suitable accommodation.</li> <li>• Up to 2 hours of duty extension and 1 hour of flight time extension for unforeseen circumstances if required to complete an air medical transport, reportable to the principal operations inspector within 10 business days, or quarterly.</li> <li>• One physiological night’s rest after three consecutive WOCL exposures without at least one 2-hour sleep opportunity received in the WOCL.</li> <li>• For duties that infringe on or encompass the WOCL, one physiological night’s rest after any extended duty time if a 2-hour on-duty sleep opportunity is not available.</li> <li>• One physiological night’s rest after any extended flight time.</li> <li>• Pre-flight risk assessment of the flightcrew to be reviewed by a second operational control person, to include fatigue monitoring.</li> <li>• Operating in multiple theaters permitted.</li> </ul>			

**7.5.2. Air medical non-WOCL duties without sleep opportunities**

The minimum prior rest is 12 hours for non-WOCL operations because it would allow the flightcrew member to be fully rested in the event the duty and/or flight time must be extended to complete the medical function, and there is no rest facility available during duty. The ARC recognizes that the maximum duty time and minimum rest do not sum to a 24-hour day. That is because the 14-hour limit is a maximum allowed when needed, but most operations will schedule 12-hour duties with a 12-hour rest to avoid schedule rotation and to provide around-the-clock service.

When on-duty sleep opportunities are not available, duty and flight time extensions are limited to 1 hour. In addition, one physiological night’s rest is required after any duty or flight time extension.

The recommended limits for air medical non-WOCL duties without sleep opportunities are summarized in Table 11.

**Table 11.** Air medical operations with an AMP that have no sleep opportunities and do not infringe on or encompass the WOCL.

Crew Complement	Duty Period (maximum hours)	Flight Time (maximum hours)	Prior Off-Duty Period (minimum hours)
One Pilot	14	8	12
Two Pilots	14	10	
Pre-requisites for using these provisions: an Air Medical OpSpec (either A021 or A024), pre-flight risk assessments, and an AMP.			
<ul style="list-style-type: none"> <li>• Up to 1 hour of duty and flight time extension for unforeseen circumstances if required to complete an air medical transport, reportable to the principal operations inspector within 10 business days, or quarterly.</li> <li>• One physiological night’s rest after any extended duty or flight time.</li> <li>• Pre-flight risk assessment of the flightcrew to be reviewed by a second operational control person, to include fatigue monitoring.</li> <li>• Operating in multiple theaters permitted.</li> </ul>			

**7.5.3. Air medical WOCL duties without sleep opportunities**

The minimum prior rest is 12 hours for WOCL operations because it would allow the flightcrew member to be fully rested in the event the duty and/or flight time must be extended to complete the medical function, and there is no rest facility available during duty. Duty time is reduced from 14 to 12 hours for WOCL duties. To mitigate cumulative fatigue, there is a limit of three consecutive WOCL exposures. Since on-duty sleep opportunities are not available, duty and flight time extensions are limited to 1 hour. In addition, one physiological night’s rest is required after any duty or flight time extension.

The recommended limits for air medical WOCL duties without sleep opportunities are summarized in Table 12.

**Table 12.** Air medical operations with an AMP that infringe on or encompass the WOCL and have no sleep opportunities.

Crew Complement	Duty Period (maximum hours)	Flight Time (maximum hours)	Prior Off-Duty Period (minimum hours)
One Pilot	12	8	12
Two Pilots	12	10	
Pre-requisites for using these provisions: an Air Medical OpSpec (either A021 or A024), pre-flight risk assessments, and an AMP.			
<ul style="list-style-type: none"> <li>• Up to 1 hour of duty and flight extension for unforeseen circumstances if required to complete an air medical transport, reportable to the principal operations inspector within 10 business days or quarterly.</li> <li>• Limit of three consecutive WOCL exposures.</li> <li>• One physiological night’s rest after any extended duty or flight time.</li> <li>• Pre-flight risk assessment of the flightcrew to be reviewed by a second operational control person, to include fatigue monitoring.</li> <li>• Operating in multiple theaters permitted.</li> </ul>			

## 7.6. Augmented Operations with an AMP

*Applicable core principles from section 4.4: A–G, I, K, M, N, P–S.*

The ARC recognizes that sleep opportunities during duty serves to mitigate fatigue. Therefore, when a flightcrew is augmented with more than the minimum complement and a rest facility is present to allow in-flight sleep, the maximum duty times and maximum flight times can be safely increased. The amount of increase depends on the number of additional pilots and the number and quality of the rest facilities. Each additional flightcrew member allows for longer periods of relief from flying and increases in-flight sleep opportunity. The allowable duty time increases with the quality of the sleep opportunity available. However, flight time is strictly determined by the number of pilots to divide the workload of flying duties (noting that the flight time maximum for a class 3 rest facility with four pilots is limited by duty time).

The quality of sleep depends on the quality of the rest facility, and the definitions of rest facilities and the general environmental requirements of a rest facility for part 135 operations should be modeled after AC 117-1, Flightcrew Member Rest Facilities, but with physical dimensions adjusted to reflect the general characteristics of airframes used by part 135 operators conducting augmented operations requiring a rest facility. For example, a Class 1 facility should provide a flat sleeping position, separate from flight deck and passenger cabin, temperature-controlled, light-controlled, and isolated from noise and disturbance. However, the ARC recommends that the FAA retain the definitions of the three different classes of rest facilities but adjust the physical space requirements to account for the limitations placed on aircraft used under part 135.

In consideration of the longer duty periods permitted with augmented flightcrews and the potential that these duties will infringe on or encompass the WOCL, it is important that flightcrew members be fully rested prior to such duties. Hence, there is the requirement that the pre-duty rest be at least 12 hours and that it include one physiological night's rest. Likewise, since these duties may infringe on or encompass the WOCL and may prevent a full night of sleep, post-duty rest is also required, and is longer for duties that are 16 hours or more. Augmented duties less than 14 hours do not have a post-duty requirement for any other set of limits; hence, none is required here. For augmented duties longer than 14 hours, flight time is often greater than 10 hours and may infringe on the WOCL; hence, post-duty rest is required and increases with the length of the duty reflecting the greater chances of infringing the WOCL, starting with 14 hours of post-duty rest following duties of 14–16 hours. *One point of view* is that after a duty period of 16 hours or greater, flightcrew members should receive 18 hours of post-duty rest as this allows them an opportunity to sleep in both the nighttime and daytime optimal times for sleep and, when combined with a prior night's rest, provides sufficient fatigue mitigation and recovery. *Another point of view* is that after a duty period of 16 hours or greater, flightcrew members should receive 24 hours of post-duty rest as this ensures an opportunity for both a physiological night's rest and daytime sleep at the most optimal time prior to the next duty.

The ARC recognizes that in-flight sleep is planned, but the quality of that sleep may be dependent on operational conditions; hence, other mitigations are appropriate to fully mitigate the potential fatigue associated with these longer duties. Pre-flight planning must be performed to minimize critical phases of flight that coincide with periods of impaired alertness (i.e., the WOCL) and the method should be defined in the AMP. Additionally, a separate risk assessment must be performed for any additional segments added after the start of duty. Pre-flight duty extensions for unforeseen circumstances are permitted up to 2 hours with concurrence of all flightcrew members, provided the extension does not position the end of flight in the WOCL. Also, there shall be a limit of two augmented duties in a 168-hour period to minimize cumulative fatigue.

It is important that the structure of the duty period and the sequence of flights permits the flightcrew to have available a minimum of 4 consecutive hours of sleep opportunity (shared by the flightcrew), with preference given to the landing crew. The number of flight segments in an augmented duty is limited to three, to afford the pilots the opportunities for sufficient consolidated sleep.

The recommended limits for augmented operations are summarized in Table 13.

**Table 13.** Operations with augmented flightcrews, in-flight sleep opportunities, and an AMP.

Flightcrew Complement <sup>1,2</sup>	Duty Period (maximum hours)	Flight Time (maximum hours)	Prior Off-Duty Period (min hrs)	Post-Duty Rest (min hrs)
<i>Class 3 Rest Facility</i>			12 hours pre-duty rest including one physiological night's rest	14 hours of post-duty rest following duties of 14–16 hours  18 or 24 hours of post-duty rest following duties of 16 hours or more*
Three Pilot	15	13		
Four Pilots	16	17		
<i>Class 2 Rest Facility</i>				
Three Pilots	16	13		
Four Pilots	18	17		
<i>Class 1 Rest Facility</i>				
Three Pilots	17	13		
Four Pilot	19	17		
Pre-requisites for using these provisions: Pre-flight risk assessments and an AMP.				
* <i>One point of view</i> is that after a duty period of 16 hours or greater, flightcrew members should receive 18 hours of post-duty rest. <i>Another point of view</i> is that after a duty period of 16 hours or greater, the pilots should receive 24 hours of post-duty rest.				
Mitigations:				
<ul style="list-style-type: none"> <li>• Planning to minimize critical phases of flight that coincide with periods of impaired alertness, i.e., not in the WOCL, method defined in the AMP.</li> <li>• A separate risk assessment must be performed for any additional segments added after the start of duty.</li> <li>• Limit of two augmented duties in a 168-hour period.</li> <li>• Each flightcrew member to have maximum sleep opportunity, with a minimum of 4 consecutive hours total for the entire flightcrew, with preference given to the landing crew.</li> <li>• Augmented duties are limited to duties that include no more than three segments.</li> </ul>				
Flight time extension not allowed in accordance with section 7.7.2.				
Duty period extensions allowed in accordance with section 7.7.1:				
<ul style="list-style-type: none"> <li>• Maximum of 2 hours duty extension with concurrence that all flightcrew members are fit for the extension.</li> <li>• Permissible when extension does not include the end of flight in the WOCL.</li> <li>• Reportable to the FAA within 10 days.</li> <li>• Limit of one pre-takeoff duty extension per 168 hours.</li> </ul>				
Operating in multiple theaters permitted.				
<sup>1</sup> To get the increase for four pilots, there must be two sleep surfaces so that two pilots can have sleep opportunities simultaneously.				
<sup>2</sup> For aircraft with a mix of classes of rest facilities, the limits associated with the lower class apply.				

## 7.7. Recommendations Regarding Duty and Flight Time Extensions

*Applicable core principles from section 4.4: A–D, H, I, M, N, P, R, S.*

The ARC recommends that operators with an AMP be allowed limited duty extensions for unforeseen circumstances that arise immediately preceding the last flight segment of a duty period, as specified in the applicable tables in this section.

The ARC recommends that (with the exception of unforeseen circumstances that could not have been known in advance, or for exceptionally limited circumstances pertaining to medical operators with an AMP as outlined in section 7.5) no certificate holder may assign, and no pilot may accept, a flight assignment known to exceed the flight time limitations, or duty time limitations, including any legal extensions, if the duty time limitation is more limiting, for the operation being conducted.

Finally, the ARC recommends that “legal to start, legal to finish” be eliminated. The flightcrew member must be able to complete the flight (estimated time en-route plus taxi-in time, as stated on the flight plan) within the prescribed duty and flight limits (plus any legal extension), or the flight cannot depart.

### 7.7.1. Background and rationale: duty time extensions

In the decades that have passed since the part 135 rest and duty rules were last updated, the understanding of science surrounding fatigue has advanced greatly. In that time, it has been well established from a physiological standpoint that time spent awake (generally measured from the time the last restorative sleep opportunity was obtained) increases fatigue levels and decreases performance in the average person. In addition, while less established from a scientific study perspective, workload factors (including flight time and flight segments) contribute to acute fatigue and should be mitigated to the greatest extent possible (see section 4.3 on the science of fatigue). This combination of time spent awake and workload is especially critical to consider when evaluating the introduction of safety-sensitive functions at the end of a duty period. This is even more significant when introduced to a duty period that has been extended to the maximum duration allowable in a regulation.

The ARC recognizes the aviation industry operates in an ever-changing and dynamic environment. Consequently, the ARC acknowledges that unforeseen circumstances will be encountered that may lead to a delay in the departure of a scheduled flight (including unforecast weather, equipment malfunction, air traffic delay, and late-arriving passengers or cargo). In certain instances under the current part 135 rules, such unforeseen circumstances have allowed a certificate holder to extend duty periods to an unlimited duration in order to complete a flight or series of flights, even though the unforeseen circumstances occurred early in the duty period. Within the industry, this is known as “legal to start, legal to finish.” However, the ARC believes that unforeseen circumstances should not be used as a scheduling tool to extend a flightcrew member’s duty period when those circumstances are not or are no longer unforeseeable.

During review of the part 135 rules, the ARC recognized that the application of “legal to start, legal to finish” often results in the current maximum duty period limit of 14 hours being extended to complete delayed segments. These duty days in excess of 14 hours contribute to higher levels of acute fatigue for flightcrew members. As outlined in section 4 of this recommendation, appropriate fatigue mitigation must be in place to counteract these effects.

The ARC determined that an AMP would provide the necessary structure to appropriately mitigate fatigue in a certificate holder’s operation. Consequently, the ARC determined that in order for a certificate holder to be able to continue using limited duty time extensions for its operations, implementation of an approved AMP be required. The structure of the AMP and its corresponding training requirements, policies, and procedures are described in more detail in section 6 and Appendix B.

In discussions among the ARC members, it was agreed that flightcrew member concurrence to a duty time extension is critical. It allows flightcrew members to assess whether they are fit to extend a duty period prior to accepting the extension. As outlined in the recommendation regarding fitness for duty in section 8.2, both the certificate holder and flightcrew member hold a joint responsibility for fatigue mitigation, and flightcrew member concurrence is a required component of any duty time extension. It was also discussed that the concurrence for a duty extension be obtained for each flightcrew member involved in the operation, and the ability to concur with a duty time extension should not be at the sole discretion of the pilot-in-command. The concurrence of each flightcrew member should be documented, and the records of the extension and concurrence should be maintained by the certificate holder.

In addition to an AMP requirement and flightcrew member concurrence, the ARC agreed that duty time extensions for unforeseen circumstances must be limited in scope and duration. Sufficient opportunity for rest must be available for a flightcrew member who has accepted a duty extension. In certain circumstances, extended, recuperative rest may be required to mitigate a duty extension. The duration, scope, and any recuperative rest associated with a duty time extension are necessarily tied to the operation being conducted, details of which can be found in this section in the applicable tables that pertain to AMP operations. For example, a duty time extension for unforeseen circumstances during a WOCL operation is more limited in duration than a duty extension for a non-WOCL operation.

Finally, the ARC agreed that in order to exercise an extension (prior to takeoff), the unforeseen circumstances must pertain to the segment that would exceed the duty limits. The extension may not be the result of unforeseen circumstances impacting previous legs in the duty period. Additionally, the ARC agreed that once a flightcrew member is operating under a duty time extension to complete a planned flight, no additional flights may commence within that duty period. This is because once an extension has been used to complete a flight assignment, additional flight assignments are no longer unforeseen.

Additional commentary can be found in COVID-19 Addendum at the end of this report.

### **7.7.2. Background and rationale: flight time extensions**

In conjunction with the review of duty time extensions under part 135, the ARC also reviewed flight time extensions. It should be noted that in this recommendation, flight time is considered a primary workload factor to be used to gauge and mitigate fatigue. Because of this, it is critical that flight time limits be strictly adhered to, with the exception of encountering unforeseen circumstances after a flight is airborne that could not have been known in advance. Outside of exceptionally limited circumstances for air medical operators with an AMP, as outlined in section 7.5, the ARC recommends that no certificate holder may assign, and no pilot may accept, a flight assignment if it is known prior to takeoff that the assignment will exceed the flight time limitations for the operation being conducted.

The ARC was tasked by the ARC Charter to consider “the need to accommodate the diversity of operations conducted under part 135, including the unique duty and rest time requirements of air ambulance pilots” (see section 1). As the ARC membership was comprised of a diverse selection of representatives, including several air medical associations and operators, the ARC spent considerable time evaluating the rest and duty requirements of air ambulance pilots. The recently enacted part 135 subpart L was reviewed, including the Operational Control Centers and the various facets of the required pre-flight risk assessments.

After much discussion and deliberation, the ARC recommends allowing infrequent and limited flight time exceedances that are short in duration, and limited in scope, because of the risk tolerance and special circumstances surrounding air medical operators. These limited flight-time extensions should be allowed only for medical operations being conducted by an operator using OpSpecs A021 or A024.

Additional commentary can be found in COVID-19 Addendum at the end of this report.

### **7.7.3. Mitigations for extension usage**

To further expand on the mitigations for the usage of extensions outline above, the ARC recommends that with the use of any extension to *duty time* of 30 minutes or greater for two-pilot operations, and any extension amount for one-pilot operations (whether prior to takeoff or after takeoff), flightcrew members would, at a minimum, need to be placed into rest and be given a minimum of 24 hours free from duty. Further, the recommendation is that the rest period follow immediately after the use of the extension. An extension for duty time of 30 minutes or greater for two-pilot operations, and any extension amount for one-pilot operations, would also have to be recorded and reported to the principal operations inspector.

The ARC recommends that with the use of any extension to *flight time*, whether prior to takeoff as applicable only to medical operators with an AMP (as outlined in section 7.5) or after takeoff, flightcrew members, at a minimum, would need to be placed into rest and be given a minimum of 24 hours free from duty. Further, the recommendation is that the rest period follow immediately after the use of the extension. An extension for flight time would also have to be recorded and reported to the principal operations inspector.

Additionally, with the exception of the specific mitigations for air medical operators outlined in section 7.5, the ARC recommends that the use of any duty time or flight time extension be limited to one extension in any 168-hour period.

## **8. ARC Recommendations for Prospective Rest, Fitness for Duty, Recordkeeping, Enforceability, and Tail-End Ferry**

*Applicable core principles from section 4.4: D, E, H, J, M, N.*

### **8.1. Recommendation for Assigning Rest Prospectively**

Predictable rest and duty scheduling aids in the planning of sleep, such that flightcrew member are better able to be fit for assigned duties. The ARC recommends that the FAA require operators to prospectively assign rest period and duty period start and end times so that flightcrew members may best plan their sleep opportunities to maximize fitness for their next duty.

The ARC recognizes sleep as the primary mitigation for fatigue. For a flightcrew member to be able to attain sufficient sleep to mitigate fatigue, Certificate Holders must assign a prospective rest period to flightcrew members as stipulated in the regulation. The minimum prospective rest stipulated in any table in section 7 is 10 hours to permit the flightcrew member to obtain 8 hours of uninterrupted sleep opportunity “behind the door,” similar to 14 CFR § 117.25(e). Additionally, flightcrew members have an obligation to report for duty well rested and fit for duty and, thus, to sleep during their assigned rest periods. Flightcrew members are best able to maximize their fitness for duty when they prospectively know when their rest period will end and their duty period will start, as it allows them to plan their sleep opportunities. Advanced planning facilitates sleep at the most opportune times to optimize the quality of the sleep and minimize the amount of time awake when reporting for duty. This allows the flightcrew member to report in a maximum state of alertness and reduces fatigue risks.

Pilot rest requirements for operations conducted under part 135 have been the subject of debate, misapplication, and the subsequent issuance of various letters of interpretation for decades (Orellana 2015, Kidd 2017, Jimenez 2011, etc.). Through those interpretations, the FAA has long held that a flightcrew member is either on-duty or in-rest. Further, the FAA has held that when a flightcrew member is in rest, the flightcrew member’s rest period must be “(1) continuous, (2) determined prospectively (i.e., known in advance), and (3) free from all restraint by the certificate holder, including freedom from work or the present responsibility for work should the occasion arise.” However, in spite of the language contained in the rule and the interpretations that support it, operators and flightcrew members still struggle to understand and comply with the concept of prospective rest.

The ARC believes it is common within the industry for some operators, upon completion of a duty assignment, to place flightcrew members in rest and considers them in rest indefinitely until they are called for their next duty assignment. Under this scheme, an operator claims that the flightcrew member was not on duty during a period of time prior to being placed on duty. Therefore, when looking back 10 hours, they state that the flightcrew member was in rest for

the required period of time. This is commonly referred to in the part 135 industry as “rolling rest.” The practice of rolling rest does not provide sufficient opportunity for flightcrew members to plan their sleep opportunities to maximize their fitness for duty.

For example, if a pilot was relieved of duty at 1200, the pilot may enter a rest period and become available for duty again 1000. However, if the operator does not have a trip scheduled and has not prospectively assigned a duty period, the operator may leave the pilot in rest. Then, if a trip presents itself at 1700, the operator calls the pilot to perform the trip. Because the pilot did not expect this trip, the pilot shows up for duty having been awake since 0800. If the trip requires a full 14-hour duty period, the pilot will have been awake for 23 hours when the trip concludes, creating a fatigue risk. However, if the pilot knew in advance when the rest period would end and the duty period would start, the pilot could nap during the afternoon secondary WOCL, obtain adequate sleep, and reduce fatigue risk in the subsequent operation.

By prospectively assigning rest periods and duty period start and end times, and when used in conjunction with additional recordkeeping requirements as outlined in section 8.2, the ARC believes that “rolling rest” can be effectively eliminated from part 135.

## **8.2. Recommendation Regarding Fitness for Duty**

The ARC recommends that the FAA makes fatigue mitigation the joint responsibility between the certificate holder and the flightcrew member. It also recommends that the FAA establishes that no certificate holder may assign, and no flightcrew member may accept, assignment to a duty period if the flightcrew member has reported for a duty period too fatigued to safely perform his or her assigned duties. As part of the flight preparation process, each flightcrew member must affirm that he or she is fit for duty prior to commencing flight.

The ARC agrees that both the certificate holder and the flightcrew member jointly share in the responsibility to mitigate fatigue, consistent with core principle N in section 4.4 and with the recommendation for assigning rest prospectively in section 8.1. The ARC considers the mitigation of fatigue to be central to all recommendations made herein. The ARC also considers that a consolidated, prospective rest opportunity provides the best opportunity for a flightcrew member to receive restorative rest. In order for this rest opportunity to provide the sleep necessary to mitigate fatigue, certificate holders are responsible for scheduling flightcrew members in such a manner as to provide a reasonable prospective rest period to ensure a meaningful rest opportunity. Flightcrew members are responsible to adequately manage their sleep opportunities and must report for any flight duty rested and prepared to perform their assigned duties. As such, as part of the flight release, each flightcrew member must affirmatively state that he or she is fit for duty prior to commencing each flight.

The ARC acknowledges that occasions will arise when a certificate holder may provide an adequate prospective rest opportunity and, despite a flightcrew member’s best effort to sleep, a flightcrew member may be too fatigued to perform the assigned duty. In these circumstances,

it is the responsibility of the flightcrew member to report that he or she is fatigued and is not fit for duty. Upon receiving a report that a flightcrew member is too fatigued for duty, it is the responsibility of the certificate holder to remove the flightcrew member from safety sensitive functions until such time that the flightcrew member receives adequate sleep and can report fit for duty.

### **8.3. Recommendation for Additional Recordkeeping**

The ARC recommends that the FAA require the Certificate Holder to record rest, duty, and flight times in sufficient detail to determine compliance with the rest, duty, and flight time limitations of part 135.

Central to the identification of current deficiencies within the current part 135 regulatory structure, the ARC believes the current record keeping requirements of part 135 certificate holders, as it pertains to flight time, rest, and duty time assignments, are insufficient to enable the FAA to effectively enforce the regulation. For example, 14 CFR § 135.63(a)(4)(vii) does not require a certificate holder to maintain a specific record of a flightcrew member's duty time, but only a record of flight time.

The result of the insufficient record keeping requirements is that enforcement is nearly impossible for aviation safety inspectors, thereby creating an environment in which operators fail to assign rest prospectively. As a result, part 135 operators that keep records beyond the current requirements find themselves at a disadvantage in competing with operators that keep only the minimum required information. This situation tends to punish the companies that follow industry best practices.

In addition to the current requirement to document a "pilot's flight time in sufficient detail to determine compliance with the flight time limitations of this part," the proposed updates to part 135 should contain changes to recordkeeping regulations. The changes should mandate that Certificate Holders document, and have available for inspection, records to show compliance with regulations pertaining to:

- 1) Flightcrew assignment
- 2) Flightcrew rest notifications, including:
  - a. Prospective rest period start and end times
  - b. Date and time in which the assignment was made
- 3) Compliance with flight and duty time limitations pertaining to the specific operation planned and performed, including:
  - a. Assignment of a prospective duty report time
  - b. Date and time in which the duty assignment and prospective duty report time assignment was made
  - c. Duty period start and end times

- d. Any change made to the duty start and end times, and the time at which the change was made
- e. For applicable AMP operations that permit duty extensions:
  - i. All records of duty time extensions
  - ii. Time-stamped record of flightcrew concurrence to the duty extension prior to takeoff (all flightcrew members)
- 4) Compliance with cumulative flight and duty time limitations
- 5) Records documenting the amount and reason for any exceedance to the regulatory limitations contained therein
- 6) Records showing compliance with any post-duty rest requirements contained in the regulations
- 7) Records documenting the Reference Time Zone for a flightcrew prior to beginning any sequence of duty periods

#### **8.4. Recommendation Regarding Enforceable Regulatory Language**

The ARC recommends that the FAA adopt regulatory language that captures the intent of the ARC recommendations with sufficient clarity and completeness. This would aid certificate holders in complying with proposed regulations, and aid aviation safety inspectors in enforcing those regulations.

The introduction and application of up-to-date fatigue science fails if the regulations implementing them lack needed enforceability. In order for the proposed recommendations to be successful in application, the ARC discussed numerous current practices of enforcement, including their effectiveness and related deficiencies. At the conclusion of those discussions, the ARC unanimously agreed that the FAA's ability to enforce any revised regulations pertaining to prospective rest for flightcrews is a paramount objective of any such regulatory modernization.

In addition to the aforementioned recordkeeping requirements, the ARC discussed other concepts to further assist in certificate holder compliance and FAA enforcement. The ARC believes clear and concise definitions and regulatory clarity serve as core tenets of enforceability and should be considered during the implementation of the recommendations.

Clear and concise definitions have been developed, proposed, and are outlined within the ARC's overall recommendations (see section 5). These should be contained within a separate (umbrella type) regulation within part 135 subpart F so as to apply specifically and directly to certificate holders operating under this part of 14 CFR.

Additionally, the proposed regulations must be written in such a clear and succinct manner as to avoid the need for repetitive and unnecessary interpretations. Preamble text as well as overall ARC recommendations must be written to support and underscore the regulatory text where necessary.

## **8.5. Part 91 Tail-End Ferry Segments during Part 135 Operations**

The intent of the ARC is that a flightcrew member operating under part 135 and reaching the duty time limit should not be required to perform additional duties under part 91. But the ARC recognizes the complexities of intermixing requirements under part 135 and part 91. The ARC recommends, at a minimum, that any flight segment conducted by a flightcrew member during an assigned duty period under the operational control of the certificate holder, before, during, or after the duty period (including any part 91 segments), without an intervening rest period, should count towards a flightcrew member's part 135 flight time and duty period limitations.

### **8.5.1. Background**

Pursuant to the ARC's assigned tasks, numerous and varied discussions were held related to components of part 135. Of particular concern to ARC members was the current practice of operators assigning, and pilots accepting, a part 91 flight(s) after the conclusion of a duty period that contained flight segments conducted under part 135. The acceptance of these flights outside of a part 135 duty period can directly impact the safe operation of aircraft as they further extend a long duty period.

It has been well established that, from a physiological standpoint, the time spent awake (measured from the time the last restorative sleep opportunity was obtained) increases fatigue levels and decreases performance in the average person. In addition, while less established from a scientific study perspective, workload factors (including flight time and flight segments) contribute to acute fatigue and should be mitigated to the greatest extent possible (see section 4.3 on the science of fatigue). This combination is especially critical to consider when evaluating the addition of safety-sensitive functions at the end of a duty period that has been continued to the maximum duration allowable in a regulation.

Currently, an operator may assign, and a pilot may accept, a part 91 flight at the conclusion of a part 135 duty period that would have otherwise exceeded the allowable duty limits for part 135, had the part 91 flight been considered as a part of the part 135 duty period. This practice – referred to as “tail-end ferry flights,” “logistical ferry flights,” “91 home,” or “positioning flights,” among other terms – allows an operator or pilot to claim the flight is outside the scope of the part 135 duty period, and therefore, the rest and duty regulations for part 135 would not apply.

From a safety perspective, the ARC believes that the continued allowance of the extended pilot duty for tail-end ferry flights exposes the flightcrew and operator to a potential accident as a direct result of this fatiguing practice. These types of flights fit the description of “safety-sensitive” and, as such, the ARC members recommend that part 91 flights conducted for compensation or hire before, during, or after a part 135 duty assignment should be considered as a part of the part 135 duty assignment for the application of part 135 rest requirements and duty limitations.

The ARC members also believe that there is ample evidence and support for including these part 91 flights as part of a pilot's part 135 flight time and duty period limitations, as evidenced by the following.

### **8.5.2. NTSB support**

The National Transportation Safety Board (NTSB) has identified fatigue as one of the top priorities in its safety recommendations "Most Wanted List." Specifically, the NTSB has the following open recommendations to "Reduce Fatigue Related Accidents" in part 135 operations:

- *A-94-194: Status: Open–Unacceptable Response*  
"TO THE FEDERAL AVIATION ADMINISTRATION: Revise the Federal Aviation Regulations contained in Title 14 Code of Federal Regulations Part 135 to require that pilot flight time accumulated in all company flying conducted after revenue operations—such as training and check flights, ferry flights and repositioning flights—be included in the crewmember's total flight time accrued during revenue operations."
- *A-95-113: Status: Open–Unacceptable Response*  
"TO THE FEDERAL AVIATION ADMINISTRATION: Finalize the review of current flight and duty time regulations and revise the regulations, as necessary, within 1 year to ensure that flight and duty time limitations take into consideration research findings in fatigue and sleep issues. The new regulations should prohibit air carriers from assigning flightcrews to flights conducted under 14 CFR 91 unless the flightcrews meet the flight and duty time limitations of 14 CFR 121 or other appropriate regulations."
- *A-14-072: Status: Open–Unacceptable Response*  
"TO THE FEDERAL AVIATION ADMINISTRATION: Require principal operations inspectors to ensure that operators with flight crews performing 14 CFR 121, 135, and 91 subpart K overnight operations brief the threat of fatigue before each departure, particularly those occurring during the window of circadian low."

As demonstrated by the NTSB recommendations above, part 91 flying after the conclusion of a maximum duration part 135 duty period has long been identified as an unacceptable safety hazard.

### **8.5.3. FAA support**

In addition to the NTSB's recommendations, the FAA has also recognized the need to limit additional part 91 flying that would lead to a fatigued flightcrew. The following are a sample of the FAA's support of this recommendation.

In response to NTSB Recommendations A-94-194, A-95-113, and A-14-72 listed above, the FAA issued a response dated March 16, 2020, stating:

“The FAA will publish an advance Notice of Proposed Rulemaking (NPRM) addressing part 91 tail-end ferry operations for part 135 operators and an NPRM to extend part 121 flight, duty, and rest limits to tail-end ferry flights that follow an all-cargo flight.”

On June 24, 2009, the FAA convened the Flight and Duty Time Limitations and Rest Requirements Aviation Rulemaking Committee to address flightcrew fatigue in pilots operating under part 121 and part 135. At the conclusion of that ARC, the FAA published the final rule in the Federal Register, Vol. 77, No. 2. for FAR 117 - Flightcrew Member Duty and Rest Requirements on January 4, 2012. Contained in the final rule is the following excerpt:

“The NTSB’s list of Most Wanted Transportation Safety Improvements also includes a safety recommendation on pilot fatigue and ferry flights conducted under 14 CFR part 91. Three Flightcrew Members died after a Douglas DC-8-63 operated by Air Transport International was destroyed by ground impact and fire during an attempted three engine takeoff at Kansas City International Airport in Kansas City, Missouri. The NTSB noted that the flightcrew conducted the flight as a maintenance ferry flight under part 91 after a shortened rest break that followed a demanding round trip flight to Europe that crossed multiple time zones. The NTSB further noted that the international flight conducted under part 121 involved multiple legs flown at night following daytime rest periods; this caused the flightcrew to experience circadian rhythm disruption. In addition, the NTSB found that the captain’s last rest period before the accident was repeatedly interrupted by the certificate holder.

“In issuing its 1995 recommendations, the NTSB stated that the flight time limits and rest requirements under part 121 that applied to the flightcrew before the ferry flight did not apply to the ferry flight operated under part 91. The NTSB found that the regulations permitted a substantially reduced flightcrew rest period for the nonrevenue ferry flight. As a result of the investigation, the NTSB reiterated earlier recommendations to (1) finalize the review of current flight and duty time limitations to ensure the limitations consider research findings on fatigue and sleep issues and (2) prohibit certificate holders from assigning a flightcrew to flights conducted under part 91 unless the flightcrew met the flight and duty time limits under part 121 or other applicable regulations (recommendation No. A-95-113).”

Additionally, the Flight and Duty Time Limitations and Rest Requirements ARC recommendation document contains the following excerpt:

“In 1994 the NTSB issued a safety study on commuter airline safety. The NTSB noted that most of the pilots surveyed for the study had flown fatigued. The NTSB concluded that the practice of scheduling part 135 pilots for training, check flights, or other nonrevenue flights at the end of a full day of scheduled revenue flying increases the potential for fatigue-related accidents. The NTSB recommended that the FAA revise part 135 to require that pilot flight time accumulated in all company flying conducted after revenue operations, such as training and check flights, ferry flights, and

repositioning flights, be included in the Flightcrew Member's total flight time accrued during revenue operations."

While the final rule excluded part 135 operations, the Notice of Proposed Rule Making (NPRM) issued by the FAA on September 14, 2010, stated the following:

"...the part 135 community should expect to see an NPRM addressing its operations that looks very similar to, if not exactly like, the final rule the agency anticipates issuing as part of its rulemaking initiative."

Finally, as implemented in the final rule, the FAA included all part 91 operations as part of the flight and duty time limits of part 117, if at least one of their flight segments is operated under part 117:

"...it applies to Flightcrew Members operating under part 91 only if at least one their flight segments is operated under part 117. Flightcrew Members operating under part 91 and who do not have any flight segments subject to part 117 (e.g. pilots flying only part 91 operations) are not subject to the provisions of this rule."

Given the support of the NTSB and the FAA, the ARC members believe that the continued practice of extending pilot duty after a part 135 duty period for tail-end ferry flights not only subverts the intention of rest and duty limits for flightcrew members, but it also exposes the flightcrew and operator to unnecessary safety risks. This provides the foundation for our recommendation.

## 9. Economic Impact of Revised Part 135 Regulations

FAA data indicate that the part 135 industry is comprised of over 1,900 certificate holders with an average of 10.5 pilots-in-command and 2.4 other pilots per certificate, totaling 25,220 pilots. According to IBISWorld,<sup>2</sup> industry wage earnings in 2018 totaled \$3.87 billion. The Part 135 ARC was tasked to provide cost and benefit estimates for any recommendation to change regulatory requirements (see section 1).

The ARC considered economic impact on operators throughout the course of its work. As part of its objective (see section 3), the ARC recommends a tiered approach with options for effective management of fatigue that fits a variety of business models and operational fatigue risks (see section 6). In this context, the ARC recommends that a set of duty, flight, and rest limits be made available for operations that do not have or need an AMP (see sections 6.1 and 7.1). While those limits are deliberately more restrictive to avoid the potential for unmitigated fatigue, they are sufficient for many operations that limit most operations to non-WOCL hours of the day. For many operations that can fit within that framework, this tier of regulations is designed specifically to reduce complexity and cost.

More broadly, if the ARC's recommendations are adopted, operators would incur costs scaled in accordance with the complexity of their operations. Operators that opt not to develop and implement an AMP will have tighter restrictions on their pilots' flight time and duty limits, but will also minimize costs associated with fatigue mitigations. Conversely, operators that choose to invest in additional fatigue mitigations are afforded additional flexibility in the form of less strict pilot flight time and duty limits. For such operators, any additional costs are expected to be offset by the ability to operate under a wider range of circumstances.

Upon request from the FAA, the Part 135 ARC will reassemble and provide examples to illustrate use of the tables in section 7 and any of the further recommendations in this report (see sections 5 through 8). These examples will illustrate how certain operations would have to change under the recommended limits compared to how those operations are conducted under the current part 135 rules. Some of the examples may represent an adverse economic impact; some may represent a beneficial economic impact. The ARC did not attempt to quantify the dollar value of such impacts, whether positive or negative, across the industry, because the ARC did not know a) the prevalence of the various part 135 operations, b) whether more economical alternatives might be devised that could operate under the recommended rules, or c) whether operations would be less fatiguing and safer, thus incurring lower costs based on fewer fatigue calls and incidents.

Throughout the discussions that led the ARC to recommend the AMP concept and the fatigue risk analysis tools included in the AMP, the ARC operated under the assumption that a rule

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<sup>2</sup> <https://www.ibisworld.com>

requiring part 135 operators to have an active safety management system (SMS) would be effective before any regulatory changes to part 135 pilot rest and duty requirements. This assumption was based on statements from the FAA that a notice of proposed rulemaking requiring an SMS for airports, part 135 operators, and part 145 repair stations would be published in September 2022. The ARC assumed that most operators would include a flight risk analysis tool as part of their SMS. Therefore, any cost from specifically addressing fatigue in their pre-flight risk assessment would be minimal. Further, such costs would be justified by addressing risks specific to each flight that may not be captured by a regulatory framework, such as whether or not a flightcrew member was actually able to sleep during the assigned rest period.

The ARC evaluated the economic impact of the recommendation to add recordkeeping requirements that prevent rolling rest, as outlined in section 8.2. It determined that most part 135 operators were already keeping these records out of necessity to ensure compliance with rest and duty requirements. Further, the ARC determined that requiring such recordkeeping would provide a mechanism to enforce future rest and duty requirements. FAA stakeholders informed the ARC that current recordkeeping requirements are insufficient for enforcing rest and duty regulations. The ARC agreed that the ability of the FAA to ensure operator compliance with the rules, which exist to provide safe rest and duty limitations, outweighs the costs associated with the recordkeeping.

The unprecedented circumstances of the national emergency resulting from the novel coronavirus disease 2019 (COVID-19) caused significant delays in the ARC's deliberations. As all meetings came to a halt due to the contagious nature of COVID-19, the ARC did not meet for 3 months. Like many, the ARC believed the inability to meet in person would be limited to a matter of weeks. Simultaneously, the attention of many ARC volunteers was diverted to keeping their businesses from closing as the entire industry was slowed to nearly 25% of pre-pandemic levels. As the impact and effects of the pandemic became better understood, the ARC resumed meeting using video communication technology (VCT). While VCT allowed the ARC to interact, it did not prove sufficiently conducive to engagement on complex subjects. The FAA granted the ARC a six-month extension to continue developing recommendations based on the assigned tasks (see section 1.2). Because members of the ARC were unable to meet and discuss the assigned tasks in person for over a year, the 6-month extension was insufficient for the ARC to effectively determine cost and benefit estimates associated with the whole of its recommendations to change regulatory requirements.

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## Appendix A. Abbreviations and Acronyms

AC	Advisory circular
AMP	Alertness Management Program
ARC	Aviation Rulemaking Committee
ASAP	Aviation Safety Action Program
ASRS	Aviation Safety Reporting System
CARs	Canadian Aviation Regulations
CFR	Code of Federal Regulations
EASA	European Union Aviation Safety Agency
FDP	Flight duty period
FMG	Fatigue Management Guide
FOQA	Flight operational quality assurance
FRMS	Fatigue Risk Management System
ICAO	International Civil Aviation Organization
InFO	Information for Operators
NPRM	Notice of Proposed Rulemaking
NTSB	National Transportation Safety Board
OpSpec	Operations Specifications
SAPRs	Standards and Recommended Practices
SBA	Small Business Administration
SMS	Safety management system
VCT	Video communication technology
WOCL	Window of Circadian Low

## **Appendix B. ARC Recommended Components of an Alertness Management Program**

- 1. Senior-Level Management Commitment to Reducing Fatigue and Improving Flightcrew Member Alertness**
- 2. AMP Scope and the Organization's Fatigue Management Policy and Procedures**
  - a) Define the scope and objectives of the organization's AMP.
  - b) Indicate how the organization's policies and procedures are adequate to mitigate and manage the effects of fatigue and improve flight-crew alertness. (Level 2 AMP only.)
  - c) Define the organization's AMP safety objectives and expectations.
  - d) Define the structure of the alertness management program and roles and responsibilities of those assigned to implement and manage the program.
- 3. Fatigue Risk Management and Mitigation**
  - a) Define within the AMP which reactive, proactive, or predictive tools will be used to manage alertness and avoid excessive fatigue.
  - b) Define how alertness considerations will be factored into the overall operational risk assessment process. Fatigue factors shall be considered a risk factor in combination with other operational risk factors, such as weather, terrain, airfield factors, and aircraft factors.
  - c) AMP shall define how the organization will ensure that flight planning is conducted with protections to avoid excessive fatigue.
- 4. Safety Assurance and Fatigue Reporting Policy**
  - a) AMP defines how fatigue reporting system enables and encourages crewmembers and other employees to report subjective fatigue and, from time to time, and request relief from duties because of chronic fatigue.
  - b) AMP defines the required content of a fatigue report, how a crewmember files a fatigue report, and who in the organization has the responsibility for monitoring fatigue reports and what actions are to be taken when a fatigue report is filed.
  - c) AMP defines how fatigue reports are used as data sources by the organization to determine the causes of fatigue and to develop new and amended fatigue mitigation strategies when needed.
  - d) AMP defines how that information is used to improve operating practices to reduce fatigue in future operations.
  - e) Useful guidance for fatigue reporting is available at the following link:  
<https://www.ifalpa.org/publications/library/ifalpa-fatigue-reporting-guidance--3362>

## **5. *Fatigue Incident Reporting Process***

- a) AMP defines detailed procedures for reviewing and acting upon reports of performance errors that may be attributable wholly or in part to fatigue. Such reports are similar to crew fatigue reports (item 4) and can serve as a mechanism for obtaining all relevant data regarding fatigue contributions to the incident.
- b) AMP defines how other data sources such as procedural errors, Flightcrew Member deviations, flight exceedances, Aviation Safety Action Program (ASAP) or Aviation Safety Reporting System (ASRS) reports and flight operational quality assurance (FOQA) data may help the operator to objectively document fatigue.

## **6. *System for Monitoring Flightcrew Member Fatigue***

- a) AMP defines a process to capture all relevant information, such as the schedule leading up to the fatigue event, the actions of the employee to obtain rest, subjective and objective evidence of fatigue, environmental conditions that may have contributed to fatigue, relevant health or medical conditions, specific actions related to the incident, and communications prior to and during the event.
- b) AMP defines a corporate policy to protect the employee from adverse actions that would discourage reports of fatigue.
- c) AMP defines how an event is evaluated for potential fatigue involvement as well as defining the methodology used for conducting a detailed root cause analysis.
- d) AMP contains operational procedures to follow when one identifies, or suspects, fatigue risk in oneself or others.

## **7. *The Organization's AMP Evaluation Program***

- a) The AMP defines a methodology that continually assesses the effectiveness of the AMP, including the effectiveness of the AMP to improve alertness, and to mitigate performance errors.
- b) AMP has a process for determining the need for amending the AMP, as appropriate, when it is determined that a policy or procedure is no longer effective in managing fatigue events, and documentation of acting upon such need.
- c) AMP shall specify procedure for documenting any deviation of the provisions of the AMP and procedures for remediating the deviation.

## **8. *Fatigue Education and Awareness Training Program***

- a) AMP define the frequency of the Fatigue Education and Awareness training program and the persons required to take the training, to include at minimum all pilots and other personnel involved with scheduling aircraft or crew members.
- b) Reviews the flight, duty, and rest requirements as implemented by the organization.
- c) AMP defines how awareness of the AMP program itself is presented to employees, including fatigue related policies and procedures, and the responsibilities of management and employees to mitigate or management the effects of fatigue and improve flight-crew member flight deck alertness.
- d) AMP promotes training on the basics of fatigue, including sleep fundamentals and circadian rhythms.

- (1) The causes and awareness of fatigue.
  - (2) The effects of fatigue relative to flight-crew member performance, including the ability to react to unusual or emergency circumstances.
  - (3) Fatigue countermeasures, prevention, and mitigation.
  - (4) The influence of lifestyle, including nutrition, exercise, and family life, on fatigue.
  - (5) Familiarity with sleep disorders.
  - (6) The potential impact of commuting on alertness and fatigue.
  - (7) Flight-crew member responsibility for ensuring adequate rest and fitness for duty.
  - (8) The effects of operating through multiple time zones.
  - (9) Operational procedures to follow when one identifies, or suspects, fatigue risk in oneself or others.
  - (10) Incorporate lessons learned regarding the effects of fatigue and mitigation initiatives relative to the operator's operations.
- e) AMP provides a methodology that continually assesses the effectiveness of the training program.

## **9. Prescriptive Flight Time and Duty Period Limitations and Mitigations**

- a) General requirements.
- (1) AMP defines how the organization will enforce the prescriptive duty and rest limits, document compliance with the limits, and how crewmembers will be informed in advance of scheduled rest and duties.
  - (2) AMP defines operating procedures to provide the fatigue mitigations that accompany each set of prescriptive limits.
  - (3) AMP defines which prescriptive limits that apply to their organization, and which do not. An organization may prescribe more restrictive limits than defined in the approved Duty, Flight and Rest requirements and required mitigations but may not adopt less stringent limits without approval from the FAA.
  - (4) If the organization schedules a flight duty that is not defined in their AMP, then the organization will follow the prescriptive limits defined for organizations without an AMP.
- b) Organizational methods to implement the limitations and mitigations.
- (1) The AMP will define any limitations and mitigations specific to the organization.
  - (2) The AMP will define how those limitations and mitigations will be applied and enforced within the organization.
  - (3) The AMP will define what recordkeeping will be performed to verify compliance with the prescriptive limits and required mitigations.

## **COVID-19 Addendum. Additional Conversation and Viewpoints Not Addressed by the ARC**

The unprecedented circumstances of the national emergency resulting from the novel coronavirus disease 2019 (COVID-19) caused significant delays in the ARC's deliberations. As all meetings came to a halt due to the contagious nature of COVID-19, the ARC did not meet for 3 months. Like many, the ARC believed the inability to meet in person would be limited to a matter of weeks. Simultaneously, the attention of many ARC volunteers was diverted to keeping their businesses from closing as the entire industry was slowed to nearly 25% of pre-pandemic levels. As the impact and effects of the pandemic became better understood, the ARC resumed meeting using VCT. While VCT allowed the ARC to interact, it did not prove sufficiently conducive to engender effective engagement on many of the complex issues.

Because members of the ARC were unable to meet and discuss the assigned tasks in person for over a year, the 6-month extension granted by the FAA was insufficient for the ARC to thoroughly discuss the full range of viewpoints on all matters related to the complex nature of fatigue, duty limits, operational extensions, minimum required rest, and the operational and economic impacts related to these issues. The ARC members listed at the end of this Addendum would like to describe various topics that were not fully deliberated. These are points of view that did not result in formal recommendations.

Additionally, the complexity of the part 135 industry cannot be understated. Although membership of the ARC consisted of representatives of the general categories of stakeholders operating under part 135 (e.g., scheduled, on-demand, air ambulance, passengers, and cargo), it is imperative to note that within these categories many sub-categories, nuances, and diversities exist, each representing distinct operational, geographic, and economic challenges and requirements. In addition to the topics described below, scheduled and cargo operations were not thoroughly addressed by the ARC due to the time constraints.

ARC members representing industry offer the following additional points of view for FAA's overall consideration of the ARC's report. FAA should provide, to the broadest degree possible, opportunity for industry participation and should seek comments as to the impacts of any proposed regulatory activities prior to publishing a notice of proposed rulemaking.

### **COVID-19 Addendum. 1. Flight and Duty Time Extensions for Unforeseen Circumstances**

ARC members reached consensus on the removal of the "legal to start, legal to finish" concept from rulemaking, yet due to the complexity of on-demand operations, some ARC members felt a provision similar to 14 CFR § 135.267(e) should remain, with strong limitations. Currently, §

135.267(e) allows for unlimited extensions of flight time due to unforeseen circumstances. All ARC members feel unlimited extensions are potentially hazardous and should be reduced.

The part 135 industry is vastly different from scheduled service, operating from remote locations and often under complex operational circumstances. 14 CFR § 135.267(e) has been a key provision for the part 135 industry to adapt to rapidly changing operational environments, while maintaining the highest degree of safety. Recognizing the ever changing, dynamic environment in which unforeseen circumstances will be encountered that may lead to delays, the ARC discussed the importance of maintaining provisions that allow for extensions.

14 CFR § 135.267(e) allows for extensions of flight time due to unforeseen operational circumstances, such as delays due to weather, and provides compensatory rest to offset the fatigue induced by a longer day. Further, there is no limit on the amount a duty day can be extended due to unforeseen circumstances, such as late-arriving cargo or passengers, in the current part 135 rules, provided the operator reasonably scheduled the flight. This allows an operator, under current rules, to extend duty and flight time in any segment of flight, provided the day was scheduled within duty limitations when assigned. Some ARC members feel both extensions of flight time and duty time, limited in scope, should be allowed for operational flexibility for operators with either a Level 1 or Level 2 AMP.

Some ARC members believe that the combination of an AMP and the consideration for fatigue mitigations presented in the operating tables make a limited extension of flight or duty time low-risk. Certain additional mitigations would be considered. For example, to avoid frequent abuse and over-use of this provision, operators should be required to report duty and flight time extensions, when taken in quantities over a certain threshold, to their principal operations inspector as well as track these extensions in the company's AMP for ongoing internal evaluation. However, the number of extensions should not be restricted, as the rest requirements ensure flightcrew members would have ample opportunity for recuperative sleep prior to the next scheduled duty, and a restriction would fail to accommodate the on-demand nature of the industry. Also, these extensions should only be made available for use on the final segment of flight during the duty day (for example, a delay on the first segment of flight would not be considered an unforeseen operational circumstance for a segment of flight later in the duty day, only the segment of flight in which the unforeseen event occurred).

Extensions of flight time are currently permitted prior to taxi and prior to takeoff. Recognizing that the extension should not be of unlimited duration, some ARC members suggest extensions of flight time be capped at no more than 60 minutes and only be permitted at "block out" time (when the aircraft taxis with intent to depart) and extensions of duty time should be capped at no more than 120 minutes. Such mitigations, when combined with the AMP and rest requirements, would sufficiently mitigate fatigue-related risk to a safe level, while accommodating the unique and diverse operational environments encountered under part 135.

When either duty or flight time is extended, additional compensatory rest must be provided to the flightcrew for recuperative time off; however, some ARC members felt that additional

discussion is needed to more completely address the issues and explore alternative science-based solutions that meet the physiological mitigations desired for the crew members, while balancing the subsequent impact to operations.

The following text outlines the details of the modification to § 135.267 for additional consideration suggested by some ARC members:

**(e)** When a flightcrew member has exceeded the daily flight time or duty time limitations in this section, because of circumstances beyond the control of the certificate holder or flightcrew member (such as adverse weather conditions, late-arriving cargo or passengers), that flight crewmember must have a rest period before being assigned or accepting an assignment for *flight time* of at least:

**(1)** 12 consecutive hours of rest if the flight time limitation is exceeded by not more than 30 minutes or if the duty time limitation is exceeded by not more than 60 minutes;

**(2)** 18 consecutive hours of rest if the flight time limitation is exceeded by more than 30 minutes, but not more than 60 minutes, or if the duty time limitation is exceeded by more than 60 minutes, but not more than 120 minutes. Flight time extensions more than 60 minutes or duty time extensions more than 120 minutes are not permitted.

**(3)** Flight time extensions are only permitted after the aircraft has taxied with the intent to depart, while duty time extensions are permitted prior to or after taxi.

Any provisions for extending flight or duty time must still be fully developed so as to understand the operational impact, potential unintended consequences of overly prescriptive regulations, staffing implications, and costs. Any mitigations should be predicated on the science related to alertness and fatigue management.

## **COVID-19 Addendum. 2. Consecutive Exposures to Window of Circadian Low**

Circadian disruption is one of many causes of fatigue. Preventive strategies are designed to decrease the impact of circadian disruption and sleep loss on performance and alertness. There are a variety of different strategies to accomplish this goal. Some of these strategies include minimizing sleep loss, naps during duties, education on good sleeping habits, and acceleration of circadian adaptation to different shift types. In light of the fact that a number of operators conduct routine operations through the WOCL, some members of the ARC desire to further explore the operational impact, unintended consequences of potentially overly prescriptive regulations, staffing implications, and costs of limiting flightcrew members to three consecutive WOCL duties.

For example, some members of the ARC would like to explore whether maintaining a WOCL schedule for extended periods of time would permit the circadian rhythm to adapt, which could provide an alternative fatigue mitigation. Similarly, a flightcrew member that is regularly scheduled for operations starting early in the morning or ending late in the evening could have the potential benefit of a circadian rhythm shift. This shift would be negated by strict limitations or mitigations on such operations, leading to shifting crew schedules and the unintended consequence of flightcrew members not being able to adapt to any one sleep cycle.

### **COVID-19 Addendum. 3. Contributors to the COVID-19 Addendum**

<b>Name</b>	<b>Organization</b>	<b>ARC Title</b>
Tony Bonham	Air Evac Lifeteam	Member
Bill Cush	Cape Air	Member
Dennis Florian	Flexjet	Member
John W. Hazlet	RACCA	Member
Chris Hill	HAI	Member
Tom Klassen	Halo-Flight	Member
Bill McDonald	A4A	Member
Jessica Naor	Grandview Aviation	Member
Sally Veith	AMOA	Member
Ryan Waguespack	NATA	Member
Eric Walter	Bemidji Aviation	Member

[4910-13]

**DEPARTMENT OF TRANSPORTATION**

**Federal Aviation Administration**

**14 CFR Parts 5, 21, 91, 119, 121, and 135**

**Docket No.: FAA-2021-0419; Notice No. 23-05**

**RIN 2120-AL60**

**Safety Management Systems**

**AGENCY:** Federal Aviation Administration (FAA), Department of Transportation (DOT).

**ACTION:** Notice of proposed rulemaking (NPRM).

**SUMMARY:** The FAA proposes to update and expand the part 5 requirements for safety management systems (SMS) and require certain certificate holders and commercial air tour operators to develop and implement an SMS. This proposed rule would extend the requirement for an SMS to all certificate holders operating under the rules for commuter and on-demand operations, commercial air tour operators, production certificate (PC) holders that are holders or licensees of a type certificate (TC) for the same product, and holders of a TC who license out that TC for production. The FAA also proposes this rule in part to address a Congressional mandate as well as recommendations from the National Transportation Safety Board (NTSB) and two Aviation Rulemaking Committees (ARCs). Additionally, the proposed rule would more closely align the United States with Annex 19 to the Convention on International Civil Aviation. This proposed rule is intended to improve aviation safety by requiring organizations to implement a proactive approach to managing safety.

**DATES:** Send comments on or before *[Insert date 60 days after date of publication in the*

*Federal Register]*. **ADDRESSES:** Send comments identified by docket number FAA-2021-0419

using any of the following methods:

- Federal eRulemaking Portal: Go to [www.regulations.gov](http://www.regulations.gov) and follow the online instructions for sending your comments electronically.
- Mail: Send comments to Docket Operations, M-30; U.S. Department of Transportation (DOT), 1200 New Jersey Avenue, SE, Room W12-140, West Building Ground Floor, Washington, DC 20590-0001.
- Hand Delivery or Courier: Take comments to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE, Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.
- Fax: Fax comments to Docket Operations at 202-493-2251.

*Privacy:* In accordance with 5 USC 553(c), DOT solicits comments from the public to better inform its rulemaking process. DOT posts these comments, without edit, including any personal information the commenter provides, to [www.regulations.gov](http://www.regulations.gov), as described in the system of records notice (DOT/ALL-14 FDMS), which can be reviewed at [www.dot.gov/privacy](http://www.dot.gov/privacy).

*Docket:* Background documents or comments received may be read at [www.regulations.gov](http://www.regulations.gov) at any time. Follow the online instructions for accessing the docket or go to the Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE, Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

**FOR FURTHER INFORMATION CONTACT:** For technical questions concerning this action, contact Scott Van Buren, Office of Accident Investigation and Prevention, AVP-4, Federal Aviation Administration, 800 Independence Avenue SW, Room 300 East, Washington, DC 20591, telephone (202) 494-8417; mail Scott.VanBuren@faa.gov.

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### **List of Abbreviations and Acronyms Frequently Used in This Document**

AC – Advisory Circular  
ACSAA – Aircraft Certification and Accountability Act  
ANPRM – Advance Notice of Proposed Rulemaking  
ARC – Aviation Rulemaking Committee  
CBI – Confidential Business Information  
CFR – Code of Federal Regulations  
EASA – European Union Aviation Safety Agency  
FAA – Federal Aviation Administration  
FOIA – Freedom of Information Act  
ICAO – International Civil Aviation Organization  
IRFA – Initial Regulatory Flexibility Analysis  
LOA – Letter of Authorization  
NAICS – North American Industry Classification System  
NPRM – Notice of Proposed Rulemaking  
NTSB – National Transportation Safety Board  
OMB – Office of Management and Budget  
PC – Production Certificate  
RFA – Regulatory Flexibility Act  
RIA – Regulatory Impact Analysis  
SBA – Small Business Administration  
SMS – Safety Management System  
TC – Type Certificate  
U.S.C. – United States Code

### **I. Executive Summary**

#### **A. Purpose of this NPRM**

A safety management system (SMS) provides an organization-wide approach to identifying safety hazards, assessing, and managing safety risk, and assuring the effectiveness of safety risk controls. An SMS provides a set of decision-making processes and procedures that can improve safety by assisting an organization in planning, organizing, directing, and

controlling its aviation-related business activities. Currently, the SMS requirements of part 5 of Title 14 of the Code of Federal Regulations (CFR) apply only to air carriers certificated under part 119 and conducting operations in accordance with part 121 (part 121 operators). In this Notice of Proposed Rulemaking (NPRM), the Federal Aviation Administration (FAA) proposes to expand the applicability of the SMS requirements to include additional entities in an effort to enhance safety, respond to a Congressional mandate, and more closely align the FAA's SMS requirements with International Civil Aviation Organization (ICAO) Annex 19.

Historically, the approach to aviation safety was based on the reactive analysis of past accidents and the introduction of corrective actions to prevent the recurrence of those events. An SMS, however, helps organizations to proactively identify potential hazards in the operating environment, analyze the risks of those hazards, and mitigate those risks to prevent an accident or incident. In 2015, the FAA promulgated 14 CFR part 5, which required part 121 operators to develop and implement SMS and set out the basic requirements for those systems. The FAA believes that the next step in improving aviation safety is to extend SMS requirements to additional organizations that play a critical role in the design, manufacturing, and operation of aircraft (i.e., part 119 certificate holders operating under part 135, Letter of Authorization (LOA) holders operating commercial air tours under § 91.147, and certain certificate holders under part 21). These organizations are in the best position to prevent future incidents and accidents because they are closest to the hazards, and they know the most about their operations and products. An SMS provides a structured, repeatable, systematic approach to proactively identify hazards and manage safety risk. With implementation of an SMS, these organizations would be better able to develop and implement mitigations that are appropriate to their environment and operational structure. The FAA believes the implementation of SMS can be used to avoid or

mitigate future accidents. Representative examples of accidents that the FAA believes could be avoided can be found in sections V.G. and VII.A of this proposal. This proposal is based on the recommendations of two previous Aviation Rulemaking Committees (ARCs),<sup>1</sup> the National Transportation Safety Board (NTSB),<sup>2</sup> and the Joint Authorities Technical Review of the Boeing 737 MAX Flight Control System.<sup>3</sup>

Further, the Aircraft Certification Safety and Accountability Act (Public Law 116-260, 134 Stat. 2309, hereafter referred to as ACSAA), enacted on December 27, 2020, mandated the application of SMS regulatory requirements to holders of both a Type Certificate (TC) and a Production Certificate (PC) issued under part 21.<sup>4</sup> ACSAA further mandated that the FAA include certain requirements in its implementing regulations. The FAA proposes amendments to part 5 in accordance with this legislation.

Lastly, requiring SMS for certain commercial operators, and design and manufacturers would more closely align the FAA's SMS requirements with ICAO Annex 19; therefore, this proposed rule would increase U.S. alignment with other civil aviation authorities that are also implementing SMS requirements in accordance with ICAO Standards and Recommended Practices.<sup>5</sup>

## B. Summary of the Proposed Rule

An SMS requires four essential components – safety policy, safety risk management, safety assurance, and safety promotion. Additionally, an SMS requires that an organization

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<sup>1</sup> The SMS ARCs are discussed in Section IV.A.

<sup>2</sup> NTSB recommendations are discussed in Section IV. B.

<sup>3</sup> Joint Authorities Technical Review (JATR), *Boeing 737 MAX Flight Control System: Observations, Findings, and Recommendations*, Washington, October 11, 2019.

<sup>4</sup> Section 102(a)(1) of ACSAA.

<sup>5</sup> Several major civil aviation authorities have established or are in the process of establishing SMS requirements for air operators, air traffic management, airports, and maintenance organizations, including the European Union Aviation Safety Agency (EASA), Brazil, Canada, Japan, New Zealand, and Australia. Fewer countries have design and manufacturing organizations and, therefore, they have not established SMS requirements for those entities. However, New Zealand, Japan, and EASA have established SMS requirements for design and manufacturing organizations.

document the system itself and maintain any records produced under that system. In this NPRM, the FAA proposes to expand the applicability of the SMS requirements to include additional entities, add new requirements to part 5, and amend existing regulations in parts 5, 21, 91, and 119. Several of these proposed amendments respond to the statutory mandate in ACSAA.

Specifically, the FAA proposes to expand the applicability of part 5 beyond part 121 operators to include part 135 operators, § 91.147 air tour operators, and certain certificate holders under part 21. These entities would receive the greatest safety benefits of an SMS as they are best situated to prevent future incidents and aviation accidents.

In response to the statutory requirements in ACSAA, the FAA proposes to add a requirement for each SMS to include a code of ethics that applies to all employees and clarifies that safety is the highest priority. Consistent with ACSAA, the FAA also proposes to revise the existing requirement for a confidential employee reporting system by adding a provision to ensure that employees can report without concern of reprisal.

Additionally, the FAA proposes several amendments to part 5 that are intended to increase the effectiveness of SMS, including several new requirements. The FAA proposes to require organizations to develop a system description, which is a summary of aviation-related processes and activities and a description of interfacing persons that contribute to the safety of the organization's aviation-related products and services. The FAA proposes to add information that must be considered during the system analysis, which is conducted when a person applies safety risk management. Specifically, the FAA proposes to require persons to consider the interfaces of the system in conducting the system analysis. The FAA also proposes to require persons who identify hazards to notify interfacing persons who are best able to address or mitigate the hazard. To account for these new requirements, the FAA proposes conforming

amendments to the SMS documentation and recordkeeping requirements to ensure organizations document the system description and retain all communications concerning the notification of hazards to interfacing persons. Furthermore, the FAA proposes several amendments to part 5, including a revision to the definition of “hazard” to ensure it encompasses aviation incidents as well as accidents, the relocation of the definitions to the beginning of the subpart to facilitate readability of part 5, and the removal of all references to the term “certificate holder” to conform to the new applicability proposed by the rule. The FAA also proposes amendments to certain regulations in parts 21, 91, and 119 to conform with, and enable the implementation of, the proposed requirements in part 5.

The following table summarizes the proposed provisions and provides the proposed section(s) of the Federal Aviation Regulations that contains the provisions.

Table 1 provides a summary of the major provisions of this proposed rule.

**Table 1. SUMMARY OF MAJOR PROVISIONS**

<b>Provision</b>	<b>Proposed 14 CFR § affected</b>	<b>Summary of Proposed Provision</b>
Applicability of part 5	5.1, 21.55, 21.135, 21.147, 91.147, and 119.8	Expand the applicability of part 5 (currently limited to part 121 operators) to make SMS requirements applicable to part 135 operators, § 91.147 air tour operators, and certain holders of a TC <sup>6</sup> and PC issued under part 21 for the same product. <sup>7</sup>
Definition of “Hazard”	5.3 <sup>8</sup>	Revise the definition of “hazard” to also mean conditions or objects with the potential to cause or contribute to an incident.
General Requirements	5.5(b)	Add a new requirement to develop and maintain a system description that includes information about the aviation products or services provided by the person and a description of the interfacing persons that

<sup>6</sup> As discussed in Section V.A.3 of the preamble, the FAA considers a licensee of a TC to be equivalent to a holder of a TC. For purposes of this table, each reference to “TC holder” or “holder of a TC” is intended to encompass “licensee of a TC.” Thus, part 5 would also apply to a person who holds a PC and is a licensee of a TC for the same product.

<sup>7</sup> Part 5 would also apply to applicants seeking to operate under part 135 or § 91.147, and to an applicant for a PC who is the holder or licensee of a TC for the same product.

<sup>8</sup> The definitions and general requirements currently exist in §§ 5.5 and 5.3, respectively. The FAA proposes to relocate the definitions to § 5.3 and the general requirements to § 5.5.

		contribute to the safety of the person's products or services.
Part 121 operators	5.7(a)	Require part 121 operators to revise their current SMS in accordance with the new requirements of part 5 and to submit revisions no later than 12 months after effective date of final rule.
Applicants seeking to operate under part 121	5.7(b)	Require applicants seeking to operate under part 121 to develop and implement an SMS in accordance with part 5 and to submit a statement of compliance as part of the certification process.
Part 135 operators and § 91.147 air tour operators	5.9(a)	Require part 135 operators and § 91.147 air tour operators to develop and implement an SMS in accordance with part 5 and to submit a statement of compliance no later than 24 months after the effective date of final rule.
Applicants seeking to operate under part 135 or § 91.147	5.9(b)	Require applicants seeking to operate under part 135 or § 91.147 to develop and implement an SMS in accordance with part 5 and to submit a statement of compliance as part of the certification or LOA process.
Holders of PC and TC for the same product	5.11	Require any person that holds a PC and TC <sup>9</sup> issued under part 21 for the same product to develop an SMS in accordance with part 5; to submit an implementation plan for FAA approval no later than December 27, 2024; and to implement the SMS no later than December 27, 2025.
TC holders applying for a PC for same product	5.13	Require TC holders <sup>10</sup> who apply for a PC for the same product to develop an SMS in accordance with part 5, to submit an implementation plan for FAA approval during the certification process, and to implement the SMS no later than one year after obtaining FAA approval.
TC holders who have a licensing agreement to allow other persons to obtain a PC	5.15(b)	Require TC holders, who have a licensing agreement to allow other persons to obtain a PC, to develop an SMS in accordance with part 5; to submit an implementation plan for FAA approval no later than December 27, 2024; and to implement the SMS no later than December 27, 2025.
TC holders who enter into a licensing agreement to allow other persons to obtain a PC	5.15(c)	Require TC holders, who enter into a licensing agreement to allow other persons to obtain a PC, to develop an SMS in accordance with part 5, to submit an implementation plan for FAA approval when providing written licensing agreements to the FAA,

<sup>9</sup> See footnote 7.

<sup>10</sup> See footnote 7.

		and to implement the SMS no later than one year after obtaining FAA approval.
Implementation plans	5.17	Require implementation plans filed under §§ 5.11, 5.13, and 5.15 to include a description of how the person intends to comply with part 5, and for the person to make available, upon request, all necessary information and data that demonstrates that the SMS has been or will be implemented in accordance with the implementation plan.
Safety policy	5.21(a)(7)	Add a new requirement for the safety policy to include a code of ethics that is applicable to all employees, including management personnel and officers, which clarifies that safety is the organization's highest priority.
System analysis and hazard identification	5.53(b)(5)	Add a new requirement for the person conducting the system analysis to consider the interfaces of the system.
Safety performance monitoring and measurement	5.71(a)(7)	Revise the requirement for a confidential employee reporting system by adding a provision to ensure that employees can report without concern of reprisal.
	5.71(c)	Add a new requirement for holders of both a TC and PC for the same product to submit a summary of the confidential employee reports to the FAA every 6 months.
Notification of hazards to interfacing persons	5.94	Add a new section to: (1) require the person who identifies a hazard to notify the interfacing person who, to the best of their knowledge, could address the hazard or mitigate the risk; and (2) require procedures for reporting and receiving hazard information with interfacing persons.
SMS documentation	5.95(c)	Add a new requirement for SMS documentation to include the system description.
SMS records	5.97(d)	Add a new requirement for persons to retain records of all communications provided under new § 5.94 for a minimum of 24 consecutive calendar months.

### C. Summary of Costs and Benefits

The FAA estimated quantified annualized costs of \$51.3 million using a 7 percent discount rate over a 5-year period of analysis. The costs represent resources to develop and implement an SMS. Mitigation costs to reduce or eliminate any hazards identified by an SMS, which are yet to be identified and thus unknown, are not quantified in the analysis. The FAA

evaluated benefits qualitatively. The benefits are the value that would result from avoided fatalities, injuries, aircraft damage, and investigation costs. Please see Section VII. for more information.

## **II. Authority for this Rulemaking**

The FAA's authority to issue rules on aviation safety is found in Title 49 of the United States Code (U.S.C.). Subtitle I, Section 106 describes the authority of the FAA Administrator. Subtitle VII, Aviation Programs, describes in more detail the scope of the Agency's authority.

In 2010, Congress mandated that the FAA conduct rulemaking to require part 121 operators to implement an SMS in the Airline Safety and Federal Aviation Administration Extension Act of 2010 (Pub. L. 111-216, 124 Stat. 2366).<sup>11</sup>

Subsequently, Congress enacted section 102(a)(1) of the Aircraft Certification, Safety, and Accountability Act (Public Law 116-260; 134 Stat. 2309, hereafter referred to as ACSAA), on December 27, 2020. Section 102, titled "Safety Management Systems," requires the FAA to initiate a rulemaking to require manufacturers that hold both a TC and a PC issued pursuant to 49 U.S.C. 44704 have an SMS consistent with Standards and Recommended Practices established by ICAO and contained in Annex 19 to the Convention on International Civil Aviation (61 Stat. 1180), for such systems. Section 102 of ACSAA requires the implementing regulations to include a confidential employee reporting system through which employees can report hazards, issues, concerns, occurrences, and incidents, without concern for reprisal for reporting, and a code of ethics. This rulemaking proposes regulations in accordance with those requirements.

Additionally, given this clear Congressional support for SMS as a safety concept, the FAA is proposing to use its discretion under the following authorities to proactively extend SMS

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<sup>11</sup> See Sec. 215(a).

requirements to part 119 certificate holders authorized to operate under part 135 and LOA holders operating under § 91.147.

This rulemaking is promulgated under the authority described in 49 U.S.C. 106(f), which establishes the authority of the Administrator to promulgate regulations and rules. This rulemaking is also promulgated under 49 U.S.C. 44701(a)(5) (“The Administrator of the Federal Aviation Administration shall promote safe flight of civil aircraft in air commerce by prescribing regulations and minimum standards for other practices, methods, and procedure the Administrator finds necessary for safety in air commerce and national security”); 44701(a)(2)(A) (“The Administrator of the Federal Aviation Administration shall promote safe flight of civil aircraft in air commerce by prescribing regulations and minimum standards in the interest of safety for inspecting, servicing, and overhauling aircraft, aircraft engines, propellers, and appliances”); 44702(a) (“The Administrator of the Federal Aviation Administration may issue airman certificates, design organization certificates, type certificates, production certificates, airworthiness certificates, air carrier operating certificates, airport operating certificates, air agency certificates, and air navigation facility certificates”); and 44704(a)(1) (“The Administrator of the Federal Aviation Administration shall issue a type certificate for an aircraft, aircraft engine, or propeller, or for an appliance specified under paragraph (2)(A) of this subsection when the Administrator finds that the aircraft, aircraft engine, propeller, or appliance is properly designed and manufactured, performs properly, and meets the regulations and minimum standards”). Additionally, this rulemaking is consistent with the requirements of 49 U.S.C. 44701(d)(1)(A) (“When prescribing a regulation or standard under [49 U.S.C. chapter 447], the Administrator shall consider the duty of an air carrier to provide service with the highest possible degree of safety in the public interest.”).

Finally, 49 U.S.C. 44701(c) directs the Administrator to “carry out this chapter in a way that best tends to reduce or eliminate the possibility or recurrence of accidents in air transportation.” This rulemaking is intended to require certain entities that are regulated under the foregoing statutory authorities to develop and maintain an SMS to improve the safety of their operations. The development and implementation of SMS may enhance safety in air transportation and design and manufacturing so that persons can proactively identify and mitigate safety hazards, thereby reducing the possibility or recurrence of accidents in air transportation consistent with the mandate in § 44701(c). For these reasons, the proposed regulations are within the scope of the FAA’s authority and are consistent with Congress’s mandate that the FAA exercise its authority to proactively – not just reactively – promote safe flight of civil aircraft and to reduce or eliminate hazards that could result in accidents in air transportation.

### **III. Purpose of this Rulemaking**

An SMS is a formal, top-down, organization-wide approach to managing safety risk and ensuring the effectiveness of safety risk controls. It includes systematic procedures, practices, and policies for the management of safety risk. An SMS is a management system integrated into an organization’s operations that enforces the concept that safety should be managed with as much emphasis, commitment, and focus as any other critical area of an organization.

The purpose of an SMS is to reduce incidents, accidents, and fatalities by aiding organizations in identifying hazards and mitigating those hazards before they lead to an incident or accident. Anecdotal evidence from SMS voluntary program participants indicates that SMS

improves the safety of organizations.<sup>12</sup> Although the authors of a 2012 study by the Australian Transport Safety Board acknowledged the prevalence of earlier studies that were inconclusive, they ultimately concluded that “recent studies have demonstrated that well-implemented SMS, especially those where the organisation invests effort into the SMS, are associated with enhanced safety performance.”<sup>13</sup> Research by Tinsley, Dillon, and Madsen<sup>14</sup> suggests that the attention an SMS would bring to seemingly smaller events, or near accidents, could prevent catastrophes. Tinsley, Dillon, and Madsen studied near accidents in dozens of companies across industries and in laboratory simulations. They determined that multiple near accidents preceded and foreshadowed every disaster and business crisis they studied, and that most near accidents were ignored. The authors found that identifying near accidents and correcting root causes are good investments for an organization. Similarly, in examining large U.S. commercial airlines that operated from 1990 to 2007, Madsen, Dillon, and Tinsley<sup>15</sup> found that for airlines to continue to improve safety they must attend to the yet undiscovered or unrecognized risks in the system without waiting for an accident to bring attention to them. Additionally, the FAA contends that expanding the implementation of SMS in the aviation industry would increase overall safety for each entity using an SMS, as well as requiring communication across the aviation industry with respect to identified hazards.

The FAA previously forecasted a reduction in fatalities as a result of implementing SMS for part 121 certificate holders.<sup>16</sup> The FAA still expects an overall reduction in fatalities,

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<sup>12</sup> As described in the Regulatory Impact Analysis for the rule, for example, one participant noted that the compressed executive awareness time of new safety related issues resulted in formal management actions occurring in less than 90 days for low-risk issues and within hours for high-risk issues. Another participant noted that they have seen a substantial drop in the major risk categories that they track.

<sup>13</sup> Thomas, Dr. Matthew J.W.; *A Systematic Review of the Effectiveness of Safety Management Systems*, Australian Transport Safety Bureau, 2012, p. 27. [https://www.atsb.gov.au/sites/default/files/media/4053559/xr2011002\\_final.pdf](https://www.atsb.gov.au/sites/default/files/media/4053559/xr2011002_final.pdf)

<sup>14</sup> Tinsley, Catherine H. et al., *How to Avoid Catastrophe*. Harvard Business Review, Brighton, 2011. <https://hbr.org/2011/04/how-to-avoid-catastrophe>.

<sup>15</sup> Madsen, Peter et al., *Airline Safety Improvement Through Experience with Near-Misses: A Cautionary Tale*. Risk Analysis, May 2016, Vol. 36, No. 5.

<sup>16</sup> See Section V (Regulatory Notices and Analysis) starting on page 1318 of 14 CFR part 5 final rule published January 8, 2015, 80 FR 1308.

however quantifying the effects of part 5 requirements on part 121 certificate holders cannot be done at this time due to inadequate data. The data available for 2020 and 2021 is both significantly reduced and atypical due to the COVID-19 pandemic.

Over the last few decades, accidents involving commercial aviation operators have decreased.<sup>17</sup> Despite an overall reduction in accidents, the FAA has determined that many of the accidents involving part 135 and § 91.147 operators could have been effectively mitigated by the presence of an SMS. These accidents highlight the systemic improvement opportunities to safety as described in the Regulatory Impact Analysis (RIA) for this rulemaking. According to NTSB data, from 2015 to 2019, there were 215 accidents involving part 135 operators, with a total of 121 fatalities,<sup>18</sup> as well as 33 accidents involving air tour operators operating under § 91.147, with a total of 16 fatalities.<sup>19</sup> The FAA identified 35 of these accidents involving part 135 operators and four accidents involving § 91.147 operators which involved fatalities and serious injuries that could have been mitigated had those operators implemented an SMS. Additional accidents not involving fatalities or serious injuries may also have been avoided. The FAA also identified several accidents across parts 91, 121, and 135 involving design and production issues that resulted in fatalities and serious injuries that could have been mitigated or prevented if the design and manufacturing organizations involved had implemented an SMS.<sup>20</sup> A full listing of each accident used to inform the analysis of this rulemaking (including a brief description of the accident, a quantified estimate of the probability of mitigation through the adoption of SMS, and a rationale for estimated probability) is included in Appendix A to the RIA.

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<sup>17</sup> U.S. Air Carrier Safety Data, <https://www.bts.gov/content/us-air-carrier-safety-data>. Accessed March 22, 2022.

<sup>18</sup> National Transportation Safety Board. US Civil Aviation Accident Rates. 2022. Available at: <https://www.nts.gov/safety/Pages/research.aspx>.

<sup>19</sup> Data file of sightseeing accidents provided by the NTSB April 2020.

<sup>20</sup> These accidents include those identified by NTSB accident numbers: DCA19MA086, ERA18LA199, DCA18MA142, ERA18FA120, DCA17FA021, WPR16FA153, DCA16FA199, ERA16FA185, WPR16FA055, DCA16FA013, CEN15MA290, ERA15FA254, and DCA15FA073.

Given the rapid development, growth, and increasing complexities of the airspace, the FAA believes that SMS requirements should extend to parties that play a critical role in the design, manufacturing, and operation of aircraft. ACSAA requires the FAA to include holders of both a TC and a PC among those organizations that should be required to implement an SMS. Applying SMS to commuter and on-demand air carriers, air tours, and the manufacturers responsible for design and production of products would continue to reduce incidents, accidents, and fatalities and improve safety in aviation by requiring these organizations to proactively identify hazards, assess risk of those hazards, and develop and implement mitigations, as necessary. The FAA anticipates that this systemic safety effort will have a measurable effect on the reduction in fatalities as described in the RIA for this rulemaking. ICAO, other civil aviation authorities, industry advisory groups, and the NTSB all agree that the use of an SMS improves safety. An SMS has been implemented by each part 121 operator, and many other organizations have implemented an SMS following the FAA's SMS Voluntary Program. The FAA has also implemented SMS within many of its own organizations. The FAA's own experience has shown that organizations that have an SMS may:

- Increase safety of products or services by identifying and addressing problems before they occur.
- Improve data-informed decision making to prioritize resource allocation.
- Enhance communication regarding safety by using common, consistent terminology within the organization and throughout the industry.
- Strengthen the organization's safety culture.

Further, expansion of the SMS requirements would increase U.S. alignment with other civil aviation authorities that are also implementing SMS requirements in accordance with ICAO

Standards and Recommended Practices. With an SMS, a U.S. company would have an improved ability to operate internationally due to better alignment with ICAO standards and recommended practices. Furthermore, a U.S. company without an SMS could even be barred from doing business in a country where the civil aviation authority requires them to have an SMS.

To date, SMS requirements have mainly focused on internal identification and mitigation of risk within an organization. However, the FAA is proposing to augment these requirements to encourage a more collaborative approach in which persons required to have an SMS share hazard information with each other and work together to identify and address hazards and safety issues. To enable this more collaborative approach, this proposal includes requirements to share hazard information with other organizations, which are intended to ensure that relevant information is shared with the person in the best position to address the hazard. The expanded applicability and hazard information sharing among interfacing organizations would enable a network of organizations working collaboratively to manage risk, thereby enhancing the safety benefits of SMS by assuring that hazards are communicated and mitigated effectively.

#### **IV. Background**

##### **A. SMS Aviation Rulemaking Committees**

The FAA chartered two ARCs composed of industry stakeholders to provide advice on implementing SMS in aviation regulations, including parts 21, 91, 121, 125, 135, 141, 142, and 145. The industry stakeholders on these ARCs included individual companies and associations representing operators, design and manufacturing organizations, repair stations, and training organizations. These ARCs expressed industry support for SMS and recommended that the FAA publish rules requiring use of SMS.

## 1. SMS ARC (2009)

On February 12, 2009, the FAA chartered the SMS ARC with membership from across the aviation industry to evaluate the public comments submitted in response to an Advance Notice of Proposed Rulemaking (ANPRM) on potential rulemaking requiring certain part 21, 119, 121, 125, 135, 141, 142, and 145 certificate holders to develop an SMS<sup>21</sup> and provide its recommendations regarding further action the agency should consider in developing and implementing SMS requirements.<sup>22</sup>

In its report, the ARC recommended the FAA issue regulations on SMS and that those regulations apply to certificate holders under 14 CFR parts 21, 119, 121, 125, 135, 141, 142, and 145, as well as operators under 14 CFR part 91 subpart K. This broad applicability would more closely align with ICAO Standards and Recommended Practices. The ARC, however, recommended phased promulgation of SMS regulations and that the FAA prioritize new SMS regulations based on the potential safety benefit, as well as industry experience and regulatory oversight readiness. The FAA addressed these recommendations by first focusing on part 121 by promulgating 14 CFR part 5 on January 8, 2015 and proposing a rule to require airports certificated under part 139 to implement an SMS. Although the SMS requirements in part 5 currently apply only to part 121 operators, the FAA explained in that rulemaking that part 5 was designed for broader application and the FAA intended for the SMS requirements to apply to other FAA-regulated entities in the future.<sup>23</sup> The rulemakings implementing SMS for part 121 operators and airports certificated under part 139 are addressed in more detail in Section IV.C. of this NPRM preamble.

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<sup>21</sup> 74 FR 36414, July 23, 2009.

<sup>22</sup> Safety Management System (SMS) Aviation Rulemaking Committee; Order 1110.152, Washington, D.C. Available at: [https://www.faa.gov/regulations\\_policies/rulemaking/committees/documents/media/SMSARC-2122009.pdf](https://www.faa.gov/regulations_policies/rulemaking/committees/documents/media/SMSARC-2122009.pdf) (as of March 15, 2022).

<sup>23</sup> NPRM, "Safety Management Systems for Part 121 Certificate Holders," 75 FR 68224, 68232 (November 5, 2010).

When considering this proposed rule, the FAA explored applying part 5 SMS requirements to additional certificate holders and operators consistent with the ARC recommendations, as well as any certificate holders and operators required by ICAO Standards and Recommended Practices in ICAO Annex 19 (i.e., parts 21, 135, 141, 142, 145, and some operators under part 91). However, in this proposed rule the FAA is choosing to address the most impactful parts to which ICAO Annex 19 is applicable (part 135 [operators], part 21 [design and manufacturing], and § 91.147 [air tours]).

The ARC also recommended that the FAA provide additional protections for SMS safety information and proprietary data. As discussed in more detail in Section V.H., the FAA has addressed data protection in this proposal.

The ARC recommended alignment with the SMS framework developed by ICAO in Annex 19, which would facilitate SMS requirement compatibility with States actively engaged in developing and adopting their own SMS requirements. The FAA designed part 5 consistent with this recommendation.

The ARC recommended that the FAA recognize existing systems and processes. For instance, some operators have systems for internal auditing, employee reporting, and revising manuals, which could be leveraged in the development of their SMS. The FAA is incorporating this recommendation in this proposed rule by encouraging certificate holders and LOA holders to leverage their existing systems and processes to meet the requirements. In addition, the FAA is proposing guidance material that describes how existing systems and processes may align with SMS requirements.

Further, the ARC expressed concern regarding the potential impact of SMS requirements on small businesses. The FAA addressed this concern. Just as existing part 5 requirements are

performance-based and scalable, each revision proposed in this NPRM is also intended to be scalable. Scalability is discussed further in Section V.F. of this NPRM preamble. In addition, the proposed guidance accompanying this NPRM should assist certificate holders in appropriately scaling the implementation of SMS to fit their operations. The guidance material is discussed further in Section VI. of this preamble.

## 2. Part 21 SMS ARC (2012)

The Part 21 SMS ARC, established on October 5, 2012,<sup>24</sup> evaluated improvements to the effectiveness and efficiency of existing “certification procedures for products and parts,” and the benefits of incorporating SMS in the design and manufacturing environment. The FAA received the ARC’s final report in October 2014.<sup>25</sup>

The ARC recommended establishing regulatory requirements for implementing SMS for design and production approval organizations that would be consistent with the part 5 requirements.<sup>26</sup> The ARC recommended that SMS requirements apply to organizations that design or manufacture products (under a TC or a PC) and to those that design or manufacture articles (under a technical standard order authorization or parts manufacturer approval), or that make changes to products (under a supplemental type certificate) that could directly prevent continued safe flight and landing if they fail.<sup>27</sup>

The FAA analyzed the ARC’s recommendation and developed an alternative (see Alternative 1 in Section VII.A.5.) to the current proposal that may have met the intent of the ARC’s recommendation by extending SMS requirements beyond holders of both a TC and a PC

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<sup>24</sup> 14 CFR 21/Safety Management Systems Aviation Rulemaking Committee Charter. Available at:

[https://www.faa.gov/regulations\\_policies/rulemaking/committees/documents/media/Part21ARC-10052012.pdf](https://www.faa.gov/regulations_policies/rulemaking/committees/documents/media/Part21ARC-10052012.pdf) (visited March 15, 2022).

<sup>25</sup> Part 21/Safety Management Systems (SMS) Aviation Rulemaking Committee to the Federal Aviation Administration: Recommendations on Certification Procedures for Products and Parts. October 5, 2014.

<sup>26</sup> At the time the ARC submitted its final report in 2014, the FAA had not finalized the proposed part 5 requirements. Part 5 became effective March 9, 2015.

<sup>27</sup> Part 21/Safety Management Systems (SMS) Aviation Rulemaking Committee to the Federal Aviation Administration: Recommendations on Certification Procedures for Products and Parts, page 31. October 5, 2014.

for the same product. This alternative would require SMS for design and production approval holders who design or produce products typically used for compensation or hire with some exceptions (described in Alternative 1 in Section VII.A.5.). As part of this alternative, the FAA considered permitting design and production approval holders to apply to be excluded from part 5 requirements if the failure of the article or product alteration would have little or no impact on the continued safe flight and landing of the aircraft. After analyzing the costs and benefits, the FAA determined that there were costs to including these design and production approval holders, but was unable to estimate the magnitude of benefits. The analysis of this alternative is provided in Section VII.A.5. As a result, the FAA is not proposing to adopt the full scope of the ARC's recommendation in this NPRM at this time.

#### B. National Transportation Safety Board Recommendations

The NTSB first recommended in 1997 that transportation organizations implement an SMS, and early recommendations were aimed at improving safety in the maritime industry. Since then, a number of NTSB investigations related to various modes of transportation, including aviation, have cited organizational factors contributing to accidents and have recommended SMS as a way to prevent future accidents and improve safety. The NTSB issued 18 recommendations regarding SMS for aviation organizations over a 15-year period, spanning 2007 through 2021.<sup>28</sup> These recommendations covered commercial operations under 14 CFR parts 121 and 135, revenue passenger carrying business operations under part 91, and certificate holders under part 21. Eight of the 18 NTSB recommendations were issued to the FAA.<sup>29</sup>

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<sup>28</sup> NTSB Safety recommendations: A-07-010 (2007), A-09-016 (2009), A-09-089 (2009), A-09-098 (2009), A-09-106 (2009), A-12-062 (2012), A-12-063 (2012), A-14-105 (2014), A-14-106 (2014), A-16-036 (2016), A-19-028 (2020), A-19-036 (2019), A-19-038 (2019), A-20-025 (2020), A-21-007 (2021), A-21-013 (2021), A-21-014 (2021), and A-21-048 (2021).

<sup>29</sup> NTSB Safety recommendations: A-07-010 (2007), A-09-089 (2009), A-09-016 (2009), A-16-036 (2016), A-19-028 (2020), A-21-013 (2021), A-21-014 (2021), and A-21-048 (2021).

The NTSB regularly publishes a Most Wanted List, which “highlights transportation safety improvements needed now to prevent accidents, reduce injuries, and save lives.”<sup>30</sup> The NTSB 2021-2022 Most Wanted List recommended that the FAA, “Require and Verify the Effectiveness of Safety Management Systems in all Revenue Passenger-Carrying Aviation Operations.”<sup>31</sup>

### C. Safety Management System Rulemaking Efforts

#### 1. Safety Management Systems for Domestic, Flag, and Supplemental Operations

On July 23, 2009, the FAA published an ANPRM to solicit public comments on whether certain 14 CFR part 21, 119, 121, 125, 135, 141, 142, and 145 certificate holders, product manufacturers, applicants, and employers (product/service providers) should be required to develop an SMS.<sup>32</sup> Subsequently, on August 1, 2010, Congress enacted the Airline Safety and Federal Aviation Administration Extension Act of 2010 (Pub. L. 111-216, 124 Stat. 2366), which directed the FAA to conduct rulemaking to “require all part 121 air carriers to implement a safety management system.”<sup>33</sup> To meet the rulemaking deadlines mandated by the Act, the FAA decided not to immediately address SMS for other product/service providers.<sup>34</sup> The FAA limited the SMS rulemaking project to part 121 air carriers, issuing an NPRM on November 5, 2010,<sup>35</sup> and subsequently withdrawing the ANPRM.<sup>36</sup>

On January 8, 2015, the FAA published the Safety Management Systems for Domestic, Flag, and Supplemental Operations Certificate Holders final rule (SMS for part 121 final rule)

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<sup>30</sup> 2021-2022 NTSB Most Wanted List of Transportation Safety Improvements, [www.nts.gov/mwl](http://www.nts.gov/mwl)

<sup>31</sup> 2021-2022, NTSB Most Wanted List of Transportation Safety Improvements, Require and Verify the Effectiveness of Safety Management Systems in all Revenue Passenger-Carrying Aviation Operations, <https://www.nts.gov/Advocacy/mwl/Pages/mwl-21-22/mwl-as-01.aspx>

<sup>32</sup> ANPRM, “Safety Management Systems,” 74 FR 36414. July 23, 2009.

<sup>33</sup> See Sec. 215(a).

<sup>34</sup> See “Safety Management System; Withdrawal,” 76 FR 14592. March 17, 2011.

<sup>35</sup> 75 FR 68224.

<sup>36</sup> See *id.*

requiring operators authorized to conduct operations under part 121 to develop and implement an SMS to improve the safety of their aviation related activities.<sup>37</sup> The final rule added part 5 to Title 14 of the CFR, creating the SMS requirements for part 121 certificate holders, modeled on the ICAO SMS framework in ICAO Annex 19 and consistent with the 2009 ARC recommendations. The requirements in part 5 were meant to be applicable to organizations of various sizes and complexities, as well as adaptable to fit the different types of organizations in the air transportation system and operations within an individual company. The final rule also modified 14 CFR part 119 to specify applicability and implementation of the new SMS framework in part 5 for part 119 certificate holders authorized to conduct operations under part 121. Part 121 operators met the requirement to have an SMS acceptable to the FAA by 2018. The FAA has seen continuous improvement in 121 operators' use of SMS to manage the safety of their operations and, therefore, is proposing to expand part 5 applicability with this rulemaking.

## 2. Safety Management Systems for part 139 Airports

On July 14, 2016, the FAA published the "Safety Management System for Certificated Airports" supplemental notice of proposed rulemaking [(81 FR 45872)] (Airports SMS SNPRM). The Airports SMS SNPRM proposed to require airports that meet certain criteria to develop and implement an SMS in the airport's movement and non-movement areas. The FAA is working to finalize that rule.

### D. Aircraft Certification, Safety, and Accountability Act

The Lion Air and Ethiopian Airlines accidents involving the Boeing 737 MAX resulted in several investigations, not only of the accidents, but also of the FAA's oversight and

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<sup>37</sup> 80 FR 1308. The FAA published technical amendments on January 13, 2015 (80 FR 1584) and May 25, 2017 (82 FR 24009) to correct a date and a reference in the rule, respectively.

certification processes. One such investigation, convened by the FAA in April of 2019, was the Boeing 737 MAX Flight Control System Joint Authorities Technical Review. The Joint Authorities Technical Review included representatives from the National Aeronautics and Space Administration, the FAA, and several foreign civil aviation authorities. One of the Joint Authorities Technical Review recommendations was that the FAA encourage applicants to have a system safety function, such as a safety management system, that is independent from their design organization.<sup>38</sup>

Subsequently, on December 27, 2020, Congress enacted ACSAA, which set forth a variety of reforms intended to address certain safety standards relating to the aircraft certification process. Section 102 of ACSAA requires that the FAA promulgate rules to require holders of both a TC and a PC issued under 14 CFR part 21 to implement an SMS. ACSAA also establishes a timeline for those certificate holders to adopt an SMS (i.e., no later than four years after the date of enactment, December 27, 2024), and it establishes certain requirements for the rulemaking, including a confidential employee reporting system through which employees can report hazards, issues, concerns, occurrences, and incidents without concern for reprisal for reporting, and a code of ethics.

#### E. International Movement Toward SMS

ICAO Annex 19, Safety Management, establishes a framework for member States to develop and implement SMS requirements within their State's rules. Several member States, including the U.S., started developing and implementing SMS requirements within their countries after Annex 19 First Edition was published in July 2013 and became applicable in

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<sup>38</sup> Joint Authorities Technical Review (JATR), *Boeing 737 MAX Flight Control System: Observations, Findings, and Recommendations*. October 11, 2019.

November 2013.<sup>39</sup> Annex 19 currently requires States to establish requirements for SMS for international commercial air transportation, design and manufacturing, maintenance, air traffic services, training organizations, and certified aerodromes, as well as SMS criteria for international general aviation operators of large or turbojet airplanes.

Member States continue to make progress in developing, implementing, and maintaining requirements for SMS that are aligned with ICAO's SMS standards and recommended practices, including certificating authorities in Canada, Brazil, the United Kingdom, Japan, Australia, and Europe (European Union Aviation Safety Agency (EASA)). In the EASA regulatory framework, SMS is mandatory for certificated operators of airplanes and helicopters authorized to conduct commercial air transportation. Additionally, as a result of recent EASA rulemaking efforts, SMS will also be applicable for continuing airworthiness of an aircraft and its components. The EASA also adopted a rule for design and production organizations (part 21), which will become applicable on March 7, 2023.<sup>40</sup>

FAA also notes that other civil aviation authorities and interested parties are initiating evaluations to determine the effects of SMS post implementation. Two evaluations of note are discussed as follows.

In 2019 Transport Canada Civil Aviation published an evaluation of the impact of SMS on aviation safety 10 years after it was mandated for airline operators, private operators, approved maintenance organizations that service airline operator aircraft, air navigation services, and aerodromes/airports/heliports.<sup>41</sup> The evaluation findings were based on multiple lines of evidence, including a survey of nearly 1800 aviation industry stakeholders (operators, approved

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<sup>39</sup> The Second Edition of Annex 19 was published in July 2016 and became applicable in November 2019.

<sup>40</sup> European Union Aviation Safety Agency Commission Implementing Regulation (EU) 2022/203 of 14 February 2022.

<sup>41</sup> Evaluation of Safety Management Systems in Civil Aviation - Transport Canada, July 2019. Available at: <https://tc.canada.ca/sites/default/files/2021-02/evaluation-safety-management-systems-civil-aviation.pdf>.

maintenance organizations, aerodromes), case studies involving eight enterprises and interviews. The evaluation found that many organizations have implemented policies and practices associated with an effective SMS, specifically, non-punitive reporting, executive commitment and hazard identification and mitigation. The evaluation found notable buy-in to SMS among those surveyed. Although accident trends declined over the 10-year evaluation period it was also noted that a lack of objective data limited ability to show safety improvement directly attributable to SMS because of the difficulty in separating other effects that may also benefit safety.

A Griffith University (Queensland Australia) doctoral thesis paper evaluated the impact of SMSs on safety performance for commercial aviation operations using two case studies.<sup>42</sup> Legislation in Australia for the implementation of an SMS for regular public transport Air Operator Certificate holders was mandated by the Civil Aviation Safety Authority in 2009 with phased implementation to be complete by 2011.

The first case study examined SMSs in the international general aviation and charter operation sector while the second case study reviewed SMSs in the Australian airline sector. In the first case study, researchers conducted an analysis of de-identified Flight Safety Foundation general aviation and charter sector audit findings. A total of 7,625 audit findings were reviewed from 2011–2014 from a population of 117 operators. The determination of safety performance was not possible for this sample population using a conventional accident rate metric due to the lack of availability of flight departure data. However, the study concluded that safety performance had improved since SMS implementation, showing a uniform decrease in the number of negative audit findings. Although the study did not control for the number and

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<sup>42</sup> The Impact of Safety Management Systems on Safety Performance: Commercial Aviation Operations - Griffith University thesis paper. April 2015. Available at: <https://research-repository.griffith.edu.au/handle/10072/367145>.

thoroughness of audits performed during the years under study, the study did present qualitative findings by year and discipline, independent of the number of audits conducted. The study further concluded that a decrease in findings for the last two years of the study were likely due to the improvements brought about by growing and maturing safety management systems.<sup>43</sup>

In the second case study, researchers conducted a review of airline SMSs in Australia by comparison of Civil Aviation Safety Authority safety audit indicators for the sampled population before and after the implementation of SMS. The study concluded that the empirical evidence indicates that SMSs improve the safety performance of commercial aviation operations. The study also showed that SMS safety assurance plays the most critical role in an effective SMS; its associated subcomponents of continuous improvement, safety performance monitoring and measurement, and management of change have the highest net influence of all the SMS components. FAA notes that the Griffith University study conclusions and multiple correlation analyses are based on a short timeframe (three years of fully implemented SMS) and study of longer timeframes involving more mature SMSs is desirable.

## **V. Discussion of the Proposal**

The FAA proposes changes to part 5 to further the safety of flights for compensation or hire and passenger carrying operations. To that end, the FAA considers that overall aerospace system safety would be increased by requiring entities beyond part 121 operators to implement SMS, including other operators that fly for compensation or hire and the designers and manufacturers of products used in the system. The FAA envisions these safety management systems to be scalable to the size and complexity of the organization, and to not be unduly burdensome. By requiring entities that span the disparate sectors of aviation from manufacturing

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<sup>43</sup> Yeun, Richard Chee Kin, *The Impact of Safety Management Systems on Safety Performance: Commercial Aviation Operations*, PhD Thesis (Queensland Australia: Griffith University, 2015), See table 6.5, pp 122-123. <https://hdl.handle.net/10072/367145>.

and design to operations to implement an SMS, the FAA seeks to create a network of organizations that speak the same language of safety management and can better communicate with one another and share information about any hazards they identify during the course of their business. Although some part 121 operators may communicate with one another voluntarily at this time, the FAA considers that there would be greater safety benefit if all aviation organizations, from the manufacturer to the operator, were to communicate hazard information to one another. The FAA considers that the benefits of safety management systems are derived from each of the components of an SMS and that the proposed changes to part 5 would assist in maximizing the potential of an SMS to increase safety across the aerospace system.

#### A. Applicability

Part 5 currently applies only to persons authorized to conduct operations under part 121. The FAA proposes to amend § 5.1 and expand the applicability of part 5 to: (1) any person authorized or applying to conduct operations under part 135 or § 91.147; (2) any person that holds or applies for a PC issued under part 21 for a product for which they are the TC holder or licensee; and (3) TC holders who license the TC for production.

Although the FAA recognizes the value of the variety of voluntary safety programs, their optional nature and lack of comprehensive application of all elements of part 5 may not yield as much safety benefit as a mandatory SMS that complies with all proposed requirements of part 5. Therefore, to ensure that the minimum standard is met, the FAA is proposing to broaden the application of part 5 SMS requirements.

##### 1. Part 135 Operators

As described in Section III, the FAA identified a number of accidents involving part 135 operators which resulted in fatalities and serious injuries that could have been mitigated through

SMS. These accidents involved both passenger-carrying and cargo-only operations. Each of these accidents stemmed from different circumstances; however, the accidents analyzed were a representative cross section of the overall circumstances that were present in the balance of total part 135 accidents that occurred. Therefore, the FAA considers that an SMS would have been effective in similar accidents among those not analyzed.

The FAA proposes to require all part 119 certificate holders authorized to operate under part 135 and applicants for those certificates to develop and implement an SMS that meets the part 5 requirements. This aligns the proposed part 5 applicability with ICAO Annex 19 and with other civil aviation authorities that generally do not differentiate between size and complexity of air carriers. SMS is necessary for safety of air transportation generally because anyone who engages in air transportation must understand the hazards associated with their operation, effectively assess the risks, and understand how to mitigate those risks. The identification of hazards through SMS may include analyzing the potential risk associated with crewmember fatigue when compounded by variations in individual 135 operations, such as scheduling variances, frequency of operations, distance, and number of pilots.<sup>44</sup>

The FAA considered excluding part 135 operators who use only one pilot-in-command in their operations from the SMS requirements. Approximately 31 percent (594) of the part 135 operators use one pilot-in-command. These operators have between 1 and 7 aircraft. Similar to most part 135 operators, these operators might also meet the size standard for small businesses (see Section VII.B for details). However, as all part 135 operators conduct air transportation of passengers and cargo, the FAA determined such exclusion would not be in the interest of safety

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<sup>44</sup> See report from the Part 135 Pilot and Duty Rules Aviation Rulemaking Committee dated July 2, 2021, a copy of which has been placed in the docket for this rule.

as evidenced by the part 135 accidents discussed in Section III that could have been mitigated through an SMS (including those involving only one pilot-in-command).

As a fundamental matter, the flying public expects safe carriage from operators offering flight services for hire. Irrespective of whether an operator employs one pilot or a thousand, that company has the same responsibility to conduct safe operations. Part 135 operators employing just a single pilot are not immune to accident or serious injury; the FAA's review of NTSB reports from 2015 to 2020 showed that part 135 operators employing just a single pilot were involved in five accidents involving a fatality or serious injury. This record demonstrates that very small and single pilot part 135 operators continue to face insufficiently addressed safety hazards that cause the loss of life. More importantly, the FAA concluded that these operators could have used basic components of SMS, such as establishing safety policies, performing safety risk management to assess risk and develop controls, and using safety assurance to verify risk control effectiveness to address hazards that contributed to these accidents. These SMS elements, which require the operator to proactively monitor its practices, procedures, and how it makes decisions, are especially important for small organizations. Small organizations by definition have fewer people and, as a result, have fewer opportunities for checks and balances on decisions that can affect safety. SMS addresses this by requiring small operators to create a structure for proactively monitoring their decision-making processes and addressing deficiencies. Very small operators may implement SMS requirements differently than larger operators. For example, with respect to § 5.93, small operators will have fewer employees to communicate with than large operators where personnel may have a more narrow set of responsibilities and less awareness of all operations. At one end of the spectrum, a one-person operator would have a system for documenting their own hazard information, actions, mitigations, safety performance,

etc. for future reference. At the other end of the spectrum, a large organization would have a system capable of documenting and sharing information with larger groups of people. In particular, certain aspects of SMS such as developing more routine expectations for monitoring and responding to hazards may be particularly beneficial for smaller operators. The FAA requests comment regarding how SMS might present unique opportunities or challenges for smaller organizations.

The five accidents involving single-pilot part 135 operators between 2015 and 2020 resulted in 5 fatalities and 4 serious injuries.<sup>45</sup> Appendix A of the RIA describes how SMS could help avoid similar accidents in the future. The following discussion describes three of those accidents and identifies how having an SMS could have addressed the hazards contributing to the accidents. In each of these cases, if the operator had invested in an appropriately scaled SMS program on the front end, it could have avoided property damage, injury, and loss of life on the back end.

According to the NTSB, the probable cause of accident CEN18FA215 was the pilot's decision to fly over the river at a low altitude and his failure to maintain clearance with wires during low-level flight. The FAA examined the effect SMS would be expected to have on this accident and determined that SMS would have enabled the operator to identify hazards along waterways. As a result of conducting safety risk management (§§ 5.51 – 5.55) the organization would develop a safety risk control that would help prevent the accident from occurring. Specifically, the risk control might have established a minimum altitude above known or presumed obstructions (§ 5.55(c)). The operator might have also established a policy or control that whenever the pilot is operating around wires, the pilot would mark the location of the wires

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<sup>45</sup> NTSB accident numbers: CEN18FA215, ANC18LA046, ANC16FA017, ANC17TA015, and CEN17FA100.

on a map. This risk control would have helped to mitigate the risk of the pilot inadvertently flying into the wires because these additional controls would help to ensure the pilot's situational awareness regarding the location of the wires in relation to the aircraft. In this case, the pilot would monitor the safety performance (§ 5.71), by validating the location of the wires on the map and updating the information as appropriate. This is one way that the operator could verify that risk controls were appropriately applied and effective. In a small organization the operator could communicate (§ 5.93) the control to others in the organization face-to-face, via email, or other methods that the company regularly uses to communicate with its employees.

The probable cause of accident ANC18LA046 was the pilot's selection of an unsuitable takeoff area with unfavorable wind conditions, which resulted in the airplane's inability to maintain a climb. The FAA determined that the effect SMS would have had on this accident was similar to that of accident CEN18FA215. In this case, had the operator conducted safety risk management (§§ 5.51 – 5.55), it would likely have developed risk controls to ensure safer operations (§ 5.55(c)). For example, the operator could establish tools for a go/no-go decision customized for its operations. This could include special procedures specific to the environment or operations. Another risk control might be establishing procedures to ensure that the equipment is appropriate for the environment. Both of these controls would be documented using standard information tools already in use within the company. Conducting safety risk management could have included identifying and evaluating company approved unimproved landing areas to include ingress/egress routes and minimum acceptable weather performance limits could mitigate these hazards. In this case, safety performance monitoring (§ 5.71) might include periodic review of operations in non-standard environments to ensure that the controls provide the intended effect. Similar to the previous example, the operator could communicate (§ 5.93)

the control to others in the organization face-to-face, via email, or other methods that the company regularly uses to communicate with its employees.

The probable cause of accident ANC16FA017 was the pilot's inadvertent turn toward terrain that was higher-than-expected while trying to avoid poor visibility conditions and his subsequent attempt to clear terrain, which reduced the airspeed and led to the exceedance of the airplane's critical angle of attack and an aerodynamic stall and spin was the probable cause of accident. The FAA determined that SMS would have had an effect on this accident. In this case, with an SMS, the operator would have conducted safety risk management (§§ 5.51 – 5.55), and it would likely have identified hazards with low visibility hazards and mountainous terrain. The operator might develop safety risk controls regarding route suitability (§ 5.55(c)). These risk controls could include setting higher alternative weather minimums and selection of alternative routes that are consistent with the aircraft's performance, along with training to support these risk controls. The operator would also monitor its safety performance (§ 5.71), by validating that the higher alternative weather minimums and alternative routes are appropriate mitigations. Similar to other examples, the operator could communicate (§ 5.93) the control to others in the organization face-to-face, via email, or other methods that the company regularly uses to communicate with its employees.

In addition to addressing risk in this segment of the part 135 population, the FAA considers that a part 119 certificate holder authorized to operate under part 135 with only one pilot-in-command receives the same privileges and authorization as any other size or complexity part 119 certificate holder authorized to operate under part 135, and should therefore be subject to the same requirements with regard to SMS. The FAA recognizes that the implementation of part 5 requirements, applicable to all part 135 operators, must remain scalable to the size and

complexity of the organization. (For more information regarding scalability, please refer to Section V.F.).

Some part 119 certificate holders may be authorized to operate under both parts 121 and 135. The proposal would extend the SMS requirements to operations conducted by those combination certificate holders authorized to operate under both parts 121 and 135. Certificate holders that already have an SMS in place for only their part 121 operations would have to implement SMS for their part 135 operation.

## 2. Section 91.147 Letter of Authorization Holders

The FAA is proposing to extend the SMS requirements to all holders and applicants of LOAs issued under § 91.147 to enhance the safety of commercial air tour operations. Most operations for compensation or hire are conducted pursuant to a part 119 certification, however, nonstop commercial air tours operated under a § 91.147 LOA conduct operations for compensation or hire without a part 119 certificate. Because air tours operated under § 91.147 carry passengers for compensation or hire, the FAA is proposing to apply part 5 to these operations.

The FAA considered excluding some smaller § 91.147 LOA holders from this proposal (those conducting fewer than 100 flights per year). The FAA does not collect data on number of flights conducted under § 91.147 LOAs; however, approximately 54 percent (373) have only one aircraft registration. These LOA holders might also meet the size standard for small businesses, but the FAA does not have data to make this determination either (see Section VII.B for details). Consistent with the approach proposed for part 135 operators who use only one pilot-in-command in their operations, the FAA believes such an exception would not meet the safety objective.

FAA review of NTSB accident reports from 2015 to 2020 identified one accident involving a fatality or serious injury in the segment of § 91.147 LOA holders conducting fewer than 100 flights per year. As discussed in Section V.A.1, small operators bear the same responsibility for safety as large operators.

The § 91.147 LOA holder accident resulted in 5 fatalities involving an operator conducting air tours.<sup>46</sup>

The NTSB indicated that the probable cause of this accident was the operator's use of a passenger harness/tether system, which caught on and activated the floor-mounted engine fuel shutoff lever. As a result, the aircraft lost engine power in-flight and ditched into the East River. In addition, the operator allowed outside influence on company decisions. Moreover, they failed to address foreseeable safety risks associated with the harness/tether device.

If the operator had an SMS in place the company would have conducted safety risk management prior to installing the harness/tether device. While conducting safety risk management, the hazard of the harness/tether device potentially shutting off the fuel lever would have been identified under § 5.53(a) and analyzed under § 5.55(a). Based on that analysis, the company would assess the safety risk (§ 5.55(b)) and implement appropriate safety risk controls (§ 5.55(c)). After developing safety risk controls, the organization would communicate them to the appropriate flight crews and maintenance personnel (§ 5.93) face-to-face, via email, or other methods that the company regularly uses to communicate with its employees.

In addition, all § 91.147 LOA holders are authorized to provide the same service, regardless of their size. Improving aviation safety for all passenger-carrying operations conducted for compensation or hire would require all § 91.147 LOA holders to meet part 5

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<sup>46</sup> NTSB accident number: ERA18MA099.

requirements for SMS, so long as the implementation of those requirements remains scalable to the size and complexity of the organization. (For more information regarding scalability, please refer to Section V.F.). As the requirements are scalable, so too will be compliance costs.<sup>47</sup> And, as evidenced by the accident discussed, there are safety benefits to be achieved from implementation of SMS even among these smaller operators.

The FAA is aware that there are § 91.147 LOA holders with low flight volume, as well as 135 operators who use only one pilot-in-command in their operations.<sup>48</sup> The FAA seeks supporting information and data regarding whether this applicability should be limited to a certain subset of § 91.147 LOA holders and part 135 operators, and if so, how?

### 3. Part 21 Certificate Holders

The FAA is proposing to require holders of both a TC and a PC issued for the same product under part 21 to develop and implement an SMS that complies with the part 5 requirements. Section 102(a)(1) of ACSAA requires the FAA to initiate a rulemaking proceeding to require that, “manufacturers that hold both a type certificate and a production certificate issued pursuant to section 44704 of title 49, United States Code, where the United States is the State of Design and State of Manufacture, have in place an SMS that is consistent with the standards and recommended practices established by ICAO.” As discussed in Section IV.E., Annex 19 requires ICAO member States to mandate SMS for the management of safety risk in design and production of aviation products. To meet the statutory requirement and align U.S. aviation design and manufacturing organizations with safety management practices followed by other international organizations complying with Annex 19, the FAA proposes to require holders of

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<sup>47</sup> For example, in Section VII.B, Regulatory Flexibility Act, the FAA finds that the annual costs as a percentage of receipts for smaller operators with 1 to 9 aircraft is about 0.1% to 0.4% compared to those with a larger number of aircraft between 100 to 500 is about 0.2% to 0.3%.

<sup>48</sup> There are some § 91.147 LOA holders that conduct infrequent air tours even though that is not their primary business (e.g., flight schools, aerial applicators, or electronic news gathering, etc.).

both a TC and a PC issued for the same product under part 21 to develop and implement an SMS that complies with the part 5 requirements.

Additionally, the FAA proposes to apply part 5 to: (1) persons who hold or are licensees of a TC and are seeking a PC for that same product, and (2) persons who hold a PC for a product for which the person is a licensee of the TC. This approach ensures that there are no gaps in SMS applicability for part 21 certificate holders because TC licensees have the same privileges as TC holders under § 21.45 and the same reporting requirements as TC holders under § 21.3 for failures, malfunctions, and defects. Therefore, in the context of an SMS, the FAA considers a licensee of a TC to be equivalent to a holder of a TC and should be required to comply with the requirements of this proposed rule.

Through ACSAA, Congress intended for SMS requirements to apply to entities that design and manufacture products. The FAA further recognizes that critical decisions are made during design and development that impact the safety of aviation products. Consequently, companies that design a product and allow other companies to produce that product should be held to the same regulatory requirements as a person holding both the TC and a PC for the same product. Upon evaluating section 102(a)(1) of ACSAA, the FAA determined that the implementing regulations combined with the regulatory framework of part 21 could enable certain persons to avoid the proposed requirements by licensing their TC to another person to obtain a PC.<sup>49</sup> To address this gap, the FAA proposes to apply part 5 to TC holders who license their TC to other persons in accordance with §§ 21.47 and 21.55.

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<sup>49</sup> Under §§ 21.47(a) and 21.55, a person who holds a TC for a product may enter into a written licensing agreement to allow another person to use that TC to obtain a PC. As a result, the person obtaining the PC would be allowed to use the TC holder's design approval to manufacture the product. Therefore, some business relationships result in one person holding the TC and a different person holding the PC for the same product.

The FAA notes that there may be persons who manufacture products under a TC in accordance with part 21 Subpart F. Section 21.123(g) requires these persons to obtain a PC within 6 months after the date of issuance of the TC. Therefore, these persons would be required to comply with the proposed rule because they have applied for a PC.

The FAA also notes that there may be persons who hold a PC for a supplemental type certificate. A supplemental type certificate is a design approval for a modification to a product. A person who holds a PC for a supplemental type certificate may produce articles used to modify the product but cannot produce a complete product. Under the proposed rule, part 5 would not apply to either a supplemental type certificate holder or a PC holder for a supplemental type certificate because these design and production approvals are for modifications to a product and not for complete products. Similarly, there are persons who may hold a TC and a PC that is designated for the production of parts or articles only. The proposed rule would not apply because the PC is only for the production of a part or an article and not for the same product.

The FAA considered applying part 5 to certain persons holding other design and production approvals such as technical standard order authorizations, parts manufacturer approvals, and supplemental type certificates, an approach that would be consistent with the Part 21 SMS ARC recommendation. Although there may be safety benefits to applying SMS to this larger population, the FAA could not substantiate these benefits. The FAA invites comments as to whether part 5 should apply to all holders of TCs, PCs, supplemental type certificates, technical standard order authorizations, or parts manufacturer approvals. The FAA requests that comments specify whether any exceptions should be made in the event that the FAA extends part 5 to these design and production approval holders and what those exceptions should entail. The FAA further requests information and data related to the safety benefits or impact of applying

part 5 to additional design and production approval holders beyond the applicability in this proposed rule.

## B. General Requirements and Definitions

### 1. Definitions

The FAA is proposing to move the definitions in part 5 from current § 5.5 to proposed § 5.3 and to amend the definitions of “hazard” and “safety policy.” Currently, the definition of “hazard” in part 5 is “a condition that could foreseeably cause or contribute to an aircraft accident as defined in 49 CFR 830.2.” In Annex 19, ICAO defines “hazard” as “a condition or an object with the potential to cause or contribute to an aircraft incident or accident.”<sup>50</sup> The FAA is proposing to amend the definition of the term “hazard” to “a condition or an object with the potential to cause or contribute to an incident or aircraft accident, as defined in 49 CFR 830.2,” to further align with the internationally-recognized definition published by ICAO. Although the FAA previously did not include incidents in the definition of hazard,<sup>51</sup> the FAA now considers that the definition of hazard should include anything that affects or could affect the safety of aviation operations, not just those conditions or objects that could result in serious injury, death, or substantial damage. This is because many of the same circumstances that result in an incident could just as easily result in an accident. As discussed in Section III, Tinsley, Dillon, Madsen studied near accidents in dozens of companies across industries and in laboratory simulations. They determined that multiple near accidents preceded and foreshadowed every disaster and business crisis they studied, and that most near accidents were ignored. The authors found that “surfacing near misses and correcting root causes is one [of] the soundest investments that

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<sup>50</sup> International Civil Aviation Organization, Annex 19 to the Convention on International Civil Aviation, Safety Management, Second Edition, pp. 1-2, July 2016.

<sup>51</sup> 80 FR 1308.

organizations can make.”<sup>52</sup> Therefore, the FAA is proposing to add to the definition of hazard, the term "incident" as defined in 49 CFR § 830.2. The FAA believes that this proposed change would improve both international alignment and the identification of hazards. 49 CFR § 830.2 defines “incident” as an occurrence other than an accident, associated with the operation of an aircraft, which affects or could affect the safety of operations. The FAA does not define a threshold or *de minimis* standard for what could affect aviation safety. The FAA believes that organizations are in the best position to determine what occurrences would have the ability to impact the safety of their products or services, and as a part of developing their SMS they may define thresholds for what might entail a reportable incident that could affect aviation safety.<sup>53</sup> They are also in the best position to determine the processes and tools they can use to communicate this information to their employees. Because safety risk management and safety assurance are ongoing and iterative processes, the organization will continually improve its ability to identify, communicate, and mitigate hazards, preventing them from resulting in incidents or accidents.

In addition, the FAA proposes two other modifications to the definition of “hazard” to more closely align with the ICAO definition: (1) while objects are a subset of the term “condition,” the FAA is proposing to add the term “object,” and (2) the FAA is proposing to change “foreseeably” to “the potential to.” These changes would align the definition more closely with the ICAO definition of “hazard”.

In addition, the FAA proposes to amend the definition of safety policy to change “certificate holder” to “person.” This proposed change would make the definition consistent with

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<sup>52</sup> Tinsley, Catherine H., Robin L. Dillon, and Peter M. Madsen. How to Avoid Catastrophe. Harvard Business Review. <https://hbr.org/2011/04/how-to-avoid-catastrophe>. 2011.

<sup>53</sup> For additional discussion on hazard information sharing, please see section V.C.4.b. (Safety Promotion (Subpart E), Proposed amendments to subpart E).

the revised applicability proposed by this rule, which includes persons who are not certificate holders (e.g., LOA holders).

## 2. Requirement to Develop and Implement SMS

As discussed previously, the FAA is proposing to move the General Requirements for SMS currently contained in § 5.3 to proposed § 5.5. For clarity, the FAA would reorganize proposed § 5.5 into three subparagraphs: 1) general requirements for the components of an SMS, 2) a new proposed requirement for a system description, and 3) the requirement to maintain an SMS in accordance with part 5. Additionally, the FAA is proposing to remove certain provisions from current § 5.3 as unnecessary.

The FAA proposes to add a requirement for all persons subject to part 5 to develop a system description. A system description is a summary of aviation-related processes and activities and a description of interfacing persons that contribute to the safety of the aviation-related products and services provided. The FAA considers that organizations that receive the aviation-related products and services could contribute to the safety of those products and services and would, therefore, be identified among the interfacing persons.

A system description is important because organizations are often made up of a complex network of interactions involving different internal departments that also interface with external organizations that contribute to the safe operation of the organization. For an organization to have an effective SMS, it must fully understand its aviation-related business operations and activities that impact the management of aviation safety. Without that understanding, the SMS is unlikely to be clearly defined, adequately applied, or effectively executed. The use of an organization system description would also enable the organization to have a clear picture of its many interactions.

Although the focus of this regulation is on aviation, some organizations might also extend their SMS to their non-aviation related activities, such as security and occupational safety and health issues. If an organization elects to do so, the FAA would only conduct oversight of the SMS related to its aviation functions. The FAA is proposing to limit the application of SMS only to the aviation-related activities conducted by the organization under 14 CFR.

The FAA also proposes to add a provision in § 5.5(c) to make clear that the SMS requirements in part 5 are continuing requirements. For example, the requirements of part 5 do not cease to apply the moment a person develops and implements an SMS. Rather, a person must also maintain SMS in accordance with part 5. The new provision in proposed § 5.5(c) is not intended to impose a new requirement on the regulated community; it is intended only to clarify the existing requirements.

Furthermore, to remove unnecessary rule text, the FAA proposes to remove the provisions that are currently contained in § 5.3(b) and (c). Section 5.3(b), which requires the SMS to be maintained in accordance with the recordkeeping requirements of Subpart F of part 5, is unnecessary because the recordkeeping requirements of Subpart F apply irrespective of this provision. Additionally, § 5.3(c), which requires compliance with the relevant regulatory requirements of 14 CFR, is unnecessary because persons must comply with applicable regulatory requirements in 14 CFR irrespective of whether the FAA expressly requires compliance in § 5.3(c).

The FAA also proposes to remove two requirements from current § 5.3(a). First, the FAA proposes to remove the requirement for the SMS to be submitted to the Administrator for acceptance. The proposal to expand the applicability of part 5 has resulted in the FAA proposing new regulations to address the additional entities that would be covered by part 5, namely §§ 5.7,

5.9, 5.11, 5.13, and 5.15. These proposed regulations would set forth the requirements for each regulated entity, including which documents the entity must submit to the Administrator for acceptance or approval. Second, the FAA proposes to remove the requirement for an SMS to be appropriate to the size, scope, and complexity of the organization's operation. The FAA has determined that this provision is unnecessary because the FAA's SMS requirements are performance-based and scalable. As such, persons that are required to develop an SMS under part 5 may scale their SMS to the size and complexity of their organizations. The FAA does not need to expressly require scalability in the regulations when the performance-based requirements are designed for that purpose.

### C. Components of Safety Management Systems

An SMS is composed of four major components: (1) safety policy, (2) safety risk management, (3) safety assurance, and (4) safety promotion. Additionally, an SMS requires documentation and recordkeeping. Currently, part 5 contains a subpart for each major component and a subpart for documentation and recordkeeping. The proposed rule would retain these subparts but includes proposed amendments to each one.

#### 1. Safety Policy (Subpart B)

Safety policy is the foundation for an SMS and must be documented and communicated throughout the organization. All organizations must define policies, processes, procedures, and organizational structures to accomplish their safety objectives and goals. A documented safety policy ensures that all employees of the organization are aware of management's commitment to achieving the organization's safety objectives and are aware of their own role in meeting the safety objectives.

#### a. Summary of Current Requirements in Subpart B

Subpart B of part 5 sets forth the requirements for the organization's safety policy. The safety policy component of SMS includes safety policy documentation, identification accountability and authority in regard to safety, designation and responsibilities of safety management personnel, and emergency response planning. Section 5.21 currently requires a documented safety policy that: (1) establishes the organization's safety objectives, (2) includes a commitment to fulfill those safety objectives, (3) contains a statement concerning the necessary resources for implementation of the SMS, (4) contains a safety reporting policy, (5) defines unacceptable behavior and conditions for disciplinary action, and (6) establishes an emergency response plan for transitioning from normal to emergency operations.

#### b. Proposed Amendments to Subpart B

The FAA is proposing to add a requirement to § 5.21(a) that would require the safety policy to include a code of ethics that applies to all employees, including management personnel and officers. The code of ethics would clarify that safety is the organization's highest priority. This proposed requirement responds to section 102(f) of ACSAA, which mandates that "the regulations issued under subsection (a) shall require a safety management system to include establishment of a code of ethics applicable to all appropriate employees of a certificate holder, including officers (as determined by the FAA), which confirms that safety is the organization's highest priority." The FAA agrees that a code of ethics is beneficial to overall safety; therefore, this proposal would fulfill that legislative mandate and extend the requirement to all persons required to have an SMS.

The FAA acknowledges that section 102(f) of ACSAA only requires the FAA to apply the code of ethics requirement to certain part 21 certificate holders. However, to the greatest

extent possible, the FAA seeks consistency in the SMS requirements. Furthermore, the FAA believes having a code of ethics, applicable to all employees of the organization, would influence the safety culture of the organization. If employees see their management engaged with safety as the highest priority, then that same safety attitude would likely prevail throughout the entire organization. Therefore, all persons required to have an SMS would benefit from having a code of ethics that confirms that safety is the organization's highest priority. For that reason, the FAA is proposing to apply this requirement to all persons who would be required to have a part 5-compliant SMS.

Additionally, the FAA proposes minor amendments to subpart B (§§ 5.21 through 5.27) to reflect the new applicability requirements of the proposed rule. Currently, these regulations use the term "certificate holder" because part 5 applies to part 119 certificate holders authorized to conduct operations under part 121. The FAA proposes to remove all references to "certificate holder." Instead, the proposed rule refers to "person" to reflect the new applicability set forth in proposed § 5.1. Additionally, the FAA proposes to amend the current requirements of § 5.25 that refer only to "certificate(s)" by adding a reference to "Letter(s) of Authorization." This would ensure that the requirements of § 5.25 pertaining to the accountable executive apply to § 91.147 LOA holders.

## 2. Safety Risk Management (Subpart C)

Another core component of an SMS is safety risk management. A comprehensive SMS using safety risk management includes identifying hazards, assessing risk, and developing risk controls to reduce or eliminate risk associated with those hazards. Safety risk management allows an organization to focus on the areas of greatest risk from a safety perspective, taking into

account system complexity and scope of the operations, and allows the organization to implement appropriate risk controls.

Organizations must apply safety risk management when implementing new or revising existing systems, developing operational procedures, and to address hazards or ineffective controls identified through safety assurance processes. For example, an organization would initiate safety risk management after learning that certain de-icing operations are not effective and use safety risk management to analyze the de-icing operations.<sup>54</sup> Safety risk management includes the following: (1) system analysis, (2) identifying hazards associated with the system, (3) analyzing the risk associated with the hazards, (4) assessing risk associated with the hazards to determine acceptable safety risk, and (5) controlling the risk of identified hazards when necessary.

The system analysis serves as the initial source for hazard identification when new systems are designed, when systems are revised, and when new operational procedures are developed. The system analysis also serves as a basis for describing and organizing information for risk analysis when potential hazards or ineffective risk controls are discovered in the safety assurance process. The system analysis processes ensure that information regarding the function and purpose of the system; the system's operating environment; outline of the system's processes and procedures; and the personnel, equipment, and facilities that the system requires for operation are analyzed so that hazards may be appropriately identified.

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<sup>54</sup> There are existing regulations that prohibit a takeoff when frost, ice, or snow (contamination) is adhering to the wings, control surfaces, rotors or propellers of an aircraft and some operations require a de-icing program [ §§ 91.527, 121.629, and 135.227]. However, this example describes how operators can use SMS to focus on certain de-icing operations that may not be performing adequately and use a structured process to correct performance deficiencies or identify design changes (additional controls) using the SRM process. Current regulations prohibit takeoff when certain conditions are met, but there are no requirements for the company to look more broadly at the system and determine if or when there is a systemic issue with de-icing.

Next, an organization must use established processes to identify hazards within the context of the system analysis. Any hazards that are identified must be analyzed to the extent necessary to determine possible outcomes associated with each hazard.

The organization must then analyze the outcomes to determine the severity and likelihood (i.e., risk) associated with the outcomes.<sup>55</sup> Subsequently, the organization must assess the safety risk, which requires the certificate holder to determine whether the safety risk is acceptable or mitigation is required.

Finally, the organization would develop and implement risk controls where necessary. Risk controls may mitigate the outcomes by reducing the likelihood or severity of the outcome or eliminating hazards by design. After these controls are developed, but before being implemented, the organization must assess whether the controls are likely to be effective and would not introduce any new hazards. When the risk controls are assessed and determined to be acceptable, the organization would implement them. Those controls would then be continuously monitored under the processes developed under subpart D, Safety Assurance, to ensure they are effective.

#### a. Summary of Current Requirements in Subpart C

Subpart C of part 5 currently contains the safety risk management requirements for an SMS. Section 5.51 establishes when a certificate holder would need to apply safety risk management processes and procedures to systems to identify the hazards and assess the risk associated with the systems. Once a certificate holder determines that the processes of safety risk management have been triggered under § 5.51, it must conduct a system analysis, as required by

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<sup>55</sup> As discussed in examples later in the preamble, this analysis may be either qualitative or quantitative depending on the size of the organization, the nature of the safety issue being addressed, and availability of relevant data, among other factors. SRM, as with all components of the SMS, should be scaled to fit the organization. Since each safety issue is unique and each SMS is developed to fit the organization, the FAA cannot make general estimates or judgments regarding the amount of time or documentation an organization would need for any given identified hazard. Consistent with the intent to scale this rule to the organization and the issue, the FAA would look to the organization to make that determination on a case-by-case basis.

§ 5.53. Section 5.53 provides information that must be considered when conducting a system analysis and identifying hazards. Currently, when conducting a system analysis, the following must be considered: (1) function and purpose of the system, (2) the system's operating environment, (3) an outline of the system's processes and procedures, and (4) the personnel, equipment, and facilities necessary for operation of the system. Section 5.55 establishes the requirements for safety risk assessment and controls.

b. Proposed Amendments to Subpart C

The FAA is proposing several changes to subpart C. First, as in the other subparts, the FAA is proposing to amend § 5.51 and § 5.55 by removing the term “certificate holder” to reflect the broadened applicability of the proposed rule. Instead, these sections will refer to “any person required to have an SMS under this subpart.”

Additionally, the FAA is proposing to add a new requirement, § 5.53(b)(5), which would add the interfaces of the system to the list of items that must be considered when conducting a system analysis in accordance with § 5.53. Interfaces are a point where two or more operations, systems, subjects, or organizations connect and interact. Interfaces can be internal (e.g., between functional groups in an organization, between hardware/software components of the system being analyzed, or between processes in the system being analyzed), or they can be external (e.g., between organizations, between the system being analyzed and other systems, or between a human using the system and the system itself). The FAA is proposing to include the interfaces of the system in the list of considerations required when performing the system analysis in § 5.53 because hazards can exist with interfacing organizations, processes, or systems in the way the two interfacing parts interact with each other. Understanding the interfaces while conducting a system analysis is important because the system analysis serves as the basis for identifying and

analyzing hazards and their associated risk. This addition would further improve the ability of part 121 operators to analyze risk. As the aviation system becomes more complex, dynamic, and integrated, understanding these interfaces can assist in the identification of related hazards and improve safety overall. An SMS that looks both inward and outward is more effective at identifying hazards, a core function of any operational SMS. The FAA emphasizes that under this proposed requirement interfaces would be considered only to the extent that they affect aviation safety. For example, the interface between a part 21 aircraft manufacturer's engineering and payroll departments would not be considered when conducting a systems analysis under § 5.53 because this interface would not impact the aviation safety of the aircraft design. Additionally, the use of fall-arrestors in operator maintenance facilities to protect individuals working on aircraft would not be considered when conducting a system analysis in § 5.53 either because the interface is an occupational safety and health concern and does not directly affect the quality of work performed on the aircraft.

### 3. Safety Assurance (Subpart D)

Safety assurance verifies that the risk controls put into place under safety risk management continue to be effective in managing risk and that the organization's safety performance is meeting or exceeding its safety objectives. Safety assurance has three elements: (1) safety performance monitoring and measurement; (2) safety performance assessment; and (3) continuous improvement.

Safety performance monitoring and measurement requires the development and maintenance of processes and systems that monitor operational processes and collect data on the performance of the organization. Within an organization, there are processes to collect data, such as those to meet regulatory requirements or voluntary reporting programs. In addition, there are

external data sources, such as FAA systems or information from other organizations. Safety assurance processes must also include investigations of accidents and incidents. Employee reporting systems provide another source of information regarding the performance of the organization.

The safety performance assessment is used to assess the organization's performance against its safety objectives. The safety performance assessment includes verifying the organization's compliance with established safety risk controls. In addition, the safety performance assessment identifies changes in operational environments, potential new hazards, and ineffective controls. If the assessment reveals new hazards or ineffective controls, the organization must initiate safety risk management processes. The accountable executive designated in accordance with § 5.25 must review information from the safety performance assessment on a regular basis.

Finally, safety assurance requires continuous improvement. The analysis and assessment functions of safety assurance are essential in alerting the organization to significant changes in the operating environment, possibly indicating a need for system change to maintain effective risk controls. As a result, an organization with an SMS must take steps to correct any safety performance deficiencies identified in the assessments.

a. Summary of Current Requirements in Subpart D

Safety assurance requirements for an SMS are established in subpart D of part 5. Section 5.71 covers safety performance monitoring and measurement, § 5.73 covers safety performance assessment, and § 5.75 covers requirements for continuous improvement. Pursuant to § 5.71(a), a person must develop and maintain processes and systems to acquire data with respect to its operations, products, and services to monitor the safety performance of the organization. Section

5.71(a) prescribes specific data that must be monitored, audited, evaluated, and investigated. Among these requirements, § 5.71(a)(7) requires the processes and systems to include a confidential employee reporting system in which employees can report hazards, issues, occurrences, and incidents, as well as a means to propose solutions and safety improvements. Once an organization with an SMS collects data through its safety monitoring and measurement processes, it must use the processes developed under § 5.71(b) to analyze the data.

Specifically, § 5.73 requires the organization to conduct assessments of its safety performance against its safety objectives contained in its safety policy, which include reviews by the accountable executive to: (1) ensure compliance with safety risk controls, (2) evaluate the performance of the SMS, (3) evaluate the effectiveness of safety risk controls, (4) identify changes in the environment that may introduce new hazards, and (5) identify new hazards. This analysis is used to transform raw data into usable information that can support informed decision-making related to safety.

Finally, § 5.75 requires the organization to establish and implement processes to correct any safety performance deficiencies that are identified in the safety performance assessment, which ensures continuous improvement of the organization's safety performance.

#### b. Proposed Amendments to Subpart D

The FAA is proposing to remove the word “operations” from § 5.71(a) to clarify the requirement and avoid confusion with the term “operator.” In addition, the FAA is proposing to amend §§ 5.71-5.75 by replacing “certificate holder” with “person” or “a person required to have an SMS under this subpart” to reflect the proposed broadened applicability of the rule.

The FAA is also proposing to add the text, “without concern of reprisal for reporting” to the confidential employee reporting system requirement in current § 5.71(a)(7) to meet section 102(e) of ACSAA which mandates that the proposed regulation:

[R]equire a safety management system to include a confidential employee reporting system through which employees can report hazards, issues, concerns, occurrences, and incidents. A reporting system under this subsection shall include provisions for reporting, without concern for reprisal for reporting, of such items by employees in a manner consistent with confidential employee reporting systems administered by the Administrator.

Further, section 102 mandates that regulations required by the statute shall also require holders of both a TC and a PC to submit a summary of confidential employee reports received in accordance with section 102 to the Administrator at least twice per year. Therefore, the FAA is proposing to add a new § 5.71(c), which would require holders of both a TC and a PC for the same product to submit a summary of the confidential employee reports received under § 5.71(a)(7) to the FAA once every six months.

The FAA recognizes that its proposed rule language, which would require holders of both a TC and a PC for the same product to submit a summary of the confidential employee reports received under § 5.71(a)(7) to the FAA once every 6 months, slightly differs from the statutory language. Section 102(e) of ACSAA requires the summary of reports to be submitted at least “twice a year.” As the statute does not require a particular interval for submission of the “twice a year” reports, the FAA finds it reasonable to require the reports every six months as it would preclude a person from submitting the same summary of reports twice in the same month and

provide the FAA with an opportunity to assess reports received throughout the year.

Accordingly, the FAA proposes to require the submission of these reports once every 6 months.

Although the ACSAA mandate was specific to part 21 certificate holders with both a TC and a PC, employees of all persons required to comply with part 5 should be protected from reprisal if they report hazards, issues, concerns, occurrences, or incidents. Further, the intent of the confidential system would be to provide some protection to employees, so they are able to report issues without concern of reprisal. Therefore, the FAA is proposing to apply the revision to the employee reporting system requirements in § 5.71(a)(7) to all persons required to comply with part 5. The FAA notes that this protection extends to the reporting of hazards, issues, concerns, occurrences, or incidents. If the individual reporting is responsible for creation of the hazard due to intentional actions or gross negligence, this provision would not protect them from employment actions based on the underlying offense.

However, the FAA is proposing in § 5.71(c) to require only holders of both a TC and a PC for the same product to submit a summary of the confidential employee reports to the FAA. This proposed requirement is targeted at part 21 certificate holders as this additional agency oversight is consistent with ACSAA. Summaries of confidential employee reports submitted by certificate holders with both a TC and a PC are protected from public disclosure by 49 U.S.C. 44735(a)(2), if the summaries are requested pursuant to the Freedom of Information Act (FOIA). The FAA is not proposing to extend this requirement to all persons required to have an SMS because the information would not be protected under 49 U.S.C. 44735(a)(2) for persons that are not covered by the ACSAA requirement.

#### 4. Safety Promotion (Subpart E)

Safety promotion requires communication to promote safety practices. Safety promotion also requires that employees within an organization attain and maintain the competencies necessary to perform the duties relevant to the operation and performance of the SMS. Training to maintain the SMS may vary depending upon the position and responsibilities of the employee and may range from formal classroom training to simple notices to employees. In addition to training, an organization ensures that employees are aware of the SMS policies, processes, and tools that are relevant to their responsibilities.

##### a. Summary of Current Requirements in Subpart E

The requirements for safety promotion are established in subpart E of part 5. Section 5.91 requires training for the employees of the organization to ensure they attain and maintain the competencies necessary to perform their duties relevant to the operation and performance of the SMS. Section 5.93 requires the organization to develop and maintain a means of communicating safety information that: (1) ensures employees are aware of the SMS policies, processes, and tools that are relevant to their responsibilities; (2) conveys hazard information relevant to the employee's responsibilities; (3) explains why safety actions have been taken; and (4) explains why safety procedures are introduced or changed.

##### b. Proposed Amendments to Subpart E

The FAA is proposing two amendments to the safety promotion requirements of subpart E. First, as in the other subparts, § 5.91 and § 5.93 would be amended to reflect the broader applicability of proposed part 5 by replacing “certificate holder” with “any person required to have an SMS under this part.” Second, the FAA proposes to add new § 5.94 to require notification of hazards to interfacing persons, and require any person subject to part 5 to develop

and maintain procedures for reporting hazard information to interfacing persons and for receiving hazard information from other parties.

In some circumstances, a hazard might be identified by a person who is not in a position to address the hazard or there may be another person who could implement a more effective mitigation. For example, there may be a hazard identified by an aircraft operator that needs to be addressed by an aircraft manufacturer to mitigate the hazard for other operators. Similarly, an aircraft manufacturer may identify a hazard for which crew procedures or training are an appropriate mitigation to be taken by an operator. In § 5.94, the FAA proposes that persons required to have an SMS under part 5 must share information regarding identified hazards with interfacing persons identified in their system description under proposed § 5.5 who, to the best of their knowledge, could address the hazard or mitigate the risk. Interfacing persons may be other private entities or a government entity, including the FAA. For example, a person required to have an SMS might determine that, to the best of their knowledge, the FAA's Air Traffic Organization is the interfacing person who would be in the best position to address the hazard. The number of business connections that would fall within the scope of an "interfacing person" is not limitless, however. An interfacing person would be an entity providing a good or service connected to aviation safety. A payroll accounting firm, for example, would not fall within this requirement. Within that boundary, an organization's total number of interfacing persons would likely be related to the size and complexity of the operation. The more external entities an organization relies on for aviation safety purposes, the greater the number of interfacing persons they would have for the purposes of this rule.

There may be instances in which the person with an SMS under part 5 is required to communicate hazard information to an interfacing person who is not required to maintain an

SMS under part 5. In this case, there is still a utility and benefit to safety in communicating hazard information even where the receiving party does not have to comply with part 5 because the receiving party may still address the hazard. Further, while persons are only required to share hazard information to relevant interfacing entities who, to the best of their knowledge, could address the hazard, the proposed requirements do not preclude anyone from sharing additional information with additional entities if they so choose.

The number of interfaces an organization has depends on the type of goods or services the organization provides. FAA believes companies already know who their interfaces are, since the service providers, suppliers, and customers are those with whom they have an ongoing business relationship.

In accordance with standard business practices, these organizations already have records of these relationships for purchasing, payment, and shipment purposes. Therefore, the FAA does not believe it would be burdensome to document these existing interfaces and share information about hazards, when appropriate, leveraging existing contacts and channels of communication. The FAA anticipates that the organization would update and revise contact information for these interfaces as a normal part of day-to-day business, as they would even in the absence of this proposed rule.

For example, an aircraft manufacturer may identify that the interfacing persons in their system description include various suppliers. The manufacturer has a business relationship with these interfaces. As with most business relationships, these relationships include a way to communicate hazards with all of these interfaces including their suppliers, repair stations, and customers. The manufacturer might issue a service bulletin or an operator information letter. It

could also communicate a hazard directly with a supplier or through its supplier management/purchasing organization.

The purpose of this proposed requirement is to ensure that relevant information is shared with the person in the best position to address the hazard or mitigate the associated risk prior to an incident or accident occurring. This sharing would enable a network of organizations that would work collaboratively and be more effective at identifying hazards and mitigating risk than an individual organization working in isolation.<sup>56</sup>

The following examples illustrate the network effect the FAA believes would be created by the proposed requirement to share hazard information.

Example 1: A part 121 operator receives an employee report from a pilot stating that the aircraft flight management system deviated from the expected landing approach at a particular airport. The flight crew notices the deviation and corrects the flight path for a safe landing. The operator's management classifies this employee report as a hazard because the airport is surrounded by high elevation terrain. Although this incident occurred during daytime and in visual meteorological conditions, management determines that if the same issue occurred during a night landing or in instrument meteorological conditions, the aircraft could be turned toward terrain without detection by the flight crew, potentially resulting in an accident.

The operator's management mitigates the risk through the safety risk management process by publishing an internal notice to all its flight crews warning of the issue and requesting them to avoid using that particular approach when flying into the particular airport. Additionally, the operator determines that the best person to mitigate the risk is outside its organization and

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<sup>56</sup> The FAA is not aware of other CAAs currently requiring this type of collaborative approach. However, industry has recognized the value of this approach and it is discussed in the international standard: SM-0001\_Issue B – Implementing a Safety Management System in Design, Manufacturing and Maintenance Organizations, which was developed by industry.

uses its system description to identify the appropriate interfacing person with whom the information regarding this hazard should be shared. Per proposed § 5.94, the operator sends a hazard report to the aircraft manufacturer. The aircraft manufacturer, who is a TC and PC holder, receives the hazard report and begins an investigation of the issue. The aircraft manufacturer also reports the issue per proposed § 5.94 to the flight management system supplier and navigation database supplier, which, although not required to have an SMS, are interfacing persons identified in the aircraft manufacturer's system description.

The aircraft manufacturer initiates safety risk management on the issue. Through computer simulation, the aircraft manufacturer duplicates the incident reported by the part 121 operator.<sup>57</sup> The aircraft manufacturer safety risk management team develops and completes two actions: one short term to mitigate the risk, and one long term to eliminate the hazard. For the short-term mitigation, the flight management system database is updated to remove the affected approach. This database update occurs monthly, so all airlines flying with the flight management system automatically receive the update. For the long-term mitigation, the flight management system software is updated to correct the flight management system deviation. The aircraft manufacturer issues a service bulletin to all airlines recommending incorporation of the software update. Following the software update incorporation, the affected approach is added back into the navigation database and all airlines automatically receive it at the next monthly update.

This example illustrates how an employee report pursuant to § 5.71(a)(7) and communication between organizations would assist in quickly mitigating and later eliminating a hazard that could result in an accident if not addressed. The pilot reported the incident, the airline

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<sup>57</sup> It is common for an Original Equipment Manufacturer to replicate an incident after receiving a report. Typically, the manufacturer would reach out to the reporting entity (in this example, the airline operator) to gather as much information as available about the incident. While there are risks with information transfer delays between the interfacing entity and the reporting entity, FAA believes these will be improved with the proposed rule requiring hazard information sharing.

performed the organization's safety risk management process, and also reported the hazard to the aircraft manufacturer pursuant to § 5.94. The aircraft manufacturer reported the hazard to the flight management system supplier pursuant to § 5.94 and then performed safety risk management to initially mitigate the risk and ultimately eliminate the hazard.

Without applying this new requirement, under the current process, the part 121 operator would report the incident to FAA flight standards under § 121.703(c). Flight standards would evaluate the incident and, if determined to be an airworthiness concern, would report it to the appropriate Aircraft Certification Office. The Aircraft Certification Office would then complete a risk analysis per FAA Order 8110.107. If the risk assessment was determined to be unacceptable, the aircraft certification office would work the aircraft Original Equipment Manufacturer to develop corrective action. The proposed rule requires direct hazard communication between the operator and Original Equipment Manufacturer which will facilitate more timely resolution of the incident.

Example 2: Three pilots, who work for a part 135 operator, report through the operator's employee reporting system that markings at the operator's home base airport at a newly paved intersection with a runway are confusing and nearly resulted in a runway incursion. The operator determines the reports are valid and notifies the airport authority of the pilots' observations in accordance with proposed § 5.94. The airport then could close that taxiway intersection and re-mark the pavement.

Example 3: A § 91.147 LOA holder who conducts air tours in a Stearman Biplane procures a radial engine from a repair station that specializes in overhauling radial engines. The rebuilt engine is installed on the aircraft, ground tested, and then flown for a 3-hour maintenance test flight to ensure the engine is operating correctly. During the test flight, the engine seems to

stop producing power altogether when the throttle is reduced to idle. On final approach, the engine stops, and though the aircraft lands without incident, the engine cannot be restarted because the idle jet in the carburetor vibrated out of the tapped fitting. The LOA holder and operator of the Stearman report the issue to the part 145 repair station in accordance with proposed § 5.94. While the repair station is not required to have an SMS, they would have a duty to conduct an investigation under § 145.221.<sup>58</sup> The repair station investigates its stock of carburetor jets and finds five additional jets in a single lot that were improperly threaded. The repair station can then isolate the nonconforming lot of jets and rebuild the faulty carburetor. This example illustrates that there is still benefit to sharing hazard information with entities that would not be required to have an SMS.

Finally, the FAA acknowledges that there may be some concern regarding sharing information outside an organization. The FAA does not expect that sharing hazard information would require the sharing of proprietary information; it would only require the organization to adequately describe the hazard. The FAA expects that in instances where the hazard cannot be adequately described without the use of proprietary information, the organization itself would likely be in the best position to address that hazard, and therefore, information sharing would not be necessary. The FAA seeks comment on whether organizations can share information about hazards without disclosing proprietary information. The FAA also seeks comment on whether the holder of the proprietary information would be in the best position to address the hazard. Please provide examples of any situations in which the holder of proprietary information would not be able to share information about a hazard without disclosing that proprietary information.

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<sup>58</sup> Under this existing requirement, the repair station must submit a Service Difficulty Report. In the Service Difficulty Report, the repair station must include the “apparent cause of the failure, malfunction, or defect,” meaning that the repair station would have to conduct an investigation to determine the apparent cause.

## 5. SMS Documentation and Recordkeeping (Subpart F)

Documentation of SMS processes, procedures, and outputs is necessary for persons to conduct a meaningful analysis under safety risk management, to review safety assurance activities, and for the FAA to review for compliance during inspections. Documentation and recordkeeping also preserve information that can be used to make future safety-related decisions.

### a. Summary of Current Requirements in Subpart F

The documentation and recordkeeping requirements for SMS holders are currently contained in subpart F of part 5. As currently described in § 5.95, the certificate holder is required to document its safety policy and SMS processes and procedures. Organizations with an SMS under part 5 are required to document their safety policy and SMS processes and procedures.

As described in § 5.97, the certificate holder currently must maintain records of the outputs (e.g., risk assessments and implemented risk controls) of safety risk management and safety assurance processes. Outputs of safety risk management processes must be retained for as long as they remain relevant to the operation. Records can be kept either electronically or in paper format. In addition, the certificate holder is required to retain outputs of safety assurance processes for a minimum of five years, SMS training records for as long as the individual is employed by the person, and communication records for a minimum of 24 months.

Communication records required to be retained would be limited to any communications related to SMS-related policies, processes and tools, hazard information, safety actions taken, and why safety procedures were introduced or changed. The timelines associated with the retention of these documents ensure that they are kept for a time period that provides the certificate holder

with sufficient historical data to assure compliance and to conduct the required analyses and assessments. A certificate holder may retain its documents for longer time periods if needed.

The documentation and records keeping requirements, like the rest of part 5, are designed to be scalable and flexible to accommodate a wide variety of business models and sizes. The specific information to be documented, and the means through which it is documented and retained, may vary depending on the scope and complexity of the systems. Organizations are currently required to maintain a myriad of business records. We anticipate that they will leverage existing systems or methods of records retention to meet these new requirements. The flexibility in the requirements enable the organization to use the most efficient means to fit their operations. For more information regarding scalability, please refer to Section V.F.

b. Proposed Amendments to Subpart F

The FAA is proposing to amend §§ 5.95 and 5.97 to change “certificate holder” to “any person required to have an SMS under this part.” In addition, the FAA is proposing to add § 5.95(c) to require the documentation of the system description developed under proposed § 5.5(b). The proposed addition is necessary to ensure that the system description would be documented.

The FAA is proposing to amend § 5.97(d) to require the persons required to have an SMS to retain records of all communications that occur under the hazard reporting requirements of proposed § 5.94 for a minimum of 24 consecutive calendar months. This proposed requirement is necessary to ensure consistency in the records for communications required under § 5.93 and proposed § 5.94. Maintaining these records would also enable traceability between information that is received from outside entities and actions taken using safety assurance or safety risk management processes. These records would be kept either electronically or in paper format. The

timelines associated with the retention of these documents would ensure that they are kept for a time period that provides the organization with sufficient historical data to assist the FAA with oversight. Nothing in the proposed rule would preclude a person required to have an SMS under part 5 from retaining documents for longer time periods if they so choose.

#### D. Implementation of SMS

##### 1. Requirements for Part 121 Operators

Part 121 operators currently must comply with the part 5 requirements. The FAA is proposing to add § 5.7 to establish certain new requirements and compliance dates for part 121 operators.

Proposed § 5.7(a) would apply to all part 121 operators that have an FAA-accepted SMS as of the effective date of a final rule adopted pursuant to this rulemaking. The requirements in proposed § 5.7(a) are necessary to bring part 121 operators into compliance with the proposed revisions to part 5. Part 121 operators would be required to revise their SMS to meet the new requirements proposed in §§ 5.5(b) (System Description), 5.21(a)(7) (Safety Policy Code of Ethics), 5.53(b)(5) (Safety Risk Management Interfaces), 5.71(a)(7) (Employee Confidential Reporting System), 5.94 (Hazard Notification), 5.95(c) (Documentation of System Description), and 5.97(d) (SMS Records), discussed in this section. Because part 121 operators already have an accepted SMS, the FAA considers that these new requirements would require minor adjustments. For example, current part 121 operators should be able to develop a system description with relative ease because they already have an FAA-accepted SMS and all the information needed for development of the system description. Also, a statement of compliance is unnecessary because the FAA has completed its review of the operator's SMS prior to the

enactment of this rule. The changes to this entity's SMS are minimal and the FAA can review such changes in the normal course of its oversight of the operator.

Because the proposed requirements may be met with relative ease, the FAA has determined that 12 months would provide a sufficient amount of time for current part 121 operators to implement any necessary changes based upon the amendments to part 5 and submit revisions to their SMS to the FAA for acceptance.

Under proposed § 5.7(a)(2), part 121 operators would have to submit revisions to their SMS for FAA acceptance in a form and manner acceptable to the Administrator no later than 12 months following the effective date of the rule. The FAA expects that current part 121 operators would submit revisions to their SMS through the same process they currently use for submission of changes for acceptance by the FAA.

Proposed § 5.7(b) would apply to any person applying for authorization to conduct operations under part 121 of this chapter after the effective date of the rule. New certificate holders authorized to operate under part 121 would have to develop, implement, and maintain an SMS that complies with the requirements of part 5 as amended by this rulemaking. Those seeking to operate under part 121 would have to submit the statement of compliance in a form and manner acceptable to the Administrator as part of the certification process. Under this proposal, the FAA would incorporate review of a person's compliance with part 5 requirements into the certification review process.

The statement of compliance must describe how part 5 requirements have been met, and the FAA would review that statement of compliance during the certification process to assess the applicant's compliance with part 5. The statement of compliance enables the FAA to validate the applicant's compliance with part 5 prior to issuing a certificate.

## 2. Requirements for Part 135 Operators and Holders of § 91.147 Letters of Authorization

The FAA is proposing to add new § 5.9 to establish requirements and compliance dates for part 135 operators, and holders of an LOA issued under § 91.147. Proposed § 5.9(a) would require those certificate or LOA holders to develop and implement an SMS in compliance with part 5 no later than 24 months after the effective date of the proposed rule. The FAA expects certificate holders or LOA holders to submit the statement of compliance for acceptance by the FAA within 24 months after the effective date of this proposed rule. Proposed requirements for statements of compliance are described further in this section. This rule would also require these operators to maintain their SMS in accordance with part 5.

Proposed § 5.9(b) would affect those persons applying for a certificate under part 135 or those applying for an LOA under § 91.147 who have not yet received their certificate or LOA prior to the effective date of this proposed rule. These persons would be required to develop and implement an SMS that meets the requirements of part 5 before their certificate or LOA could be issued. They would be required to submit a statement of compliance in a form and manner acceptable to the Administrator during the certification process or LOA issuance process. These operators would also be required to maintain their SMS in accordance with part 5.

Based on lessons learned and the experience gained from part 121 operators who have previously implemented SMS, as well as the voluntary program implementation for part 135 operators, the FAA proposes that 24 months is adequate to implement an SMS and provide a statement of compliance to the FAA. This timeframe allows the operator sufficient time to implement SMS without unnecessarily delaying the realization of benefits derived from SMS.

a. Statements of Compliance for Current Part 135 Operators and § 91.147 Letter of Authorization Holders and Applicants

Under this proposal, part 135 operators, and § 91.147 LOA holders would be required to develop an SMS and integrate that SMS into the existing operations of the certificate or LOA holder. The certificate or LOA holder would also be required to submit a statement of compliance in a form and manner acceptable to the Administrator no later than 24 months following the effective date of this proposed rule.

The statement of compliance notifies the FAA that the organization has complied with part 5 and prompts the FAA to update its oversight tools to include SMS. Although these statements of compliance would not be subject to an approval process, the FAA would validate the part 135 operators' and § 91.147 LOA holders' compliance with part 5 and the accuracy of their statements of compliance under existing oversight processes. Because the certificate or LOA holder would be required to integrate the SMS into its existing operations processes during implementation, the FAA expects that existing oversight processes are sufficient to oversee and validate part 5 compliance. The FAA would review statements of compliance upon submission and would validate that the organization's SMS meets the part 5 requirements over the course of several inspections. If, during those inspections, the FAA finds that the SMS does not meet the requirements of the proposed rule, a notification in writing of the deficiencies would follow.

The proposal would also require applicants for authority to conduct operations under part 135 or § 91.147 to submit a statement of compliance to the FAA for acceptance during the certification or LOA application process, as applicable. The statement of compliance enables the FAA to validate the applicant's compliance with part 5 prior to issuing a certificate or LOA.

### b. Statements of Compliance for Existing Part 121/135 Combination Certificates

For those part 119 certificate holders with combination certificates authorizing them to operate under parts 121 and 135 that already have an SMS in place due to the current part 5 requirements for part 121 operators, the FAA would review the part 121/135 operator's revised SMS submission. Certificate holders authorized to operate under parts 121 and 135 whose SMS was previously acceptable to the FAA for the part 121 portion of their organizations may choose to expand their existing SMS processes already in place to include their part 135 operations. In this case, certificate holders would submit the changes to their SMS for acceptance as described for the existing part 121 certificate holders in Section V.D.1.

Certificate holders would also be required to submit a statement of compliance for the part 135 operations. The FAA would accept the submitted statement of compliance and validate the operator's compliance with part 5 using existing oversight processes, as discussed in Section V.D.5. The FAA expects that documenting the statement of compliance for the part 135 operations would be comparatively simple because the operator has already met SMS requirements for the part 121 operations. Currently, of the seven existing combined certificates, five have already implemented SMS that covers both part 121 and 135 operations.

### 3. Requirements for Holders of Both Type Certificates and Production Certificates Issued for the Same Product under Part 21 and Certain Part 21 Production Certificate Applicants.

The FAA proposes to add a new § 5.11 to establish certain SMS requirements and compliance dates for holders with a TC and a PC for the same product issued under part 21. The FAA proposes a person that holds both a TC and a PC for the same product issued under part 21 of this chapter on or before the effective date of the proposed rule would be required to: (1) develop an SMS that meets the requirements of this part; (2) submit an implementation plan for

FAA approval in a form and manner acceptable to the Administrator no later than December 27, 2024; (3) implement the SMS in accordance with the FAA-approved plan no later than December 27, 2025; and (4) maintain the SMS in accordance with this part.

As discussed in Section IV.D., the proposed requirements are consistent with section 102(a)(1) of ACSAA, which requires that the FAA's rulemaking require these certificate holders to adopt an SMS by four years from enactment of the statute, December 27, 2024.<sup>59</sup> Because the implementation plan would require certificate holders to submit a description of how they would comply with the part 5 requirements, including but not limited to the policies, processes, and procedures used to meet those requirements, the FAA considers the certificate holder to have adopted the SMS system at the time the certificate holder files the implementation plan. By filing the implementation plan for FAA approval, the certificate holders commit to implementing the SMS described in the implementation plan and any modification to the SMS required by the FAA during the implementation plan approval process.

Under proposed § 5.13, the FAA proposes a person that holds, is applying for, or has a pending application for a PC under part 21 of this chapter for a product for which the person holds or is a licensee for a TC, would be required to: (1) develop an SMS that meets the requirements of this part; (2) submit an implementation plan for FAA approval in a form and manner acceptable to the Administrator during the certification process; (3) implement the SMS in accordance with the approved plan no later than one year from the FAA's approval of the implementation plan; and (4) maintain the SMS in accordance with this part.

Furthermore, under proposed § 5.15, the FAA is proposing to establish certain SMS requirements for any person that holds a TC for a product who allows another person to use the

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<sup>59</sup> Section 102(a)(2)(D) of ACSAA.

TC to manufacture a product under a PC. However, the requirements proposed in § 5.15 are consistent with those proposed in §§ 5.11 and 5.13.

Persons subject to §§ 5.11, 5.13, or 5.15 would not be required to file a statement of compliance under this proposal because these organizations would have to implement their SMS in accordance with their FAA-approved implementation plan which is sufficient for the FAA to verify their compliance with part 5.

#### 4. Implementation Plans

##### a. Implementation Plans for Part 21

FAA proposes to add a new § 5.17 to establish requirements for implementation plans filed under proposed §§ 5.11 (PC holders who are holders or licensees of a TC for the same product), 5.13 (TC holders or licensees applying for a PC for the same product), and 5.15 (TC holders who license their TC to others to obtain a PC). The implementation plan would include a description of how the person intends to comply with part 5, including, but not limited to, new or existing policies, processes, or procedures used to meet the requirements of part 5. The description would also demonstrate how that person would comply with the requirements of part 5 once the SMS is implemented and may reference manuals and other relevant documentation.

Upon request by the FAA, any person required to submit an implementation plan under the proposal would have to provide the FAA access to the data necessary to demonstrate that the person has developed and implemented an SMS that meets the applicable part 5 requirements. This data could include the outputs of safety risk management.

For a person that holds both a TC and a PC for the same product issued under part 21 of this chapter (§ 5.11), or for persons that hold a TC that have licensed their TC to allow another person to use that TC to obtain a PC (§ 5.15(a)), on or before the effective date of the final rule,

the person would submit an implementation plan to the FAA for approval in a form and manner acceptable to the Administrator by December 27, 2024. Section 102(a)(1) of ACSAA requires the FAA's rulemaking to require holders of both a TC and a PC to adopt an SMS by December 27, 2024. The FAA recognizes that ACSAA does not apply to persons who license their TC to allow another person to obtain a PC. However, the FAA is proposing the same compliance deadlines for consistency purposes. The FAA invites comments about whether the FAA should extend the compliance timelines for persons who license their TC to other persons and, if so, what timelines the FAA should establish. The FAA requests that responsive comments include the commenter's rationale for the proposed compliance timelines.

Section 102 of ACSAA also requires the FAA to: (1) promulgate rules to require SMS for holders of both a TC and PC, and (2) approve the certificate holders' SMS. By approving the implementation plans from part 21 certificate holders, the FAA would review the submission and would determine whether the implementation plan appropriately describes how the entity intends to comply with the requirements of the proposed part 5. Additional information regarding the form and manner of submission would be available in Advisory Circular (AC) 21-58, Safety Management Systems for Part 21 Type and Production Certificate Holders.

The implementation plan would include a description of how the person intends to comply with the requirements of the proposed rule. The FAA would review and approve the implementation plan and provide confirmation to the person of FAA's approval of the implementation plan. The person would then be required to implement the FAA-approved SMS by December 27, 2025, and maintain the SMS in accordance with the approved implementation plan.

After the effective date of the proposed rule, a person applying for a PC under part 21 for a product for which the person holds a TC, or for which an application is pending, would submit the implementation plan for FAA approval during the certification process. For persons who hold a TC and are entering into a licensing agreement to allow another person to use that TC to obtain a PC, the TC holder would submit the implementation plan for FAA approval when providing the written licensing agreement in accordance with § 21.55. The FAA would review the applicant's implementation plan and approve the means by which the person intends to comply with the applicable sections of the proposed rule. The person would then be required to implement the FAA-approved SMS within one year after FAA's approval and maintain the SMS in accordance with the implementation plan.

**b. Removal of Implementation Plan Requirement**

Currently, § 5.1(b) states that a part 119 certificate holder must submit an implementation plan to the FAA for review no later than September 9, 2015, and the implementation must be approved no later than March 9, 2016. Additionally, current § 5.1(c) states that the implementation plan may include any of the certificate holder's existing programs, policies, or procedures that it intends to use to meet the requirements of part 5, including components of an existing SMS. These requirements applied to part 119 certificate holders who were authorized to conduct operations under part 121 as of the effective date of the 2015 final rule. The FAA adopted these requirements to ensure that part 121 operators properly developed SMS within the required timeframe. The FAA proposes to remove these requirements because the dates have passed, and the requirements are no longer necessary. All part 121 operators have developed and implemented SMS in accordance with part 5.

The FAA recognizes that the proposed rule would extend the SMS requirements to additional entities who already hold certificates, and these certificate holders would have to develop and implement an SMS in accordance with part 5. Based on the FAA's experience with part 121 operators complying with part 5 and those entities participating in the voluntary SMS program, the FAA proposes to require new applicants for certificates to operate under part 121, as well as certificate holders under part 135 and LOA holders under § 91.147 to submit a statement of compliance in lieu of an implementation plan. Certificate holders receive continuous oversight and are regularly inspected by the FAA. The FAA has determined that the existing oversight processes such as FAA's Safety Assurance System,<sup>60</sup> would be sufficient to ensure compliance with part 5 by certificate holders under parts 121 and 135 and § 91.147 LOA holders, and therefore it is not necessary to require an implementation plan.

## 5. Compliance

In accordance with the FAA's compliance program, FAA personnel investigate apparent violations of FAA statutes and regulations and have a range of options available for addressing apparent violations, when appropriate, including compliance, administrative, and enforcement action. The FAA's goal is to use the most effective and appropriate means to ensure compliance with part 5 and prevent recurrence. The underlying principles and oversight processes that form the foundation of FAA's approach to compliance would not change under this proposed rule.

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<sup>60</sup> The Safety Assurance System is the Federal Aviation Administration's oversight tool to perform certification, surveillance, and Continued Operational Safety. The Safety Assurance System includes policy, processes, and associated software the FAA Flight Standards Service uses to capture data when conducting oversight. For more information see: <https://www.faa.gov/about/initiatives/sas>.

E. Proposed Changes to Sections 119.8, 91.147, 21.135, and 21.147

1. Proposed Amendments to Section 119.8

The FAA is proposing to revise § 119.8 to require certificate holders authorized to conduct operations under part 121 or 135 to comply with the applicable requirements of part 5. Currently, § 119.8 only requires certificate holders authorized to conduct operations under part 121 to comply with the SMS requirements in part 5; the proposed revision would add part 135 operators. Additionally, the FAA is revising § 119.8 to remove the compliance dates which have passed and are no longer applicable.

2. Proposed Amendments to Section 91.147

As discussed in Section V.A.2., the FAA proposes to require LOA holders operating under § 91.147 to meet the requirements of part 5. Specifically, the FAA proposes to amend § 91.147 to require an operator conducting passenger carrying flights for compensation or hire to have an FAA-accepted safety management system that meets the requirements of part 5, and to add a requirement for an LOA applicant to submit with the application the statement of compliance required under part 5. The FAA also proposes non-substantive changes, including organizational changes to improve the readability of the section.

The requirement for LOA holders and applicants to develop an SMS that complies with part 5 would be found in both part 5 and in § 91.147. Although part 5 would be applicable to § 91.147 LOA holders under proposed 5.1, this amendment is necessary to make compliance with part 5 a requirement for operation.

Because § 91.147(c) contains a complete list of all documents that applicants for an LOA must submit as part of their application, the FAA is proposing to add the statement of

compliance required under proposed § 5.9(b)(2) to the list of documents submitted when applying for an LOA.

To eliminate redundancy in the regulations, the FAA is proposing to remove the phrase “for drug and alcohol testing” from current § 91.147(a), which defines “operator” for the purposes of § 91.147 and for drug and alcohol testing.<sup>61</sup> The drug and alcohol testing requirements are contained in part 120 of 14 CFR. Under part 120, the regulations reference “operator as defined in § 91.147” numerous times. In light of these cross-references, which expressly refer to the definition of operator in § 91.147, the FAA has determined that it is unnecessary and redundant for current § 91.147(a) to state that the definition of operator is “for drug and alcohol testing.”

### 3. Proposed Amendments to Sections 21.55, 21.135, and 21.147(b)

The FAA proposes to add a new paragraph (c) under § 21.135 to require each applicant for or holder of a PC to meet the applicable requirements of part 5. A conforming edit is also proposed for § 21.147(b) to add the proposed § 21.135(c) to the list of requirements with which applicants for an amendment to a PC must comply. Because ACSAA requires the Administrator to approve a part 21 certificate holder’s SMS, the FAA is proposing these changes to part 21 to ensure that compliance with part 5 would be a pre-requisite for obtaining or amending a PC.

Additionally, the FAA is proposing to revise § 21.55 to require a type certificate holder, who allows a person to use the type certificate to manufacture a product to meet the applicable requirements of part 5. The FAA is also proposing to revise the heading of this section to account for the additional rule language.

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<sup>61</sup> One reason § 91.147 was added to the regulations was to clarify the applicability of drug and alcohol programs (Final Rule; National Air Tour Safety Standards, 72 FR 6884, Feb. 13, 2007). The FAA notes that part 120 was added two years later (Final Rule; Drug and Alcohol Testing Program, 74 FR 22649, May 14, 2009), which further functioned to eliminate confusion and streamlined the requirements of the drug and alcohol program.

## F. Scalability

Under this proposal, part 5 would apply SMS requirements to organizations that are diverse in size and complexity (i.e., aircraft fleet size, operations, product types and production volume, services, and number of employees). As the proposal is performance-based, the procedures and documentation for compliance are scalable to accommodate a wide variety of business models and sizes. This proposed rule specifies a basic set of processes to form a framework for the SMS, but does not specify particular methods for implementing these processes. This provides a balance between standardization and a robust SMS structure while allowing considerable flexibility for how an individual aviation organization chooses to establish its SMS.

The SMS ARC recommended that part 5 be both scalable and flexible to accommodate many business models.<sup>62</sup> This recommendation was incorporated into the current requirements of part 5. The four components of SMS (safety policy, safety risk management, safety assurance, and safety promotion) set forth in part 5, identify the system's requirements, but do not prescribe the means of achieving these requirements. Each organization has the flexibility to tailor an SMS that works for the organization's size, scope, and complexity to comply with the proposed rule. To enable scalability and flexibility, part 5 would continue to describe the desired measurable outcomes that must be accomplished. This performance-based approach would grant flexibility by enabling regulated persons to develop methods, processes, or other means of compliance that are appropriate to the size, scope, and complexity of their organization and operations.

For example, the objective of safety risk management – to identify hazards, assess safety risk, and develop and monitor controls within the organization's SMS – would be the same

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<sup>62</sup> SMS ARC Recommendations Final Report, p.2. March 31, 2010.

regardless of the size of the organization even though methods used might be different. The FAA does not anticipate that small organizations will need additional management and staff to satisfy the requirement elements of safety risk management. For example, smaller organizations, with few aircraft operating in a limited geographic area, might record, and track the results of the safety risk management process with paper records or digital files using common word processing or spreadsheet applications.

Additionally, persons required to have an SMS under the proposed rule would be able to comply with part 5 SMS requirements through a variety of means. The FAA considers that organizations may be able to leverage consensus or community standards, which are typically developed by third-party consultants or trade associations, to meet the requirements of part 5. In addition, the FAA recognizes that persons may already have systems and processes in place that meet the part 5 requirements.

In addition, aviation organizations that perform more than one service would be able to adapt their SMS to align with the complexity of their operations. For example, some aviation organizations have multiple certificates (e.g., the aviation organization might have multiple certificates authorizing it to conduct flight operations and to perform aircraft maintenance for other organizations, or the aviation organization might have multiple certificates authorizing it to manufacture certain products and perform flight operations or aircraft maintenance). An aviation organization with multiple types of certificates may choose to implement a separate SMS for each certificate by following the acceptance or approval process as applicable for each type of certificate. Although not required to do so, these aviation organizations may only want to implement one SMS that encompasses all their aviation-related safety activities. An aviation

organization with multiple certificates would be required to meet the part 5 statement of compliance or implementation plan requirements as applicable for its certificates.

A single pilot operator would build an SMS using tools and procedures commensurate with the size, complexity, and sophistication of the organization. Small organizations are likely to rely on the same tools that they already use in their day-to-day operations. For example, an operator may rely on standard word processing software, Excel spreadsheets, email, or even paper record books to document the system, policies, processes, and procedures. The single pilot operator would choose based on their own preferences and comfort level with the different types of technologies. This is a business decision the operator will make to maximize its own efficiencies, and it may look very different even among organizations of comparable size. In the discussion that follows, the FAA provides examples of how an SMS might be scaled to particular persons who would be required to comply with this proposed rule.

The following example illustrates how a small single pilot operator could scale implementation of SMS to fit its organization. The responsible individual would first develop a system description, which would identify the aviation operations that would be covered by the SMS and its organizational interfaces. This might be a hand-written document or a digital file on a computer. The organization would then document its safety policy; again, this could be done on paper or in a digital file. The example provided in the appendix in AC 120-92 could be used as a starting point, but there are also various examples available on the Internet that could be used as a starting point.

To meet safety risk management and safety assurance requirements, the operator could use a tool such as the Web-Based Analytical Technology (WBAT) platform which is FAA-supported software, to support employee reporting and SMS. The platform could also be used to

meet recordkeeping and documentation requirements. However, simpler options such as digital files on a computer or paper files could be used as well. For instance, AC 120-92 provides worksheets that the operator could use to meet most safety risk management requirements. To meet safety assurance requirements in a simpler way in a single pilot operator, the pilot could observe how an operation is working and identify trends in real-time. If there are issues, the pilot could take appropriate action and reevaluate the results. Any operational process could be observed and does not necessarily require formal audits or forms. Again, all of this could be documented on paper or in a digital file.

To meet communication requirements a small operator might use existing email applications to share information within its organization and with interfacing organizations, as appropriate. To meet documentation and recordkeeping requirements, the organization could use paper or digital files just as they might do for other areas of their operations such as invoicing, service and rental agreements, etc. The organization could document this using a medium of their choosing, including something as simple as a notebook.

The example above references resources available through or supported by the FAA. However, as previously noted, third-party consultants and trade associations are also resources available to assist in the development of an SMS. Further, aviation colleges and universities, ICAO, and other civil aviation authorities such as EASA and Transport Canada Civil Aviation have material that can be used to help develop an SMS.

The following example illustrates how SMS might operate in a small, low complexity operator. This example company has two helicopters and four pilots, and it provides air tour services within a 25 nautical mile range of its home airport. The company has developed a safety policy under § 5.21 that reminds everyone safety is the company's number one priority. It

contains in bold letters at the bottom, “If you see something unsafe, say something.” This policy statement is one page, signed by the company owner, and posted inside the office for all to see.

After a flight, one of the pilots reports to the air tour operator’s home base that there is a new hazard in the flightpath of their desired tour route. The hazard is a power line across a canyon and there are no visibility markers on that line. The report of the hazard is the start of the safety risk management process under § 5.51(d). Under § 5.53, the air tour operator researches the location and height of the power line relative to the flight path in the area. The operator calls the power company and learns that the line is ½-inch thick and an expected date of installation for the markers is unknown due to manufacturing delays. This information is recorded in a notebook or digital file. Even the process for conducting this analysis under § 5.53(c) can also be located in the notebook or in a digital file.

Under § 5.53, the air tour operator determines the unmarked power line is an operational hazard. Knowing that helicopters and unseen power lines are a high risk, and realizing that the company’s air tour route places them in the exact spot of the canyon where the unmarked power line exists, makes this particular risk assessment easy. The air tour company determines the severity of hitting that power line would be catastrophic and the likelihood of encountering that power line is high due to their route of flight. Using a risk matrix, the operator qualitatively determines that the risk of conducting tours with the presence of the unmarked power line is unacceptable and requires risk controls be implemented to reduce the risk to an acceptable level. All this information is placed into the notebook. The operator develops risk controls under § 5.55(c), which, in this case, is a deviation to the planned air tour route. The evaluation of the risk acceptance under § 5.55(d) is done by talking to other employees, brainstorming, or engaging with other operators. The records of meetings or conversations, as well as the risk

controls themselves, are documented using a medium of their choosing, including something as simple as a notebook or digital file consistent with the recordkeeping requirements of § 5.97.

The operator's next step is to monitor the controls it put into place through its safety assurance program. The operator will check on the deviation to the route it put in place under § 5.71(a)(1) through proposed (a)(7). This can be done by tracking the flight path or auditing the new procedures and keeping those notes in the notebook. Under § 5.93, the operator will promote safety by informing the pilots of the hazard and communicating the safety action taken, which was providing the air tour route with a deviation. Each pilot can be issued a safety alert via a memo that can be handed to them upon check in and perhaps sent via email before the flight starts.

This example illustrates how aviation safety is improved because current regulations do not require operators to have a process to identify and manage hazards. For example, operators are not currently required to: have a process to proactively identify hazards before they become accidents, establish a structured method to assure hazards are controlled, have formal communication methods that notify all company personnel of new procedures, or keep records regarding safety actions taken to prevent possible accidents.

The FAA recognizes that there is a spectrum of complexity within organizations across the aviation product and service provider industry. As discussed earlier in this section, there are relatively low-cost implementation resources available to assist persons to meet part 5 requirements, including online platforms such as the Web-Based Analytical Technology (WBAT) platform. This platform supports all aspects of an SMS and it includes the following tools: SMS implementation manager, safety risk management, safety assurance, employee reporting, and data sharing. Additionally, the FAA has drafted guidance in which there are

numerous scalability examples of how various organizations can meet the pertinent SMS requirements based upon where an organization may fall on the spectrum of complexity. The proposed Advisory Circulars (AC 21-58, Safety Management Systems for Part 21 Type and Production Certificate Holders and AC 120-92, Safety Management for Aviation Service Providers), provide in-depth discussions on how to meet each of the part 5 requirements, what tools/methods may be employed, how they may be employed, who would be involved, and includes sample tools and worksheets. For further information, see the draft AC 21-58, Safety Management Systems for Part 21 Type and Production Certificate Holders and AC 120-92 Safety Management for Aviation Service Providers, which are included in the docket of this proposed rule.

#### G. Examples of Real World Scenarios

The following accident summaries provide examples of ways that an organization having an SMS under the proposed rule might provide mitigation in real world scenarios. To illustrate how SMS would be used by different entities under the proposed rule, the following accident summaries have been arranged by the type of operator or certificate holder involved in the accident.

##### 1. Accident Involving Design and Production under Part 21

On June 28, 2015, a single engine aircraft crashed following a total loss of engine power due to the failure of the alternator drive coupling. The pilot and two passengers were fatally injured, and the airplane was destroyed by a post-crash fire. The manufacturer of the aircraft and aircraft engine were issued type and production certificates and the manufacturer of the installed replacement alternator coupling had been issued a parts manufacturer approval for the coupling

pursuant to 14 CFR part 21. The instructions provided by the engine manufacturer did not advise that a loose or improperly tight coupling could lead to a loss of power.

The NTSB report highlighted a review of the engine manufacturer's warranty records for the 5 years preceding the accident revealed six claims relating to the alternator coupling.<sup>63</sup> If an engine manufacturer in this circumstance were required to comply with the proposed rule, the warranty information would be used to prevent future safety issues. Under § 5.71, the engine manufacturer would develop a process for warranty data it receives and conduct an investigation under § 5.71(a)(6). The engine manufacturer would conduct audits of its processes and the instructions it provided on how to inspect or measure the alternator coupling under § 5.71(a)(3) before distributing the coupling. In this accident, the NTSB report also mentioned there were 10 events filed in the FAA Service Difficulty Report System relating to the alternator coupling.<sup>64</sup> The engine manufacturer would analyze those reports under § 5.71(b), which could have also revealed the inadequacy of the procedures. Then, under § 5.73, the engine manufacturer would conduct an assessment of its safety performance and ensure compliance with the risk control it established in developing new instructions for the inspection and measuring of that alternator coupling.

Section 5.51(d) would require the engine manufacturer to apply the safety risk management process to the information collected under § 5.71 that indicated the identification of hazards or ineffective risk controls. Section 5.53(a) would require the engine manufacturer to analyze its systems resulting in a focused evaluation of the maintenance instructions and tooling

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<sup>63</sup> In this example, the organization is a medium-sized company that manufactures engines. The FAA does not have detailed data on the number of warranty claims during the five-year period.

<sup>64</sup> Service Difficulty Reports are evaluated by FAA flight standards offices. If the initial evaluation indicates a serious airworthiness problem, the FAA Aircraft Certification Office and the Aircraft Evaluation Division responsible for the product must be informed of the equipment service difficulty and any recommendations for corrective actions. Original Equipment Manufacturers are not notified when a Service Difficulty Report is logged. Currently, manufacturers are not required to proactively scan the Service Difficulty Reports database.

requirements provided with the distribution of the alternator coupling. Then, under § 5.55, the engine manufacturer would analyze the safety risk associated with the procedures that inadequately ensured that the coupling was properly tightened, determine whether the risk was unacceptable, and may develop risk controls that could result in a different set of maintenance instructions.

## 2. Accident Involving Part 135 Operator

On June 25, 2015, a single-engine, turbine-powered, float-equipped airplane, operated by a part 135 on-demand air carrier, collided with mountainous, tree-covered terrain about 24 miles east-northeast of Ketchikan, Alaska.<sup>65</sup> The pilot and eight passengers sustained fatal injuries, and the airplane was destroyed.

The NTSB established the probable cause of this accident as the pilot's decision to continue visual flight into an area of instrument meteorological conditions, which resulted in his geographic disorientation and controlled flight into terrain. The NTSB report listed several contributing factors: (1) the operator's company culture, which tacitly endorsed flying in hazardous weather and failed to manage the risk associated with the competitive pressures affecting Ketchikan-area air tour operators, (2) the operator's lack of a formal safety program, including not having an SMS, and (3) the operator's inadequate operational control of flight releases. The NTSB found that the operator's management did not hold themselves accountable for conducting safe operations and fostered a company culture that condoned operating in weather conditions with inadequate visibility for visual flight.

If the proposed rule had been in effect during this time, the operator would have had requirements that may have prevented or mitigated an accident such as this one.<sup>66</sup> With an SMS,

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<sup>65</sup> NTSB accident number ANC15MA041.

<sup>66</sup> In this example, the operator employed approximately 30 to 40 people.

the operator would have a safety policy that clearly articulates the company's safety objectives and its commitment to safety as required by § 5.21. Under §§ 5.23 and 5.25, the operator would have to define accountability for safety within the organization and identify those members of management that are responsible for hazard identification, safety risk assessment, and safety promotion within their areas of responsibility. The operator allowed the operational control functions to be delegated to flight schedulers. Operational control provides for management of planning, departure, and inflight decision making to assure the safety of flights. These operational control functions were not performed adequately by those flight schedulers, leading to a loss of effective operational control. Section 5.23 requires all members of management to be accountable for their area of responsibility. Operational control responsibility resides with the Director of Operations, a required management position for an air carrier.

Section 5.51 would require the operator to apply safety risk management in the development of operational procedures. The operator had a policy that both the pilot and flight scheduler must agree that the flight can be conducted safely before a flight may be launched. This action did not take place and, more importantly, the decision to initiate that particular flight was made by a new pilot who was subject to cultural and peer influences. Section 5.51 would help close this gap by requiring the operator to conduct safety risk management when developing its procedures, policies, and training. During the safety risk management process, § 5.53 would require the operator to analyze its procedures and policies of operational control with the consideration of the operating environment of Ketchikan and the pressure of getting those passengers back to their cruise ship on time. Section 5.55 would require the operator to assess its risk and develop risk controls so the pilot would not be the sole decision maker regarding

whether the flight should proceed.<sup>67</sup> Section 5.55 would also add an additional control to its training program, requiring the inclusion of the risk of the operating environment and the hazardous local weather patterns.

The safety assurance requirements of § 5.71 would require the operator to monitor its operational processes and operational environment, to include auditing its processes and procedures. Any of these monitoring actions could have revealed that the company procedures relating to operational control of their flights were not followed. Upon discovering those discrepancies, the operator would enter back into the safety risk management process and carefully look at those procedures to include interfaces, such as training of personnel involved, to ensure all company personnel are adequately trained to follow the company procedures. Additionally, auditing of the operator's pilot training program under § 5.71 might reveal the exclusion of two items, training of hazardous local weather patterns and controlled flight into terrain avoidance training. Both are essential training items for this environment, which potentially could be identified during an analysis under § 5.53.

Under § 5.91, the operator would be required to provide SMS training to management personnel. This SMS training could positively affect the safety culture of the entire organization. Section 5.93 would require the operator to explain why safety actions and procedures are introduced or changed, thus also having an effect on the safety culture.

The FAA recognizes that in this example, the operator was already in violation of its internal company policies. Although the company's policy included a requirement not required by regulation, the documentation that the company was not adhering to its own policies could be evidence that the organization is not maintaining its SMS per this proposed rule. Documentation

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<sup>67</sup> In this example, the operator already had a policy requiring more than one person to decide whether the flight should be initiated. Therefore, the operator was not in conformance with its company policy related to operational control.

requirements under an SMS create objective evidence that the organization is identifying hazards, assessing risk, and mitigating that risk as needed. The FAA may audit this evidence at any time. Where the person has failed to comply with FAA regulations, including SMS regulatory requirements, the FAA may take enforcement action. This would also help the FAA identify safety-deficient organizations. Knowledge that adherence to its SMS policies could be audited by the FAA may encourage an organization to develop a stronger safety culture.

### 3. Accident Involving Helicopter Air Tour Conducted under Section 91.147

On February 18, 2006, a helicopter operated by an air tour operator crashed into the Pacific Ocean, off the coast of Hawaii, after attempting an emergency landing following a maintenance malfunction of the main rotor.<sup>68</sup> Three of the passengers were able to exit the helicopter but one passenger was trapped inside and drowned.

The NTSB determined the probable cause of this accident was the in-flight failure of the engine to transmission drive shaft due to improper maintenance, which resulted in low main rotor rpm and a subsequent hard landing on water.

The NTSB highlighted in its findings a failure of adequate managerial oversight during a critical maintenance task on the aircraft. A rated mechanic was not present throughout the removal, inspection, and reinstallation of the engine-to-transmission drive shaft. Additionally, maintenance records revealed no entries for the required annual inspection, or the 100-hour inspections and several required component inspections were overdue. Even though both of these deficiencies were violations of existing regulations, the FAA believes that an SMS would have allowed for the organization to self-identify, correct, and prevent the issue, negating the need for after-the-fact enforcement of non-compliance with the current regulation. If the operator

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<sup>68</sup> National Transportation Safety Board accident number WPR16FA072.

implemented an SMS as proposed by this rule, the accountability for all members of management regarding their area of responsibility would have been explicitly defined, as required by § 5.23.

The NTSB final accident report indicated the accident was caused by the in-flight failure of the engine-to-transmission drive shaft due to some missed maintenance processes. Under § 5.71, the organization could have identified the missing steps in the maintenance process. NTSB's review of maintenance records revealed no entries pertaining to a current annual inspection or 100-hour inspection. An auditing process under § 5.71 could have identified this deficiency. Additionally, a component inspection sheet provided by the operator revealed that several required component inspections were overdue and had not been completed at the time of the accident. The operator reported to the NTSB that he knew those inspections were coming due but did not realize the helicopter had flown such that it exceeded the inspection interval (which was a violation of existing regulatory requirements). Therefore, the owner did not know those items were overdue until he printed the status sheet for the investigation of the accident. If the operator monitored its operational processes as would be required under § 5.71, it would have conducted safety risk management under § 5.51 that would have identified hazards involving the lack of procedural actions resulting in overdue inspections. The organization would then develop and implement additional safety risk controls by applying § 5.55, such as management oversight, thus preventing future occurrences.

In this example, the operator was in violation of existing safety regulations. As with the previous example where an internal company policy was not followed, SMS documentation requirements would either create the objective evidence that the organization is identifying hazards, assessing risk, and mitigating risk as needed, or the lack of proper SMS documentation

may demonstrate that the organization is in violation of regulation, including SMS regulatory requirements. The FAA may audit this evidence at any time. The evidence created through the SMS would help the FAA to identify safety-deficient organizations more effectively. Where deficiencies exist, the FAA may take enforcement action; however a single safety incident would not necessarily indicate that an organization is out of compliance with its SMS.

#### H. Data Reporting and Protection

In accordance with proposed § 5.94, any organization that identifies a hazard in the operating environment would be required to provide notice of the hazard to the interfacing person or persons identified in the system description, who, to the best of their knowledge, would be able to address the hazard or mitigate the risk.

Title 49 U.S.C. 44735 provides protection from disclosure under the Freedom of Information Act,<sup>69</sup> for certain reports, data, or other information that are submitted to the FAA voluntarily and are not required to be submitted to the Administrator under any other provision of law. Section 44735(b)(4) limits disclosure of “reports, data, or other information produced or collected for purposes of developing and implementing a safety management system acceptable to the Administrator.” Section 44735(b)(4) also limits disclosure of “reports, analyses, and directed studies, based in whole or in part on reports, data or other information” related to the development and implementation of a SMS.

The protections of 49 U.S.C. 44735 do not extend to information that is required to be submitted to the FAA.<sup>70</sup> Therefore, if § 5.94 requires that notice of a hazard be submitted to the FAA (because the FAA is an interfacing party), that submission is not protected from disclosure

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<sup>69</sup> See 5 U.S.C. 552(b)(3)(B).

<sup>70</sup> As discussed earlier in this preamble, for summaries of confidential employee reports to the FAA that would be required under proposed § 5.71(c), 49 U.S.C. 44735(a)(2) offers statutory protection from disclosure under the Freedom of Information Act, pursuant to 5 U.S.C. 552(b)(3)(B).

under 49 U.S.C. 44735. However, if that notice of hazard submitted to the FAA contains trade secrets, or confidential commercial or financial information, the FAA must protect the information from public disclosure under 18 U.S.C. 1905 or 5 U.S.C. 552(b)(4). If a person voluntarily shares hazard information with the FAA and such data is not required to be submitted under § 5.94, then such information would be protected from disclosure under section 44735.

The FAA does not control data shared by a person under proposed § 5.94 with other interfacing persons such as other governmental entities or private parties. Certain protections might be available under a private, legally-binding agreement to protect the information (e.g., non-disclosure agreement) amongst the parties sharing the information, or under certain state or local laws or regulations.

Persons that would be subject to § 5.94 may seek legal guidance to determine the most appropriate way to handle and protect data and information submitted to, or received from, interfacing persons. The FAA encourages these persons to assess applicable State legal frameworks to determine how to comply with data sharing, privacy laws, and reporting requirements, and how to best protect the data shared or received. These persons should evaluate whether states afford data sharing and information protection mechanisms through local statutes or regulations, or through other legal or contractual arrangements, such as confidential disclosure agreements. The FAA expects that industry already has agreements or other arrangements with those interfaces they interact with the most to protect their data and prevent unauthorized

disclosures.<sup>71</sup> The FAA considers that industry would be best able to determine how to effectively share hazard information with interfacing parties.

## **VI. Guidance Material**

The FAA provides guidance to the industry on potential methods to comply with part 5. Included in the docket for this proposed rule are draft updates to FAA's existing SMS guidance material, AC 120-92: Safety Management Systems for Aviation Service Providers, and new draft guidance in AC 21-58: Safety Management Systems for Type and Production Certificate Holders.

### **A. Guidance for Aviation Service Providers**

The FAA is revising AC 120-92: Safety Management Systems for Aviation Service Providers, to provide guidance in meeting the new requirements of part 5, and for all types of certificate holders and LOA holders who would be required to have an SMS under the proposed rule. The draft AC also describes methods of scalability for the service providers to meet the proposed requirements based on their size and the services they provide. Lastly, this draft AC has been updated to include current information and best practices. The AC would continue to support the FAA SMS Voluntary Program participants.

### **B. Guidance for Design and Production Approval Holders**

The FAA has drafted a new AC 21-58: Safety Management Systems for Type and Production Certificate Holders that would assist part 21 TC and PC holders and applicants in developing and implementing an SMS compliant with the proposed part 5 requirements. This

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<sup>71</sup> As discussed earlier in the preamble, interfaces are often entities like suppliers or companies that the certificate holder contracts with for services. In these cases, contracts likely already exist, so the need to share hazard information could be added to those existing contracts or included in future contracts. The FAA notes that there are analogous information sharing agreements already present in the aviation industry. For example, an aircraft owner is provided with an Airplane Flight Manual. If the operator finds errors in the manual there is a means to report this to the Original Equipment Manufacturer. The manufacturer may make the change and then send out modifications to all the owners of that type of aircraft, therefore providing a closed loop communication system.

new draft advisory circular is similar to the updated AC 120-92, geared toward the needs of part 21 certificate holders, and is consistent with AC 120-92 to facilitate corporate-wide SMS implementation for part 21 certificate holders that also have other certificates under 14 CFR.

## **VII. Regulatory Notices and Analyses**

Federal agencies consider impacts of regulatory actions under a variety of executive orders and other requirements. First, Executive Order 12866 and Executive Order 13563 direct that each Federal agency shall propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify the costs. Second, the Regulatory Flexibility Act of 1980 (Public Law 96-354) requires agencies to analyze the economic impact of regulatory changes on small entities. Third, the Trade Agreements Act of 1979 (Public Law 96-39) prohibits agencies from setting standards that create unnecessary obstacles to the foreign commerce of the United States. In developing U.S. standards, this Trade Act requires agencies to consider international standards and, where appropriate, that they be the basis of U.S. standards. Fourth, the Unfunded Mandates Reform Act of 1995 (Public Law 104-4) requires agencies to prepare a written assessment of the costs, benefits, and other effects of proposed or final rules that include a Federal mandate that may result in the expenditure by State, local, and tribal governments, in the aggregate, or by the private sector, of \$100,000,000 or more (adjusted annually for inflation) in any one year. The current threshold after adjustment for inflation is \$165,000,000, using the most current (2021) Implicit Price Deflator for the Gross Domestic Product. The FAA has provided a detailed RIA in the docket for this rulemaking. This portion of the preamble summarizes the FAA's analysis of the economic impacts of this rule.

In conducting these analyses, the FAA has determined that this rule: (1) will generate benefits that justify costs; (2) is a “significant regulatory action” as defined in section 3(f) of

Executive Order 12866; (3) will have a significant economic impact on a substantial number of small entities; (4) will not create unnecessary obstacles to the foreign commerce of the United States; and (5) will not impose an unfunded mandate on State, local, or tribal governments, or on the private sector.

#### A. Regulatory Impact Analysis

In summary, the FAA estimated quantified annualized costs of \$51.3 million using a 7 percent discount rate over a 5-year period of analysis. The costs represent the value of resources needed for regulated entities to develop and implement a safety management system. Mitigation costs to reduce or eliminate any hazards identified by an SMS, which are yet to be identified and thus unknown, are not included in the analysis. The FAA evaluated benefits qualitatively. The benefits are the value that would result from avoided fatalities, serious injuries, aircraft damage, and investigation costs.

##### 1. Baseline for the Analysis

The baseline for the analysis of incremental benefits and costs of the proposed rule includes existing regulations and standards, existing practices, affected entities, and current risks of aircraft accidents and incidents. The FAA already requires part 121 operators to implement an SMS. The FAA also provides a voluntary SMS program for certificate holders under parts 21, 135, and 145. The SMS voluntary program is based on the requirements in existing part 5. There are over 200 participants in the voluntary program, including 40 participants in active conformance (full implementation of the certificate holder's SMS).<sup>72</sup> In addition, some part 121 operators have covered their part 135 operations and part 145 repair station services under their SMS. Finally, certain aircraft design and production approval holders and certificated repair

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<sup>72</sup> See FAA Order 8900.1, Volume 17, Chapter 3, "Safety Management System Voluntary Program"

stations subject to EASA requirements will be required to develop and implement an SMS under that agency's SMS requirements.<sup>73</sup>

The FAA estimated that the proposed rule would apply to approximately 65 holders of both a type certificate and a production certificate for the same product. Also, there are approximately 1,907 part 135 operators that would be required to implement an SMS, which includes 272 entities that also hold an LOA to conduct commercial air tours under § 91.147. Additionally, there are 694 LOA holders operating under § 91.147 that are not associated with a part 135 certificate that would be required to implement an SMS under the proposed rule.

With respect to aircraft accidents, although the risk associated with regularly scheduled commercial air carriers under part 121 in the United States is low, there have been accidents involving fatalities and serious injuries. Under part 135, there has been an average of 43 accidents and 24 fatalities annually from 2015 to 2019, mostly within on-demand operations. There have also been recent fatal accidents of air tours conducted under § 91.147, an average of 7 accidents and 3 fatalities annually from 2015 to 2019.

## 2. Benefits

The benefits of the proposed rule would include the value of the reductions in safety risks associated with requiring additional entities to implement SMS. The information available for estimating such benefits includes data on accident consequences, accident investigation reports identifying the probable causes, and information on the values associated with avoiding consequences. The FAA relied largely on aviation accident data from the NTSB for the years 2015 to 2019 (the most recent available at the time of the analysis) and standard values for

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<sup>73</sup> EASA adopted a rule to require SMS for maintenance organizations (part 145), which will become applicable on December 2, 2022. EASA also adopted a rule for design and production organizations (part 21), which will become applicable on March 7, 2023.

estimating avoided consequences including fatalities, serious injuries, property damage, and investigation costs.

The FAA evaluated benefits by determining annual average aviation accident consequences, the share of those consequences that could be mitigated under the proposed rule, and probability of mitigation. The FAA determined the share of consequences that could potentially be mitigatable by the rule by looking at the causes of individual accidents. Requiring certain aircraft design and production approval holders (14 CFR part 21) to implement SMS has the potential to mitigate accidents in operations conducted under 14 CFR parts 121, 135, and 91. Requiring part 135 operators and § 91.147 LOA holders to implement SMS has the potential to mitigate accidents in operations under part 135 and § 91.147. The probability of mitigation is uncertain.

The FAA used accident data from 2015 to 2019, focusing on those involving fatalities and serious injuries (1,954 out of 6,718 accidents across parts 91, 121, and 135). The FAA identified 11 accidents of which the risk could have been mitigated by requiring SMS for part 21 approval holders. The FAA also identified 35 part 135 accidents and 4 § 91.147 accidents of which the risk could have been mitigated by the proposed rule. There are a number of uncertainties in the analysis, including that not all accidents indicative of the potential for benefits from the proposed rule may have been identified. In particular, requiring SMS for certain part 21 design and production approval holders will have beneficial impacts beyond domestic operations (i.e., to citizens of foreign countries).

### 3. Costs

To estimate compliance costs, the FAA developed average onetime SMS development costs and recurring SMS implementation costs. Then, the FAA extrapolated these costs to

entities that would fall under the expanded applicability of part 5 who would not already be required to implement an SMS and are not already implementing an SMS voluntarily. To develop these estimates, the FAA conducted limited outreach to industry participants in the FAA’s voluntary SMS program to obtain data on implementation costs. In order to properly scale costs for company size, the FAA calculated these costs per employee for certificate holders under part 21 and per aircraft for operators under part 135 and § 91.147. The FAA then extrapolated the costs based on number of employees or number of aircraft. The FAA estimated only minor costs for entities that have already implemented an SMS voluntarily.

There are a number of uncertainties in the analysis, including that costs are based on a small sample. As a result, costs could be lower or higher than estimated. The outreach indicated a high level of variability depending on the individual circumstances of the entity (e.g., existing processes and capabilities). For this analysis, the FAA intends for the estimates to represent an average across entities.

#### 4. Summary

Table 2 provides a summary of annualized and present value costs using 3 percent and 7 percent discount rates.

**Table 2. Summary of Costs (Millions \$2021)**

Category	Annualized	Present Value (5 Years)
<b>3% Discount Rate</b>		
Part 21	\$5.0	\$22.8
Part 135	\$39.5	\$180.8
§ 91.147	\$7.2	\$33.0
Part 121	\$0.1	\$0.3
Total	\$51.7	\$236.9
<b>7% Discount Rate</b>		
Part 21 <sup>1</sup>	\$5.0	\$20.6
Part 135	\$39.1	\$160.4
§ 91.147	\$7.1	\$29.3
Part 121	\$0.1	\$0.3
Total	\$51.3	\$210.6
n.e. = not estimated		

**Table 2. Summary of Costs (Millions \$2021)**

<b>Category</b>	<b>Annualized</b>	<b>Present Value (5 Years)</b>
1. Based on quantified impacts. Excludes costs of mitigation, which FAA was unable to estimate.		

Considering particular uncertainties associated with estimating benefits (e.g., SMS effectiveness), the FAA estimated the number of accident consequences (fatalities, serious injuries, and destroyed airplanes) that would have to be avoided for benefits to equal costs. These estimates are based on the estimated costs if mitigation costs are minimal. Although mitigation costs are not included, neither are cost savings, such as from potential efficiency gains. For example, SMS can result in doing things differently but not always more costly.

However, the breakeven analysis is limited for providing insight on the relationship of benefits and costs because net benefits will also depend on the magnitude of mitigation costs, which have not been quantified due to lack of data. Therefore, the FAA also calculates the breakeven level of consequences for an illustrative example of mitigation costs equal to 25 percent of compliance costs. Avoided consequences would need to be higher if mitigation costs are greater than 25 percent of compliance costs. The FAA requests comment and data on the costs of mitigations that could have prevented the accidents described in the analysis.

The breakeven analysis suggests that the proposed rule would break even, across all parts, if an average of four fatalities are avoided annually (5 fatalities in the example assuming mitigation costs are 25 percent of compliance costs). Requiring SMS for certain part 21 design and production approval holders would break even if an average of four serious injuries are avoided annually (5 serious injuries assuming mitigation costs are 25 percent of compliance costs). The SMS requirements for part 135 operators would break even if an average of 3 fatalities are avoided annually (4 fatalities assuming mitigation costs are 25 percent of compliance costs). The SMS requirements for § 91.147 LOA holders would break even if an

average of 1 fatality is avoided annually (1 fatality also assuming mitigation costs are 25 percent of compliance costs). The benefits of the proposed rule could also equal costs with other combinations of avoided accident consequences.

## 5. Regulatory Alternatives

The FAA considered two alternatives to the proposed rule. Each proposed alternative would change the applicability of the requirements for an SMS:

- Alternative 1: Extend applicability of part 5 to include most design and production approval holders under part 21, with some exceptions.
- Alternative 2: Exclude from the applicability of part 5 the part 135 operators that use only one pilot-in-command in their operations and the § 91.147 LOA holders that conduct fewer than 100 flights per year.

The FAA considered an alternative to the proposed part 21 applicability based on recommendations from a part 21 SMS Aviation Rulemaking Committee. Under Alternative 1, the SMS requirements would apply beyond holders of both a type and production certificate for the same product and would include most design and production approval holders. This alternative would exclude design and production approval holders of products, articles, or changes to existing type certificated products that are not typically used for carrying passengers or property for compensation or hire. Also, as part of this alternative, the FAA considered a process that would allow design and production approval holders to apply to be excluded from SMS requirements if their article or approved product alteration would have little or no effect on the continued safe flight or landing of the aircraft. Under Alternative 1, the FAA estimated that over 3,000 additional entities would be required to implement SMS. The FAA also estimated that

over 3,000 additional entities (not associated with the entities in the previous sentence) would likely apply for an exception from the SMS requirements.

Alternative 1 would increase benefits through SMS implementation by the approximately 3,000 entities who design or produce certain safety-critical parts under any design or production approval. The alternative would also hold entities who design and produce interchangeable safety-critical parts to the same SMS standard required of entities holding both a type certificate and a production certificate for the same product. However, as of the date of this analysis, the FAA was not able to estimate these risks or benefits due to a lack of specific data and lack of certainty at this time.

The FAA estimated that costs could be \$39.4 million for Alternative 1, using a number of assumptions because the agency does not have information for these entities on the size of their aviation design and production processes. The costs would include SMS development and implementation costs, application costs for an exception to implementing SMS, and FAA review and approval costs. Compared to the proposed rule, the increased costs would be approximately \$34.4 million (annualized using a 7% discount rate).

The FAA considered an alternative for part 135 and § 91.147 that would limit the number of small operators affected. Under Alternative 2, the FAA considered excluding from the applicability of part 5 the part 135 operators that use only one pilot-in-command in their operations and the § 91.147 LOA holders that conduct fewer than 100 flights per year. The FAA estimated that 1,313 part 135 operators would be affected under Alternative 2 compared to 1,907 under the proposed rule. The FAA does not have data on the number of § 91.147 LOA holders that conduct less than 100 flights per year. However, for this analysis, the FAA used LOA holders with one registered aircraft as an estimate of LOA holders that would not be affected

under the alternative. The FAA estimated that 321 § 91.147 LOA holders would be affected under Alternative 2 compared to 694 under the proposed rule.

The reduced applicability under Alternative 2 would lower both the benefits and costs. For part 135, costs would be \$3.4 million lower compared to the proposed rule. For § 91.147, costs would be \$1.7 million lower compared to the proposed rule. With respect to benefits, the FAA identified five potentially mitigatable accidents involving operators that use only one pilot-in-command and one potentially mitigatable accident involving a § 91.147 LOA holder with one aircraft registration. These types of operators would not be required to implement an SMS.

Table 3 provides a summary of the analysis of alternatives. The uncertainty associated with the estimation of benefits and costs of the proposal also applies to the estimates of the alternatives. Section V.A., Applicability, of the preamble to the proposed rule provides the agency’s rationale for selecting the proposed option.

**Table 3. Summary of Alternatives Analysis**

Scenario	Change from Proposed Rule		
	Affected Entities	Benefits	Costs (Millions)
Alternative 1: Extend applicability to include additional design and production approval holders under part 21	SMS: +3,000 Exception: +3,000	Data not available to quantify change in risk	+\$34.4
Alternative 2: Limit applicability for certain part 135 operators (exclude operators that use only one pilot-in-command) and § 91.147 LOA holders (exclude fewer than 100 flights per year)	Part 135: -594 § 91.147: -373	Lower (would not mitigate risks identified in 5 part 135 and 1 § 91.147 accidents)	Part 135: -\$3.4 § 91.147: -\$1.7

Please see the RIA available in the docket for the more details.

**B. Regulatory Flexibility Act**

The Regulatory Flexibility Act (RFA) of 1980, Public Law 96–354, 94 Stat. 1164 (5 U.S.C. 601–612), as amended by the Small Business Regulatory Enforcement Fairness Act of

1996 (Public Law 104–121, 110 Stat. 857, Mar. 29, 1996), and the Small Business Jobs Act of 2010 (Public Law 111–240, 124 Stat. 2504 Sept. 27, 2010), requires Federal agencies to consider the effects of the regulatory action on small business and other small entities and to minimize any significant economic impact. The term “small entities” comprises small businesses and not-for-profit organizations that are independently owned and operated and are not dominant in their fields, and governmental jurisdictions with populations of less than 50,000.

The FAA is publishing this Initial Regulatory Flexibility Analysis (IRFA) to aid the public in commenting on the potential impacts to small entities from this proposal. The FAA invites interested parties to submit data and information regarding the potential economic impact that would result from the proposal. The FAA will consider comments when making a determination or when completing a Final Regulatory Flexibility Analysis.

An IRFA must contain the following:

- (1) A description of the reasons why the action by the agency is being considered;
- (2) A succinct statement of the objective of, and legal basis for, the proposed rule;
- (3) A description of and, where feasible, an estimate of the number of small entities to which the proposed rule will apply;
- (4) A description of the projected reporting, recordkeeping, and other compliance requirements of the proposed rule, including an estimate of the classes of small entities which will be subject to the requirement and the type of professional skills necessary for preparation of the report or record;
- (5) An identification, to the extent practicable, of all relevant Federal rules that may duplicate, overlap, or conflict with the proposed rule; and

(6) A description of any significant alternatives to the proposed rule which accomplish the stated objectives of applicable statutes, and which minimize any significant economic impact of the proposed rule on small entities.

#### 1. Reasons the Action is Being Considered

As described elsewhere in this preamble, the proposed rule addresses a Congressional mandate as well as recommendations from the NTSB. Additionally, the proposed rule would move the United States closer to harmonizing with ICAO Annex 19. The FAA intends for the proposed rule to improve aviation safety by requiring organizations to implement a proactive approach to managing the safety performance of an organization. The successful use of SMS by part 121 operators suggests potential benefits of expanding SMS into other sectors of the aviation system.

#### 2. Objectives and Legal Basis of the Proposed Rule

The objective of implementing an SMS is to proactively identify hazards, assess the risk of those hazards, and apply effective mitigations before an accident or incident occurs. The proposed rule would expand the use of SMS in the aviation industry by making the SMS requirements applicable to part 135 operators, § 91.147 LOA holders, and certain part 21 design and production approval holders. The proposed rule would also increase the opportunities for communication of identified hazards between part 119 certificate holders, § 91.147 LOA holders, and manufacturers. The proposed rule is therefore intended to increase the overall safety of the national airspace system. Additionally, the proposed rule would fulfill the statutory mandate in section 102 of ACSAA. Section II of this preamble describes the FAA's authority to issue rules on aviation safety under Title 49 U.S.C. and the Congressional mandate in section 102 of ACSAA.

### 3. Description and Estimate of the Number of Small Entities

FAA used the definition of small entities in the RFA for this analysis. The RFA defines small entities as small businesses, small governmental jurisdictions, or small organizations. In 5 U.S.C. section 601(3), the RFA defines "small business" to have the same meaning as "small business concern" under section 3 of the Small Business Act. The Small Business Act authorizes the Small Business Administration (SBA) to define "small business" by issuing regulations.

SBA has established size standards for various types of economic activities, or industries, under the North American Industry Classification System (NAICS). These size standards generally define small businesses based on the number of employees or annual receipts. Table 4 shows the SBA size standards for example industrial classification codes relevant for the proposed rule. Note that the SBA definition of a small business applies to the parent company and all affiliates as a single entity.

**Table 4. Small Business Size Standards: Air Transportation**

<b>NAICS Code</b>	<b>Description</b>	<b>Size Standard</b>
336411	Aircraft Manufacturing	1,500 employees
336412	Aircraft Engine and Engine Parts Manufacturing	1,500 employees
336413	Other Aircraft Part and Auxiliary Equipment Manufacturing	1,250 employees
481111	Scheduled Passenger Air Transportation	1,500 employees
481112	Scheduled Freight Air Transportation	1,500 employees
481211	Nonscheduled Chartered Passenger Air Transportation	1,500 employees
481212	Nonscheduled Chartered Freight Air Transportation	1,500 employees
481219	Other Nonscheduled Air Transportation	\$16.5 million
487990	Scenic and Sightseeing Transportation, Other	\$8.0 million
NAICS = North American Industrial Classification System		

#### a. Part 21

As described in the RIA, the FAA estimated that there may be approximately 65 design or production approval holders under part 21 that may need to implement SMS under the proposed rule. Fifteen of these entities are already implementing SMS under the FAA's voluntary program or are large businesses (based on publicly available information regarding

number of employees). Of the remaining 50 entities, 31 may meet the size standard for a small business in Aerospace Product and Parts Manufacturing (NAICS 33641)).

**b. Part 135**

Approximately 1,907 part 119 certificate holders operating under part 135 would need to implement SMS under the proposed rule. Internal FAA data indicate that all but three of these certificate holders have fewer than 1,500 employees. Thus, to the extent that the industrial classification of the parent company of these entities is scheduled passenger or freight, or nonscheduled chartered passenger or freight air transportation (NAICS 481111, 481112, 481211, or 481212), over 1,900 would be small businesses. Table 5 shows the distribution of certificate holders by total employment.

**Table 5. Distribution of Part 135 Employment**

<b>Number of Employees</b>	<b>Number of Certificate Holders</b>	<b>Percent of Certificate Holders</b>
1	292	15%
2-9	877	46%
10-19	275	14%
20-49	264	14%
50-99	106	6%
100-499	76	4%
500-999	13	1%
1000+	4	0%

Source: FAA data as of March 2021

**c. Section 91.147**

Approximately 694 air tour operators would have to implement SMS under the proposed rule. To the extent that the industrial classification of the parent company of these entities is Scenic and Sightseeing Transportation, Other, the relevant size standard is \$8.0 million. Internal FAA data does not include revenue or number of flights for these operations. However, 362 of these LOA holders have only one aircraft listed on the LOA. Many may meet the small business

size standard. The FAA requests data and information that may enable determination of whether these air tour operators would meet the SBA small size threshold.

#### 4. Projected Reporting, Recordkeeping, and Other Compliance Requirements

Section V.C.4 of this preamble discusses the reporting requirements of the proposed rule. Affected entities who identify a hazard in their operating environment must provide notice of the hazard to the interfacing person or persons who would best be able to address the hazard or mitigate the risk.

Section V.C.5 of this preamble describes the recordkeeping requirements of the proposed rule. Affected entities must maintain records of the outputs of safety risk management and safety assurance processes for as long as they remain relevant to the operation. In addition, entities must retain outputs of safety assurance processes for a minimum of 5 years, SMS training records for as long as the individual is employed by the person, and communication records for a minimum of 24 months.

Recordkeeping and reporting requirements, like the rest of part 5, are scalable to a wide variety of business models and sizes, as discussed in Section V.F. of this preamble. As a result, entities could potentially accomplish the recordkeeping and reporting requirements through the use of existing personnel rather than require additional professional skills.

Section V.C of the preamble describes the primary requirements for an SMS, which include safety policy, safety risk management, safety assurance, and safety promotion, as well as documentation. As described in the RIA, the FAA estimated the cost of compliance with all the proposed requirements based on number of employees for part 21 certificate holders and based on fleet size for part 135 operators and § 91.147 LOA holders. Table 6 and Table 7 provide the results for example size categories and expressed as a percentage of overall average receipts

(using NAICS 336411 for part 21 and 336411 for part 135 as examples<sup>74</sup>). Not included in the costs are mitigation costs which are yet unknown. The RIA provides additional detail on the cost estimates.

**Table 6. Example SMS Compliance Costs By Number of Employees: Part 21**

Number of Employees	One-time Cost	Annual Cost	One-time Cost/Receipts <sup>1</sup>	Annual Cost/Receipts <sup>1</sup>
1-99	\$7,500 - \$26,050	\$500 - \$10,130	0.2% - 1.2%	0.1% - 0.1%
100-499	\$26,320 - \$131,320	\$10,230 - \$51,050	0.2% - 1.2%	0.1% - 0.5%
500-10,000	\$131,580 - \$2,631,590	\$51,150 - \$1,023,000	0.03 - 0.1%	0.01% - 0.04%

1. Source for receipts: 2017 County Business Patterns and Economic Census ([https://www2.census.gov/programs-surveys/susb/tables/2017/us\\_state\\_naics\\_detailedsizes\\_2017.xlsx](https://www2.census.gov/programs-surveys/susb/tables/2017/us_state_naics_detailedsizes_2017.xlsx)). Adjusted for inflation using the Consumer Price Index. Based on NAICS 336411.

**Table 7. Example SMS Compliance Costs By Number of Aircraft: Part 135 and 91.147**

Number of Aircraft	One-time Cost	Annual Cost	One-time Cost/Receipts <sup>1</sup>	Annual Cost/Receipts <sup>1</sup>
1-9	\$7,500 - \$38,120	\$4,380 - \$39,420	0.1% - 0.7%	0.1% - 0.4%
10-49	\$42,360 - \$207,560	\$43,800 - \$214,640	0.1% - 0.9%	0.1% - 0.9%
50-99	\$211,800 - \$419,370	\$219,020 - \$433,670	0.2% - 0.9%	0.2% - 0.9%
100-500	\$423,600 - \$2,118,010	\$438,050 - \$2,190,230	0.2% - 0.3%	0.2% - 0.3%

1. Source for receipts: 2017 County Business Patterns and Economic Census ([https://www2.census.gov/programs-surveys/susb/tables/2017/us\\_state\\_naics\\_detailedsizes\\_2017.xlsx](https://www2.census.gov/programs-surveys/susb/tables/2017/us_state_naics_detailedsizes_2017.xlsx)). Adjusted for inflation using the Consumer Price Index. Based on NAICS 481111 and median number of employees per number of aircraft for part 135 operators.

Total annualized costs (using a 7 percent discount rate) for small businesses may be in the range of \$0.3 million for part 21 and \$37.4 million for part 135. The FAA does not have data to identify § 91.147 LOA holders that may meet the size standard. However, total annualized costs for this sector are \$7.1 million.

Although the proposed requirements are scalable to fit the size or complexity of the organization, any adverse impacts of compliance costs could disproportionately fall on small

<sup>74</sup> The ratios are similar using NACIS 336412 and 336413 for part 21 and 481112, 481113, 481211, 481212, and 481213 for part 135. For § 91.147, the FAA does not have number of employees associated with the number of aircraft on the LOA. However, assuming LOA holders of 1 and 2 registered aircraft have less than 5 employees, the ratios for one-time and annual costs as a percentage of inflation adjusted receipts in this smallest employment size category in NAICS 487990 would be 1.8% and 1.1%, respectively.

entities. Like large entities, small entities will likely pass the costs on in the form of price increases.

#### 5. All Federal Rules That May Duplicate, Overlap, or Conflict

There are no relevant Federal rules that may duplicate, overlap, or conflict with the proposed rule.

#### 6. Significant Alternatives Considered

The FAA considered extending the applicability of part 5 to include most design and production approval holders under part 21, with some exceptions. Compared to the proposed option, the FAA estimated that more than an additional 3,000 entities would need to implement an SMS and more than 3,000 would likely apply for an exception under this alternative. To the extent that the industrial classification of these entities is in aircraft manufacturing, the industry data in Table 2 suggests that a large percentage are likely small businesses (i.e., given at least 92 percent of this sector meet the size standard).

The FAA considered excluding from the SMS certificate holders under part 135 that use only one pilot-in-command in their operations and § 91.147 LOA holders that conduct less than 100 flights per year. This alternative would reduce affected part 135 operators by 31 percent and § 91.147 LOA holders by 54 percent. For part 135, costs would be \$3.4 million lower compared to the proposed rule. For § 91.147, costs would be \$5.9 million lower compared to the proposed rule. However, the alternative would also reduce benefits. The FAA identified five potentially mitigatable accidents involving operators that use only one pilot-in-command and one potentially mitigatable accident involving a § 91.147 LOA holder with one aircraft registration. These types of operators would not be required to implement an SMS.

### C. International Trade Impact Assessment

The Trade Agreements Act of 1979 (Public Law 96-39), as amended by the Uruguay Round Agreements Act (Public Law 103-465), prohibits Federal agencies from establishing standards or engaging in related activities that create unnecessary obstacles to the foreign commerce of the United States. Pursuant to these Acts, the establishment of standards is not considered an unnecessary obstacle to the foreign commerce of the United States, so long as the standard has a legitimate domestic objective, such as the protection of safety, and does not operate in a manner that excludes imports that meet this objective. The statute also requires consideration of international standards and, where appropriate, that they be the basis for U.S. standards. The FAA has assessed the potential effect of this rule and determined that it will improve aviation safety and does not exclude imports that meet this objective.<sup>75</sup> As a result, the FAA does not consider this rule as creating an unnecessary obstacle to foreign commerce.

### D. Unfunded Mandates Assessment

Title II of the Unfunded Mandates Reform Act of 1995 (Public Law 104-4) requires each Federal agency to prepare a written statement assessing the effects of any Federal mandate in a proposed or final agency rule that may result in an expenditure of \$100 million or more (in 1995 dollars) in any one year by State, local, and tribal governments, in the aggregate, or by the private sector; such a mandate is deemed to be a “significant regulatory action.” The FAA currently uses an inflation-adjusted value of \$165 million in lieu of \$100 million. An unfunded mandate is a regulation that requires a State, local, or tribal government or the private sector to incur direct costs without the Federal government having first provided the funds to pay those

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<sup>75</sup> The FAA notes that because this proposed rule would not apply to products where the state of manufacture is not the United States, aircraft manufacturers who are manufacturing abroad would not be required to have an SMS under part 5 but may have SMS requirements imposed by the state of manufacture.

costs. The FAA determined that the proposed rule will not result in the expenditure of \$165,000,000 or more by State, local, or tribal governments in the aggregate, or the private sector, in any one year.<sup>76</sup> Therefore, the requirements of Title II of the Unfunded Mandates Reform Act of 1995 do not apply.

#### E. Paperwork Reduction Act

The Paperwork Reduction Act of 1995 (44 U.S.C. 3507(d)) requires that the FAA consider the impact of paperwork and other information collection burdens imposed on the public. According to the 1995 amendments to the Paperwork Reduction Act (5 CFR 1320.8(b)(2)(vi)), an agency may not collect or sponsor the collection of information, nor may it impose an information collection requirement unless it displays a valid Office of Management and Budget (OMB) control number.

This proposed rule contains new information collection requirements and amendments to the existing information collection requirements previously approved under OMB Control Number 2120-0675. As required by the Paperwork Reduction Act of 1995 (44 U.S.C. 3507(d)), the FAA has submitted these proposed information collection amendments to OMB for its review.

#### 1. Summary:

In this rule, the FAA is proposing to require that all certificate holders operating under part 135, all LOA holders operating under § 91.147, and certain certificate holders under part 21 establish an SMS to improve safety for their operations, and to amend the requirements for certificate holders operating under part 121.<sup>77</sup> An SMS is a formalized approach to managing

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<sup>76</sup> The Unfunded Mandates Reform Act of 1995 defines “Federal private sector mandate” as “any provision in legislation, statute, or regulation that . . . would impose an enforceable duty upon the private sector . . . or would reduce or eliminate the amount of authorization of appropriations for Federal financial assistance that will be provided to the private sector for the purposes of ensuring compliance with such duty.” Public Law 104-4 section 658 (1995).

<sup>77</sup> Proposed part 121 requirements would be amended in the corresponding OMB Control Number 2120-0675.

safety by developing an organization-wide safety policy, developing formal methods for identifying hazards, analyzing and mitigating risk, developing methods for ensuring continuous safety improvement, and creating organization-wide safety promotion strategies.

Under this proposed rule, certificate and authorization holders required to comply would be burdened with the following information collection activities:<sup>78</sup>

- (1) Develop a system description - § 5.5(b)(1).
- (2) Revise and maintain the system description to reflect changes in the organization - § 5.5(b)(2).
- (3) Submit the revisions of the SMS to meet the requirements of §§ 5.5(b), 5.21(a)(7), 5.53(b)(5), 5.94, 5.95(c), and 5.97(d) for FAA-acceptance in a form and manner acceptable to the Administrator - § 5.7(a)(2).
- (4) Submit a statement of compliance in a form and manner acceptable to the Administrator - § 5.7(b)(2) and § 5.9(a)(2).
- (5) Submit an implementation plan in accordance with § 5.17 of this subpart for FAA approval in a form and manner acceptable to the Administrator - § 5.11(b) and § 5.13(b)(2).
- (6) Any person required to have an SMS under this part to have a safety policy - § 5.21(a).
- (7) Any person that holds both a type certificate and a production certificate for the same product issued under part 21 of this chapter must submit a summary of the confidential employee reports received under § 5.71(a)(7) to the Administrator every 6 months - § 5.71(c).

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<sup>78</sup> Proposed part 121 requirements not reflected in corresponding OMB Control Number 2120-0675 are system description and notification of hazards.

- (8) If a person identifies a hazard in the operating environment, the person must provide notice of the hazard to the interfacing person or persons identified in the system description who, to the best of their knowledge, could address the hazard or mitigate the risk - § 5.94(a); any person required to have an SMS under this part to develop and maintain procedures for reporting and receiving hazard information- § 5.94(b).
- (9) Any person required to have an SMS under this part to develop and maintain SMS documentation containing (a) safety policy, (b) SMS processes and procedures, (c) system description - § 5.95.
- (10) Any person required to have an SMS under this part to maintain SMS records: (a) records of outputs of safety risk management processes for as long as the control remains relevant to the operation, (b) records of outputs of safety assurance processes for a minimum of 5 years, (c) records of all training provided under § 5.91 for each individual for as long as the individual is employed by the person, (d) records of all communications provided under § 5.93 or § 5.94 for a minimum of 24 consecutive calendar months - § 5.97.

## 2. Use:

The information collection will be used to provide a basis for the FAA's review during the development and implementing phases, used by the certificate or LOA holder in its SMS processes and procedures, and used to demonstrate compliance with the part 5 requirements.

Collection and analysis of safety data is an essential part of an SMS. Types of data to be collected, retention procedures, analysis processes, and organizational structures for review and evaluation will be documented in the SMS. These records will be used by a certificate holder or LOA holder in the operation of its SMS and to facilitate continuous improvement through

evaluation and monitoring. While this proposed rule does not require a certificate holder or LOA holder to submit these records to the FAA, it would require a certificate holder or LOA holder to make these records available upon request.

3. Respondents (including number of):

Table 8 provides the FAA’s estimates of the number of respondents by affected entity category (by part 121 approval holders, part 135 operators, and § 91.147 LOA holders) that would be impacted by the paperwork requirements in this rule.

**Table 8. Number of Respondents**

<b>Affected Entity Category</b>	<b>Number of Respondents</b>
<b>System description</b>	
Part 21	65
Part 135	1,907
§ 91.147	694
Part 121	66
Total	2,732
<b>Statement of compliance</b>	
Part 135	1,907
§ 91.147	694
Part 121 <sup>1</sup>	1
Total	2,602
<b>Implementation plan</b>	
Part 21	65
<b>Safety policy</b>	
Part 21	65
Part 135	1,907
§ 91.147	694
Total	2,666
<b>Summary of employee reports</b>	
Part 21	65
<b>Notification of hazards</b>	
Part 21	65
Part 135	1,907
§ 91.147	694
Part 121	66
Total	2,732
<b>SMS documentation</b>	
Part 21	65
Part 135	1,907
§ 91.147	694
Total	2,666
<b>SMS records</b>	

**Table 8. Number of Respondents**

Affected Entity Category	Number of Respondents
Part 21	65
Part 135	1,907
§ 91.147	694
Total	2,666
1. Estimate based on one new 121 operator over last 3 years. Not applicable to existing 121 operators.	

**4. Frequency:**

The frequency of new information collection requirements and amendments to the existing information collection requirements is shown below in Table 13 with the annual burden estimate for each.

**5. Annual Burden Estimate:**

The FAA estimated the paperwork burden for up to 2,732 certificate and approval holders impacted by the rule as shown below in Table 9.

**Table 9. Paperwork Burden**

Category	Number of Respondents	Frequency of Response <sup>1</sup>	Total Number of Responses	Burden Hours <sup>2</sup>	Costs (Millions) <sup>3</sup>
<b>System Description</b>					
Part 21	65	1	65	520	\$0.05
Part 135	1,907	1	1,907	15,256	\$1.36
§ 91.147	694	1	694	5,552	\$0.49
Part 121	66	1	66	528	\$0.05
Total	2,732	NA	2,732	21,856	\$1.94
<b>Statement of compliance</b>					
Part 135	1,907	3	5,721	61,024	\$5.43
§ 91.147	694	3	2,082	22,208	\$1.98
Part 121	1	3	3	32	\$0.00
Total	2,602	NA	7,806	83,264	\$7.41
<b>Implementation plan</b>					
Part 21	65	3	195	2,080	\$0.19
<b>Safety policy</b>					
Part 21	65	1	65	260	\$0.02
Part 135	1,907	1	1,907	7,628	\$0.68
§ 91.147 LOA	694	1	694	2,776	\$0.25
Total	2,666	NA	2,666	10,664	\$0.94
<b>Summary of employee reports</b>					
Part 21	65	6	390	1,560	\$0.14
<b>Notification of hazards</b>					

**Table 9. Paperwork Burden**

Category	Number of Respondents	Frequency of Response <sup>1</sup>	Total Number of Responses	Burden Hours <sup>2</sup>	Costs (Millions) <sup>3</sup>
Part 21	65	3	195	1,560	\$0.14
Part 135	1,907	3	5,721	45,768	\$4.07
§ 91.147	694	3	2,082	16,656	\$1.48
Part 121	66	3	198	1,584	\$0.14
Total	2,732	NA	8,196	65,568	\$5.83
<b>SMS documentation</b>					
Part 21	65	3	195	2,080	\$0.19
Part 135	1,907	3	5,721	61,024	\$5.43
§ 91.147	694	3	2,082	22,208	\$1.98
Total	2,666	NA	7,998	85,312	\$7.59
<b>SMS records</b>					
Part 21	65	3	195	1,560	\$0.14
Part 135	1,907	3	5,721	45,768	\$4.07
§ 91.147	694	3	2,082	16,656	\$1.48
Total	2,666	NA	7,998	63,984	\$5.69
NA = not applicable					
1. Frequency over three-year period.					
2. Calculated as number of respondents × hours per respondent.					
3. Calculated as burden hours × average labor rate including benefits. The FAA used an average wage including benefits of \$88.97, which is the mean average wage for aerospace engineers (\$59.12) divided by the percent of total employer costs of employee compensation represented by wages (66%) to account for benefits (34%).					
Wages and benefits information available at: <a href="https://www.bls.gov/oes/current/oes172011.htm">https://www.bls.gov/oes/current/oes172011.htm</a> and <a href="https://www.bls.gov/news.release/ecec.t04.htm#ect_table4.f.1">https://www.bls.gov/news.release/ecec.t04.htm#ect_table4.f.1</a> .					

Table 10 provides a summary of the implied annual responses and burden (total divided by three).

**Table 10. Summary of Annual Burden<sup>1</sup>**

Category	Reporting	Recordkeeping	Disclosure
<b>System Description</b>			
# of respondents	911	0	0
# of responses per respondent	0.3	0	0
Time per response (hours)	3	0	0
Total # of responses	911	0	0
Total burden (hours)	7,285	0	0
<b>Statement of compliance</b>			
# of respondents	2,602	0	0
# of responses per respondent	1	0	0
Time per response (hours)	10.7	0	0
Total # of responses	2,602	0	0
Total burden (hours)	27,755	0	0
<b>Implementation plan</b>			
# of respondents	65	0	0
# of responses per respondent	1	0	0
Time per response (hours)	10.7	0	0

**Table 10. Summary of Annual Burden<sup>1</sup>**

<b>Category</b>	<b>Reporting</b>	<b>Recordkeeping</b>	<b>Disclosure</b>
Total # of responses	65	0	0
Total burden (hours)	693	0	0
<b>Safety policy</b>			
# of respondents	0	889	0
# of responses per respondent	0	0.3	0
Time per response (hours)	0	1.3	0
Total # of responses	0	889	0
Total burden (hours)	0	3,555	0
<b>Summary of employee reports</b>			
# of respondents	65	0	0
# of responses per respondent	2	0	0
Time per response (hours)	4	0	0
Total # of responses	130	0	0
Total burden (hours)	520	0	0
<b>Notification of hazards</b>			
# of respondents	2,732	0	0
# of responses per respondent	1	0	0
Time per response (hours)	8	0	0
Total # of responses	2,732	0	0
Total burden (hours)	21,856	0	0
<b>SMS documentation</b>			
# of respondents	0	2,666	0
# of responses per respondent	0	1	0
Time per response (hours)	0	10.7	0
Total # of responses	0	2,666	0
Total burden (hours)	0	28,437	0
<b>SMS records</b>			
# of respondents	0	2,666	0
# of responses per respondent	0	1	0
Time per response (hours)	0	8	0
Total # of responses	0	2,666	0
Total burden (hours)	0	21,328	0

The agency is soliciting comments to—

- (a) Evaluate whether the proposed information requirement is necessary for the proper performance of the functions of the agency, including whether the information will have practical utility;
- (b) Evaluate the accuracy of the agency's estimate of the burden;
- (c) Enhance the quality, utility, and clarity of the information to be collected; and

(d) Minimize the burden of collecting information on those who are to respond, including by using appropriate automated, electronic, mechanical, or other technological collection techniques or other forms of information technology.

Individuals and organizations may send comments on the information collection requirement to the address listed in the ADDRESSES section at the beginning of this preamble by *[Insert date 60 days after date of publication in the Federal Register]*. Comments also should be submitted to the Office of Management and Budget, Office of Information and Regulatory Affairs, Attention: Desk Officer for FAA, New Executive Building, Room 10202, 725 17th Street, NW, Washington, DC 20053.

F. International Compatibility

ICAO Annex 19 establishes an SMS Framework for managing aviation safety risk, as well as identifies the types of organizations that should implement an SMS. This rulemaking would move the United States closer to harmonization with ICAO Annex 19. The proposed rule would align with Annex 19 by requiring the following service providers to implement SMS: 1) commercial operators of airplanes or helicopters, and 2) certain organizations responsible for the design or manufacture of products. The FAA has already implemented SMS across the FAA's Air Traffic Organization.<sup>79</sup> Additionally, the FAA is proposing SMS implementation for certain airports through a separate rulemaking effort. Both of these efforts bring us closer to alignment with ICAO Annex 19 because Annex 19 also includes air traffic service providers and airports.

When part 5 was originally constructed, it was based on the SMS framework in ICAO Annex 19. Part 5 currently also includes requirements for recordkeeping, which are not part of

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<sup>79</sup> More information regarding the Air Traffic Organization's SMS is available at: [https://www.faa.gov/about/initiatives/sms/specifics\\_by\\_aviation\\_industry\\_type/air\\_traffic](https://www.faa.gov/about/initiatives/sms/specifics_by_aviation_industry_type/air_traffic).

the ICAO's SMS framework. However, recordkeeping requirements facilitate FAA's oversight functions, and they assist the person implementing SMS in demonstrating compliance with the regulations. In addition, the proposed rule would require the use of a system description and the communication of information regarding safety hazards. While these requirements are not in the ICAO's SMS framework, the FAA believes that they are beneficial to the persons implementing SMS and consistent with ICAO's intent as ICAO notes in Annex 19 that other organizations that interface with a product or service provider can make a significant contribution to the safety of its products or services.

### 1. Air Carriers and Operators

The ICAO SMS requirements for commercial operators are contained in Annex 19, but Annex 6 defines the scope of the requirements. Part I of Annex 6 covers international commercial operations in airplanes. This part of Annex 6 makes no distinction in its requirements on the basis of an organization's size. The Annex applies to all commercial air transportation operations in airplanes. In the United States, this includes operators certificated under both part 121 and part 135. Part III of Annex 6 covers commercial air transportation operators of helicopters. In the United States, these operations are conducted under part 135. Annex 6, part I addresses international flight operations; in the United States, these international flights are operated under either part 121 or part 135. The FAA currently requires part 121 operators to implement and maintain an SMS, and this proposed rule would extend the requirement for an SMS to part 135 operators, further harmonizing the United States with ICAO's SMS requirements.

## 2. Aircraft Design and Manufacturing

ICAO Annex 19 requires SMS for organizations responsible for the type design or manufacture of aircraft, engines, or propellers. This proposal extends part 5 applicability to holders of both a TC and a PC for the same product, applicants for a PC where the applicant is the holder or licensee of the TC, and holders of a TC who allow other persons to use their TC to obtain a PC. This proposal would bring the United States into closer harmonization with the ICAO Annex 19 SMS requirement for certain organizations responsible for design or manufacturing of products.

## 3. Development and Implementation of SMS by Foreign Jurisdictions

Many States have made significant progress in developing, implementing, and maintaining requirements for SMS, aligned with ICAO's SMS framework, including certificating authorities in Europe (EASA), Canada, Brazil, the United Kingdom, Japan, and Australia. Of those authorities, most have SMS requirements for international commercial operations, and some have SMS requirements for design and manufacturing. Most that do not have SMS requirements for design and manufacturing plan to adopt such requirements in the future. Several States also have SMS requirements for other operations in the aviation system: airports, maintenance organizations, training organizations, international general aviation operations, and for safety data collection, protection, and exchange.

Harmonization of requirements, to the extent feasible, is important to reduce the regulatory burden on those holding certificates or authorizations from multiple States. The FAA continues to work with other States to harmonize SMS requirements. The proposed rule aligns with sections of the ICAO SMS framework and furthers harmonization with other States requiring SMS. United States-based certificate holders providing products or services

internationally could be limited or asked to provide duplicative information to other States' approval authorities to show compliance with in-country SMS requirements. If adopted as proposed, the rule would reduce the regulatory burden on those holding certificates or authorizations across multiple States.

#### 4. Other FAA support for harmonization and standards development

The FAA is a founding member and active participant in the Safety Management International Collaboration Group, a group representing 18 international regulatory authorities. The primary purpose of the Safety Management International Collaboration Group is to promote international harmonization of SMS regulations, guidance material, and oversight strategies. The FAA is also an active participant on the ICAO Safety Management Panel.

The FAA also participated with the Aerospace Industries Association to develop an international industry standard for SMS: "Implementing a Safety Management System in Design, Manufacturing and Maintenance Organizations." This Standard is intended to enable the aviation industry to implement an SMS consistent with the ICAO Annex 19 "Safety Management" Second Edition, Appendix 2.

#### G. Environmental Analysis

FAA Order 1050.1F identifies FAA actions that are categorically excluded from preparation of an environmental assessment or environmental impact statement under the National Environmental Policy Act in the absence of extraordinary circumstances. The FAA has determined this rulemaking action qualifies for the categorical exclusion identified in paragraph 5-6.6f for regulations and involves no extraordinary circumstances.

## H. Regulations Affecting Intrastate Aviation in Alaska

Section 1205 of the FAA Reauthorization Act of 1996 (110 Stat. 3213) requires the Administrator, when modifying regulations in 14 CFR in a manner affecting intrastate aviation in Alaska, to consider the extent to which Alaska is not served by transportation modes other than aviation, and to establish appropriate regulatory distinctions. Because this proposed rule would apply to: (1) any person authorized to conduct operations under part 135, (2) any person operating under an LOA issued under § 91.147, and (3) holders of both a TC and a PC for the same product, as well as applicants for a PC where the applicant is the holder or licensee of the TC, it could, if adopted, affect intrastate aviation in Alaska. The use of SMS would improve aviation safety in Alaska. The FAA analyzed NTSB part 135 accident data from 2015 to 2019 and found that of all part 135 air carrier accidents studied, 43 percent of these accidents occurred in Alaska. Because implementation of SMS can be scaled to the size and complexity of an organization, SMS requirements would not be overly burdensome for smaller part 135 operators. The increase in safety benefits to intrastate operations in Alaska would positively impact air commerce in Alaska with the same requirements applicable to every organization under part 5. The FAA specifically requests comments on whether there is justification for applying the proposed rule differently in intrastate operations in Alaska.

## **VIII. Executive Order Determinations**

### A. Executive Order 13132, Federalism

The FAA has analyzed this proposed rule under the principles and criteria of Executive Order 13132, Federalism. The agency has determined that this action would not have a substantial direct effect on the States, or the relationship between the Federal Government and

the States, or on the distribution of power and responsibilities among the various levels of government, and, therefore, would not have Federalism implications.

B. Executive Order 13211, Regulations that Significantly Affect Energy Supply, Distribution, or Use

The FAA analyzed this proposed rule under Executive Order 13211, Actions Concerning Regulations that Significantly Affect Energy Supply, Distribution, or Use (May 18, 2001). The agency has determined that it would not be a “significant energy action” under the executive order and would not be likely to have a significant adverse effect on the supply, distribution, or use of energy.

C. Executive Order 13609, International Cooperation

Executive Order 13609, Promoting International Regulatory Cooperation, promotes international regulatory cooperation to meet shared challenges involving health, safety, labor, security, environmental, and other issues and to reduce, eliminate, or prevent unnecessary differences in regulatory requirements. The FAA has analyzed this action under the policies and agency responsibilities of Executive Order 13609, and has determined that this action may improve regulatory cooperation by moving FAA requirements for SMS closer to ICAO Standards and Recommended Practices that other States are adopting or considering adopting.

**IX. Additional Information**

A. Comments Invited

The FAA invites interested persons to participate in this rulemaking by submitting written comments, data, or views. The agency also invites comments relating to the economic, environmental, energy, or federalism impacts that might result from adopting the proposals in this document. The most helpful comments reference a specific portion of the proposal, explain

the reason for any recommended change, and include supporting data. To ensure the docket does not contain duplicate comments, commenters should send only one copy of written comments, or if comments are filed electronically, commenters should submit only one time.

The FAA will file in the docket all comments it receives, as well as a report summarizing each substantive public contact with FAA personnel concerning this proposed rulemaking.

Before acting on this proposal, the FAA will consider all comments it receives on or before the closing date for comments. The FAA will consider comments filed after the comment period has closed if it is possible to do so without incurring expense or delay. The agency may change this proposal considering the comments it receives.

**B. Confidential Business Information**

Confidential Business Information (CBI) is commercial or financial information that is both customarily and actually treated as private by its owner. Under the FOIA (5 U.S.C. 552), CBI is exempt from public disclosure. If your comments responsive to this NPRM contain commercial or financial information that is customarily treated as private, that you actually treat as private, and that is relevant or responsive to this NPRM, it is important that you clearly designate the submitted comments as CBI. Please mark each page of your submission containing CBI as "PROPIN." The FAA will treat such marked submissions as confidential under the FOIA, and they will not be placed in the public docket of this NPRM. Submissions containing Confidential Business Information should be sent to the person in the **FOR FURTHER INFORMATION CONTACT** section of this document. Any commentary that the FAA receives which is not specifically designated as CBI will be placed in the public docket for this rulemaking.

### C. Request for Comments

In the preamble under Section V., Discussion of the Proposal, the FAA requested comments pertaining to specific issues. To facilitate submission of public comments, the specific requests for comments are also listed below. When responding to the comments, please identify the issue by using the question numbers used here:

(1) The FAA requests comment regarding how SMS might present unique opportunities or challenges for smaller organizations.

(2) The FAA is aware that there are 135 operators that use only one pilot-in-command in their operations, as well as § 91.147 LOA holders with low flight volume. The FAA seeks supporting information and data regarding whether this applicability should be limited to a certain subset of part 135 operators and § 91.147 LOA holders, and if so, how? If the applicability is limited to a particular subset of part 135 operators and § 91.147 LOA holders, please provide any recommendations for alternatives that would achieve the same safety objectives as SMS for those operators that would not be included under SMS.

(3) The FAA considers that there may be safety benefits to applying SMS to a larger portion of the aviation industry that could lead to safety improvements in the aviation ecosystem as a whole. The FAA invites comments as to whether part 5 should apply to all holders of a TC, PC, supplemental type certificates, technical standard order authorizations, or parts manufacturer approvals. The FAA requests that comments specify whether any exceptions should be made in the event that the FAA extends part 5 to these design and production approval holders, and what those exceptions should entail. The FAA further requests information and data related to the safety benefits or impact of applying part 5 to additional design and production approval holders beyond the applicability in this proposed rule.

(4) Under § 5.15(a), the FAA is proposing that any person that holds a TC for a product who allows another person to use the TC to manufacture a product under a PC to be required to submit an implementation plan for FAA approval in a form and manner acceptable to the Administrator no later than December 27, 2024, and implement the SMS in accordance with the FAA-approved plan no later than December 27, 2025. These proposed compliance dates are consistent with the proposal under § 5.11 for holders with a TC and a PC for the same product issued under part 21. The FAA invites comments about whether the FAA should extend the compliance timelines for persons who license their TC to other persons and, if so, what timelines the FAA should establish. The FAA requests that responsive comments include the commenter's rationale.

(5) The FAA seeks comment on whether organizations can share information about hazards without disclosing proprietary information. The FAA also seeks comment on whether the holder of the proprietary information would be in the best position to address the hazard. Please provide examples of any situations in which the holder of proprietary information would not be able to share information about a hazard without disclosing that proprietary information

(6) The FAA seeks comments regarding the Annual Burden Estimate for the Paperwork Reduction Act to—

(a) Evaluate whether the proposed information requirement is necessary for the proper performance of the functions of the agency, including whether the information will have practical utility;

(b) Evaluate the accuracy of the agency's estimate of the burden;

(c) Enhance the quality, utility, and clarity of the information to be collected; and

(d) Minimize the burden of collecting information on those who are to respond, including by using appropriate automated, electronic, mechanical, or other technological collection techniques or other forms of information technology.

(7) Is there data or other evidence of the effectiveness of SMS in mitigating accidents and incidents?

(8) Appendix A of the RIA lists the accidents that inform the RIA and includes the FAA's assessment of the effectiveness of SMS mitigating the accident as well as the FAA's rationale:

(a) Has the FAA accurately estimated the most likely effectiveness of mitigation of any specific accidents through the proposed rule? Please provide any data or analysis to support your assessment.

(b) Does the FAA's rationale accurately assess how the use of an SMS would potentially mitigate the hazards that caused the accidents?

(c) What would be a reasonable intervention to mitigate the specific hazards identified, and what would be a reasonable estimation for the cost of the intervention or mitigation? Please provide data or analysis to support your response.

(d) Are there additional accidents or incidents that SMS could have meaningfully mitigated?

(9) The FAA seeks comments and information regarding expanding the applicability of part 5 in the future. Should the FAA consider a future rulemaking project to expand the applicability of part 5 to include repair stations certificated under part 145? Repair stations perform a wide range of repair and maintenance work on an equally wide range of aircraft and components. Some repair stations do not perform work on aircraft

used for passenger-carrying operations. Should the FAA consider applying part 5 to all certificated part 145 repair stations? Should applicability be limited to a subset of part 145 repair stations? The FAA seeks information and supporting data regarding how the applicability should be limited to a subset (i.e., to which repair stations should part 5 be applicable).

D. Availability of Rulemaking Documents

An electronic copy of rulemaking documents may be obtained from the Internet by—

1. Searching the Federal eRulemaking Portal at [www.regulations.gov](http://www.regulations.gov);
2. Visiting the FAA's Regulations and Policies Web page at [www.faa.gov/regulations\\_policies/](http://www.faa.gov/regulations_policies/); or
3. Accessing the Government Printing Office's Web page at [www.GovInfo.com](http://www.GovInfo.com).

Copies may also be obtained by sending a request to the Federal Aviation Administration, Office of Rulemaking, ARM-1, 800 Independence Avenue SW, Washington, DC 20591, or by calling (202) 267-9677. Commenters must identify the docket or notice number of this rulemaking.

All documents the FAA considered in developing this proposed rule, including economic analyses and technical reports, may be accessed from the Internet through the Federal eRulemaking Portal referenced in item (1) above.

**List of Subjects**

14 CFR Part 5

Air carriers, Aircraft, Airmen, Aviation safety, Reporting and recordkeeping requirements, Safety, Transportation.

14 CFR Part 21

Aircraft, Aviation safety, Exports, Imports, Reporting and recordkeeping requirements.

14 CFR Part 91

Air carriers, Air taxis, Aircraft, Airmen, Aviation safety, Charter flights, Reporting and recordkeeping requirements.

14 CFR Part 119

Administrative practice and procedure, Air carriers, Aircraft, Aviation safety, Charter flights, Reporting and recordkeeping requirements.

14 CFR Part 121

Air carriers, Aircraft, Aviation safety, Charter flights, Reporting and recordkeeping requirements, Safety, Transportation.

14 CFR Part 135

Air taxis, Aircraft, Airmen, Aviation safety, Reporting and recordkeeping requirements.

**The Proposed Amendment**

In consideration of the foregoing, the Federal Aviation Administration proposes to amend chapter I of title 14, Code of Federal Regulations as follows:

**PART 5—SAFETY MANAGEMENT SYSTEMS**

1. The authority citation for part 5 is revised to read as follows:

Authority: 49 U.S.C. 106(f), 106(g), 40101, 40113, 40119, 41706, 44101, 44701-44702, 44705, 44709-44711, 44713, 44716-44717, 44722, 46105; Sec. 102, Pub. L. 116-260, 134 Stat. 2309; Sec 215, Pub. L. 111-216, 124 Stat. 2366.

2. Revise Subpart A to read as follows

**Subpart A—General**

**Sec.**

**5.1 Applicability.**

**5.3 Definitions.**

**5.5 General requirements.**

**5.7 Requirements for domestic, flag, and supplemental operations.**

**5.9 Requirements for commuter and on-demand operations or passenger carrying flights for compensation or hire.**

**5.11 Requirements for certificate holders with both type certificates and production certificates.**

**5.13 Requirements for type certificate holders or licensees applying for a production certificate for the same product.**

**5.15 Requirements for type certificate holders who allow another person to use the type certificate to obtain a production certificate for the same product.**

**5.17 Implementation Plan.**

**Subpart A—General**

**§ 5.1 Applicability.**

This part applies to all of the following:

(a) Any person that holds or applies for a certificate issued under part 119 of this chapter authorizing the person to conduct operations under part 121 of this chapter.

(b) Any person that holds or applies for a certificate issued under part 119 of this chapter authorizing the person to conduct operations under part 135 of this chapter.

(c) Any person that holds or applies for a Letter of Authorization issued under § 91.147 of this chapter.

(d) Any person that holds both a type certificate and a production certificate issued under part 21 of this chapter for the same product.

(e) Any person who holds a production certificate under part 21 for a product for which the person is a licensee of the type certificate.

(f) Any person who applies for a production certificate under part 21 for a product for which the person is the holder or licensee of the type certificate.

(g) Any person who holds a type certificate under part 21 for a product who allows another person to use the type certificate to manufacture the same product under a production certificate.

### **§ 5.3 Definitions.**

*Hazard* means a condition or an object with the potential to cause or contribute to an incident or aircraft accident, as defined in 49 CFR 830.2.

*Risk* means the composite of predicted severity and likelihood of the potential effect of a hazard.

*Risk control* means a means to reduce or eliminate the effects of hazards.

*Safety assurance* means processes within the SMS that function systematically to ensure the performance and effectiveness of safety risk controls and that the organization meets or exceeds its safety objectives through the collection, analysis, and assessment of information.

*Safety Management System (SMS)* means the formal, top-down, organization-wide approach to managing safety risk and assuring the effectiveness of safety risk controls. It includes systematic procedures, practices, and policies for the management of safety risk.

*Safety objective* means a measurable goal or desirable outcome related to safety.

*Safety performance* means realized or actual safety accomplishment relative to the organization's safety objectives.

*Safety policy* means the person's documented commitment to safety, which defines its safety objectives and the accountabilities and responsibilities of its employees in regards to safety.

*Safety promotion* means a combination of training and communication of safety information to support the implementation and operation of an SMS in an organization.

*Safety Risk Management* means a process within the SMS composed of describing the system, identifying the hazards, and analyzing, assessing, and controlling risk.

### **§ 5.5 General requirements.**

(a) *SMS components*. An SMS under this part must include, at a minimum, all of the following components:

- (1) Safety policy that meets the requirements of subpart B of this part.
- (2) Safety risk management that meets the requirements of subpart C of this part.
- (3) Safety assurance that meets the requirements of subpart D of this part.
- (4) Safety promotion that meets the requirements of subpart E of this part.

(b) *System description*. Any person required to have an SMS under this part must:

(1) Develop a system description. The system description must include, at a minimum, the following information about the safety of the aviation products or services provided by the person:

- (i) The person's aviation-related processes, procedures, and activities.
- (ii) The function and purpose of the aviation products or services provided.
- (iii) The operating environment.
- (iv) The personnel, equipment, and facilities necessary for operation.

(v) Interfacing persons that contribute to the safety of the aviation-related products and services provided.

(2) Revise the system description to reflect changes to the information in (b)(1) of this section.

(c) *Continuing requirements.* Any person required to develop and implement an SMS under this part must maintain the SMS in accordance with this part.

#### **§ 5.7 Requirements for domestic, flag, and supplemental operations.**

(a) Any person authorized to conduct operations under part 121 of this chapter that has an SMS acceptable to the FAA on or before [INSERT EFFECTIVE DATE OF THE RULE], must:

(1) Revise its SMS to meet the requirements of this part in effect on [INSERT EFFECTIVE DATE OF THE RULE].

(2) Submit the revisions for FAA acceptance in a form and manner acceptable to the Administrator no later than [INSERT 12 MONTHS AFTER EFFECTIVE DATE].

(3) Make available to the Administrator, upon request, all necessary information and data that demonstrates that the person has an SMS that meets the requirements set forth in this part.

(4) Maintain the SMS as long as the person is authorized to conduct operations under part 121 of this chapter.

(b) Any person applying for authorization to conduct operations under part 121 of this chapter or with such application pending on or after [INSERT EFFECTIVE DATE OF THE RULE], must:

(1) Develop and implement an SMS that meets the requirements of this part.

(2) Submit a statement of compliance with this part to the FAA in a form and manner acceptable to the Administrator as part of the certification process.

(3) Make available to the Administrator, upon request, all necessary information and data that demonstrates that the person has an SMS that meets the requirements set forth in this part.

(4) Maintain the SMS as long as the person is authorized to conduct operations under part 121 of this chapter.

**§ 5.9 Requirements for commuter and on-demand operations or passenger carrying flights for compensation or hire.**

(a) Any person authorized to conduct operations under part 135 of this chapter or that holds a Letter of Authorization issued under § 91.147 of this chapter before [INSERT EFFECTIVE DATE], must:

(1) Develop and implement an SMS that meets the requirements of this part no later than [INSERT 24 MONTHS AFTER EFFECTIVE DATE].

(2) Submit to the FAA, a statement of compliance with this part in a form and manner acceptable to the Administrator no later than [INSERT 24 MONTHS AFTER EFFECTIVE DATE].

(b) Any person applying for authorization to conduct operations under part 135 of this chapter or a Letter of Authorization under § 91.147 of this chapter, or with such application pending on or after [INSERT EFFECTIVE DATE OF THE RULE], must:

(1) Develop and implement an SMS that meets the requirements of this part.

(2) Submit a statement of compliance with this part to the FAA in a form and manner acceptable to the Administrator as part of the certification or Letter of Authorization process.

(c) Any person required to develop and implement an SMS under this section must maintain the SMS as long as the person is authorized to conduct operations under either part 135 or § 91.147 of this chapter.

(d) Any person required to develop and implement an SMS under this section must make available to the Administrator, upon request, all necessary information and data that demonstrates that the person has an SMS that meets the requirements set forth in this part.

**§ 5.11 Requirements for production certificate holders who are holders or licensees of a type certificate for the same product.**

Any person that holds a production certificate issued under part 21 of this chapter for a product for which the person is the holder or licensee of the type certificate on or before [INSERT EFFECTIVE DATE], must:

(a) Develop an SMS that meets the requirements of this part.

(b) Submit to the FAA, an implementation plan in accordance with § 5.17 of this subpart for FAA approval in a form and manner acceptable to the Administrator no later than December 27, 2024.

(c) Implement the SMS in accordance with this part no later than December 27, 2025.

(d) Make available to the Administrator, upon request, all necessary information and data that demonstrates that the person has an SMS that meets the requirements set forth in this part.

(e) Maintain the SMS as long as the person is both a holder of a production certificate and a holder or licensee of a type certificate for the same product.

**§ 5.13 Requirements for type certificate holders or licensees applying for a production certificate for the same product.**

(a) This section applies to any holder or licensee of a type certificate for a product who either:

(1) Applies for a production certificate for that same product under part 21 of this chapter on or after [INSERT EFFECTIVE DATE OF THE RULE], or

(2) Has an application for a production certificate for that same product under part 21 of this chapter pending on [INSERT EFFECTIVE DATE OF THE RULE].

(b) Any person who meets paragraph (a) of this section must:

(1) Develop an SMS that meets the requirements of this part.

(2) Submit an implementation plan in accordance with § 5.17 of this subpart for FAA approval in a form and manner acceptable to the Administrator, during the certification process.

(3) Implement the SMS in accordance with this part no later than one year from the FAA's approval of the person's implementation plan.

(4) Make available to the Administrator, upon request, all necessary information and data that demonstrates that the person has an SMS that meets the requirements set forth in this part.

(5) Maintain the SMS as long as the person is both a holder of a production certificate and a holder or licensee of a type certificate for the same product.

**§ 5.15 Requirements for type certificate holders who allow another person to use the type certificate to obtain a production certificate for the same product.**

(a) This section applies to any person that holds a type certificate for a product that allows another person to use the type certificate to manufacture a product under a production certificate.

(b) Any person that meets paragraph (a) and has a licensing agreement in accordance with § 21.55 on [INSERT EFFECTIVE DATE], must:

(1) Develop an SMS that meets the requirements of this part.

(2) Submit an implementation plan in accordance with § 5.17 of this subpart for FAA approval in a form and manner acceptable to the Administrator no later than December 27, 2024.

(3) Implement the SMS in accordance with this part no later than December 27, 2025.

(4) Make available to the Administrator, upon request, all necessary information and data that demonstrates that the person has an SMS that meets the requirements set forth in this part.

(5) Maintain the SMS as long as the person continues to meet paragraph (a).

(c) Any person that meets paragraph (a) and enters into a licensing agreement in accordance with § 21.55 after [INSERT EFFECTIVE DATE], must:

(1) Develop an SMS that meets the requirements of this part.

(2) Submit an implementation plan in accordance with § 5.17 of this subpart for FAA approval in a form and manner acceptable to the Administrator when providing written licensing agreements in accordance with § 21.55.

(3) Implement the SMS in accordance with this part no later than one year from the FAA's approval of the person's implementation plan.

(4) Make available to the Administrator, upon request, all necessary information and data that demonstrates that the person has an SMS that meets the requirements set forth in this part.

(5) Maintain the SMS as long as the person continues to meet paragraph (a).

#### **§ 5.17 Implementation Plan.**

(a) An implementation plan filed under this part must include a description of the means of compliance (including but not limited to new or existing policies, processes, or procedures) used to meet the requirements of this part.

(b) A person required to submit an implementation plan under this part must make available to the Administrator, upon request, all necessary information and data that demonstrates that the SMS has been or will be implemented in accordance with the implementation plan.

3. Amend § 5.21 by:

- a. Revising the introductory text of paragraph (a), paragraphs (a)(1) and (a)(2).
- b. Adding paragraph (a)(7).
- c. Revising paragraphs (c) and (d).

The revisions and addition read as follows:

**§ 5.21 Safety policy.**

(a) Any person required to have an SMS under this part must have a safety policy that includes at least the following:

- (1) The person’s safety objectives.
- (2) The person’s commitment to fulfill the safety objectives.

\* \* \* \* \*

(7) A code of ethics that is applicable to all employees, including management personnel and officers, which clarifies that safety is the organization’s highest priority.

\* \* \* \* \*

(c) The safety policy must be documented and communicated throughout the person’s organization.

(d) The safety policy must be regularly reviewed by the accountable executive to ensure it remains relevant and appropriate to the person.

- 4. Amend § 5.23 by revising the introductory text of paragraph (a), and revising paragraphs (a)(3) and (b) to read as follows:

**§ 5.23 Safety accountability and authority.**

(a) Any person required to have an SMS under this part must define in its safety policy the accountability for safety of the following individuals:

\* \* \* \* \*

(3) Employees relative to the person's safety performance.

(b) The person must identify the levels of management with the authority to make decisions regarding safety risk acceptance.

5. Revise § 5.25 to read as follows:

**§ 5.25 Designation and responsibilities of required safety management personnel.**

(a) *Designation of the accountable executive.* Any person required to have an SMS under this part must identify an accountable executive who, irrespective of other functions, satisfies the following:

(1) Is the final authority over operations authorized to be conducted under the person's certificate(s) or Letter(s) of Authorization.

(2) Controls the financial resources required for the operations to be conducted under the person's certificate(s) or Letter(s) of Authorization.

(3) Controls the human resources required for the operations authorized to be conducted under the person's certificate(s) or Letter(s) of Authorization.

(4) Retains ultimate responsibility for the safety performance of the operations conducted under the person's certificate(s) or Letter(s) of Authorization.

(b) *Responsibilities of the accountable executive.* The accountable executive must accomplish the following:

(1) Ensure that the SMS is properly implemented and is performing across all pertinent areas.

(2) Develop and sign the safety policy.

(3) Communicate the safety policy throughout the person's organization.

(4) Regularly review the safety policy to ensure it remains relevant and appropriate to the person.

(5) Regularly review the safety performance and direct actions necessary to address substandard safety performance in accordance with § 5.75.

(c) *Designation of management personnel.* The accountable executive must designate sufficient management personnel who, on behalf of the accountable executive, are responsible for the following:

(1) Coordinate implementation, maintenance, and integration of the SMS throughout the person's organization.

(2) Facilitate hazard identification and safety risk analysis.

(3) Monitor the effectiveness of safety risk controls.

(4) Ensure safety promotion throughout the person's organization as required in subpart E of this part.

(5) Regularly report to the accountable executive on the performance of the SMS and on any need for improvement.

6. Revise § 5.27 to read as follows:

**§ 5.27 Coordination of emergency response planning.**

Where emergency response procedures are necessary, any person required to have an SMS under this part must develop, and the accountable executive must approve as part of the safety policy, an emergency response plan that addresses at least the following:

(a) Delegation of emergency authority throughout the person's organization.

(b) Assignment of employee responsibilities during the emergency.

(c) Coordination of the emergency response plans with the emergency response plans of other organizations it must interface with during the provision of its services.

7. Revise the introductory text of § 5.51 to read as follows:

**§ 5.51 Applicability.**

Any person required to have an SMS under this part must apply safety risk management to the following:

\* \* \* \* \*

8. Amend § 5.53 by:

- a. Revising paragraph (a).
- b. Adding paragraph (b)(5).
- c. Revising paragraph (c).

The revisions and addition read as follows:

**§ 5.53 System analysis and hazard identification.**

(a) When applying safety risk management, any person required to have an SMS under this part must analyze the systems identified in § 5.51. Those system analyses must be used to identify hazards under paragraph (c) of this section, and in developing and implementing risk controls related to the system under § 5.55(c).

(b) \* \* \*

(5) The interfaces of the system.

(c) Any person required to have an SMS under this part must develop and maintain processes to identify hazards within the context of the system analysis.

9. Revise § 5.55 to read as follows:

**§ 5.55 Safety risk assessment and control.**

Any person required to have an SMS under this part must:

(a) Develop and maintain processes to analyze safety risk associated with the hazards identified in § 5.53(c).

(b) Define a process for conducting risk assessment that allows for the determination of acceptable safety risk.

(c) Develop and maintain processes to develop safety risk controls that are necessary as a result of the safety risk assessment process under paragraph (b) of this section.

(d) Evaluate whether the risk will be acceptable with the proposed safety risk control applied before the safety risk control is implemented.

10. Amend § 5.71 by:

a. Revising the introductory text of paragraph (a).

b. Revising paragraphs (a)(6), (a)(7), and (b).

c. Adding paragraph (c).

The revisions and addition read as follows:

**§ 5.71 Safety performance monitoring and measurement.**

(a) Any person required to have an SMS under this part must develop and maintain processes and systems to acquire data with respect to its products and services to monitor the safety performance of the organization. These processes and systems must include, at a minimum, the following:

\* \* \* \*

(6) Investigations of reports regarding potential non-compliance with regulatory standards or other safety risk controls established by the person through the safety risk management process established in subpart C of this part.

(7) A confidential employee reporting system in which employees can report hazards, issues, concerns, occurrences, incidents, as well as propose solutions and safety improvements, without concern of reprisal for reporting.

(b) Any person required to have an SMS under this part must develop and maintain processes that analyze the data acquired through the processes and systems identified under paragraph (a) of this section and any other relevant data with respect to its products and services.

(c) Any person that holds both a type certificate and a production certificate issued under part 21 of this chapter for the same product must submit a summary of the confidential employee reports received under subparagraph (a)(7) of this section to the Administrator once every 6 months.

11. Amend § 5.73 by revising the introductory text of paragraph (a), and revising paragraphs (a)(1) and (b) to read as follows:

**§ 5.73 Safety performance assessment.**

(a) Any person required to have an SMS under this part must conduct assessments of its safety performance against its safety objectives, which include reviews by the accountable executive, to:

(1) Ensure compliance with the safety risk controls established by the person.

\* \* \* \* \*

(b) Upon completion of the assessment, if ineffective controls or new hazards are identified under paragraphs (a)(2) through (5) of this section, the person must use the safety risk management process described in subpart C of this part.

12. Revise § 5.75 to read as follows:

**§ 5.75 Continuous improvement.**

Any person required to have an SMS under this part must establish and implement processes to correct safety performance deficiencies identified in the assessments conducted under § 5.73.

13. Revise § 5.91 to read as follows:

**§ 5.91 Competencies and training.**

Any person required to have an SMS under this part must provide training to each individual identified in § 5.23 to ensure the individuals attain and maintain the competencies necessary to perform their duties relevant to the operation and performance of the SMS.

14. Amend § 5.93 by revising the introductory text to read as follows:

**§ 5.93 Safety communication.**

Any person required to have an SMS under this part must develop and maintain a means for communicating safety information that, at a minimum:

\* \* \* \* \*

15. Add § 5.94 to read as follows:

**§ 5.94 Notification of hazards to interfacing persons.**

(a) If a person required to have an SMS under this part identifies a hazard in the operating environment, the person must provide notice of the hazard to the interfacing person or persons identified in the system description maintained under § 5.5(b) who, to the best of their knowledge, could address the hazard or mitigate the risk.

(b) Any person required to have an SMS under this part must develop and maintain procedures for reporting and receiving hazard information in accordance with subsection (a).

16. Amend § 5.95 by revising the introductory text and adding paragraph (c) to read as follows:

**§ 5.95 SMS documentation.**

Any person required to have an SMS under this part must develop and maintain the following SMS documentation:

\* \* \* \* \*

(c) System description.

17. Revise § 5.97 to read as follows:

**§ 5.97 SMS records.**

Any person required to have an SMS under this part must:

(a) Maintain records of outputs of safety risk management processes as described in subpart C of this part. Such records must be retained for as long as the control remains relevant to the operation.

(b) Maintain records of outputs of safety assurance processes as described in subpart D of this part. Such records must be retained for a minimum of 5 years.

(c) Maintain a record of all training provided under § 5.91 for each individual. Such records must be retained for as long as the individual is employed by the person.

(d) Retain records of all communications provided under § 5.93 or § 5.94 for a minimum of 24 consecutive calendar months.

**PART 21– CERTIFICATION PROCEDURES FOR PRODUCTS AND ARTICLES**

18. The authority citation for part 21 is revised to read as follows:

Authority: 42 U.S.C. 7572; 49 U.S.C. 106(f), 106(g), 40105, 40113, 44701-44702, 44704, 44707, 44709, 44711, 44713, 44715, 45303; Pub. L. 116-260; 134 Stat. 2309.

19. Amend § 21.55 to read as follows:

**§ 21.55 Responsibility of type certificate holders that provide written licensing agreements.**

A type certificate holder who allows a person to use the type certificate to manufacture a new aircraft, aircraft engine, or propeller must meet the applicable requirements of part 5 of this chapter and provide that person with a written licensing agreement acceptable to the FAA.

20. Amend § 21.135 by adding paragraph (c) to read as follows:

**§ 21.135 Organization.**

\* \* \*

(c) Each applicant for or holder of a production certificate, except those based only on a supplemental type certificate or on the rights to the benefits of a supplemental type certificate under a licensing agreement, must meet the applicable requirements of part 5 of this chapter.

21. Amend § 21.147 by revising paragraph (b) to read as follows:

**§ 21.147 Amendment of production certificates.**

\* \* \*

(b) An applicant for an amendment to a production certificate to add a type certificate or model, or both, must comply with §§ 21.135 (c), 21.137, 21.138, and 21.150.

\* \* \*

**PART 91— GENERAL OPERATING AND FLIGHT RULES**

22. The authority citation for part 91 continues to read as follows:

Authority: 49 U.S.C. 106(f), 106(g), 40101, 40103, 40105, 40113, 40120, 44101, 44111, 44701, 44704, 44709, 44711, 44712, 44715, 44716, 44717, 44722, 46306, 46315, 46316, 46504, 46506-46507, 47122, 47508, 47528-47531, 47534, Pub. L. 114-190, 130 Stat. 615 (49 U.S.C. 44703 note); articles 12 and 29 of the Convention on International Civil Aviation (61 Stat. 1180), (126 Stat. 11).

23. Revise § 91.147 to read as follows:

**§ 91.147 Passenger carrying flights for compensation or hire.**

(a) *Definitions.* For the purposes of this section *Operator* means any person conducting nonstop passenger-carrying flights in an airplane or helicopter for compensation or hire in accordance with §§ 119.1(e)(2), 135.1(a)(5), or 121.1(d), of this chapter that begin and end at the same airport and are conducted within a 25-statute mile radius of that airport.

(b) *General requirements.* An Operator conducting passenger-carrying flights for compensation or hire must meet the following requirements unless all flights are conducted under § 91.146. The Operator must:

- (1) Comply with the safety provisions of part 136, subpart A of this chapter.
- (2) Register and implement its drug and alcohol testing programs in accordance with part 120 of this chapter.
- (3) Comply with the applicable requirements of part 5 of this chapter.
- (4) Apply for and receive a Letter of Authorization from the responsible Flight Standards office.

(c) *Letter of Authorization.* Each application for a Letter of Authorization must include the following information:

- (1) Name of Operator, agent, and any d/b/a (doing-business-as) under which that Operator does business.
- (2) Principal business address and mailing address.
- (3) Principal place of business (if different from business address).
- (4) Name of person responsible for management of the business.
- (5) Name of person responsible for aircraft maintenance.

(6) Type of aircraft, registration number(s), and make/model/series.

(7) Antidrug and Alcohol Misuse Prevention Program registration.

(8) The statement of compliance required under part 5 of this chapter.

(d) *Compliance*. The Operator must comply with the provisions of the Letter of Authorization received.

## **PART 119—CERTIFICATION: AIR CARRIERS AND COMMERCIAL OPERATORS**

24. The authority citation for part 119 continues to read as follows:

Authority: Pub. L. 111-216, sec. 215 (August 1, 2010); 49 U.S.C. 106(f), 106(g), 1153, 40101, 40102, 40103, 40113, 44105, 44106, 44111, 44701-44717, 44722, 44901, 44903, 44904, 44906, 44912, 44914, 44936, 44938, 46103, 46105.

25. Revise § 119.8 to read as follows:

### **§ 119.8 Safety Management Systems.**

No certificate holder authorized to conduct operations under part 121 or 135 of this chapter may operate an aircraft under that certificate unless the certificate holder complies with the applicable requirements of part 5 of this chapter.

Issued under authority provided by 49 U.S.C. 106(f), 44701(a), and 44703 in Washington, DC,  
on

Warren S Randolph,

Deputy Executive Director, Office of Accident Investigation and Prevention.

Federal Aviation Administration