

AVIATION RULEMAKING ADVISORY COMMITTEE (ARAC)

FEDERAL AVIATION ADMINISTRATION

March 23, 2016

ARAC MEETING, 1:00 p.m.

- Welcome and Introductions
- Ratification of Minutes
- Recommendation Report
 - Rotorcraft Occupant Protection Working Group (ARAC) Interim Report (Dennis Shanahan)
 - o Airman Certification Systems Working Group Interim Report (David Oord)
- Status Reports:
 - Aircraft Systems Information Security/Protection (ASISP) Working Group (ARAC) (Tasked: 12/18/14; Recommendations Due: August 2016) (Jens Hennig/David Floyd)
 - Air Traffic Controller Training Working Group (ATCWG) (Tasked: 9/18/15; Recommendations Due: 7/18/16) (Sid McGuirk)
 - o Transport Airplane and Engine Subcommittee (Ali Bahrami)
 - Airworthiness Assurance Working Group (Tasked: 5/13/04; Recommendations Due: Ongoing)
 - Engine Harmonization Working Group)- Engine Endurance Testing Requirements – Revision of Section 33.87 (Tasked:1/22/14; Recommendations Due: 6/30/17)
 - Flight Test Harmonization Working Group- Phase 2 Tasking (Tasked: 4/11/14; Recommendations Due: 4/11/17)
 - Transport Airplane Metallic and Composite Structures Working Group -Transport Airplane Damage-Tolerance and Fatigue Evaluation (Tasked: 1/26/15; Recommendations Due: 1/26/17)

- Transport Airplane Crashworthiness and Ditching Evaluation Working Group (Tasked: 6/4/15) (Recommendations Due: 6/4/17)
- New Tasks
 - o Rotorcraft Bird Strike Working Group (ARAC) (Gary Roach)
 - o Special Cargo
 - Special Cargo Report (George Paul)
 - Load Master Certification Working Group (Steve Grota)
- Status Report from the FAA

this proposed collection, including the validity of the methodology and assumptions used.

• Enhance the quality, utility, and clarity of the information to be collected.

• Minimize the reporting burden on those who are to respond, including the use of automated collection techniques or other forms of information technology.

Please note that comments submitted in response to this Notice are public record. Before including any detailed personal information, you should be aware that your comments as submitted, including your personal information, will be available for public review.

Abstract of Proposed Collection

The Department's student internship programs provide a key source of potential prospects who have an interest in, and are qualified, to become future Department employees. Naturally, HR/ REE wants to strengthen and maintain its connections to this group, fostering and mentoring a pool of prospects from which to obtain successful recruits.

In June 2008, HR/REE surveyed over 3,500 former interns who served from 2005 through spring 2008. The intern alumni were queried as to their motivation in seeking an internship, whether or not they had pursued a career with either the Foreign Service or Civil Service, and what their recommendations would be for the best ways for the Department to maintain contact after the conclusion of their internships. Intern alumni endorse continued contact with Department representatives mainly through electronic means and Web site reminders of career opportunities.

In an effort to address these findings and provide viable solutions to improving student engagement prior to, during and following an internship, the Department developed an intern engagement strategy that will ultimately result in a measurable conversion of interns into Department hires for the Foreign or Civil Service. The foundation of this strategy is INTERNational Connections, a web-based career networking site for current and former interns as well as Department employees that collects pertinent information about them, their experiences and their career goals.

Methodology

Users register online at *https:// internconnect.careers.state.gov* and create a profile that includes: full name, program status, names of colleges attended, major/minor, where the user is from, current post, year graduated, career goals and interests, personal interests, career path, bureau, job title, professional experience and languages the user can speak. The respondents are current and former interns, as well as Department employees.

Dated: February 29, 2016.

Derwood Staeben,

Executive Director, HR/REE, Department of State.

[FR Doc. 2016–05180 Filed 3–7–16; 8:45 am] BILLING CODE 4710–15–P

OFFICE OF THE UNITED STATES TRADE REPRESENTATIVE

Reallocation of Unused Fiscal Year 2016 Tariff-Rate Quota Volume for Raw Cane Sugar

AGENCY: Office of the United States Trade Representative. **ACTION:** Notice.

SUMMARY: The Office of the United States Trade Representative (USTR) is providing notice of country-by-country reallocations of the fiscal year (FY) 2016 in-quota quantity of the World Trade Organization (WTO) tariff-rate quota (TRQ) for imported raw cane sugar.

DATES: Effective: March 8, 2016. **ADDRESSES:** Inquiries may be mailed or delivered to Ronald Baumgarten, Director of Agricultural Affairs, Office of Agricultural Affairs, Office of the United States Trade Representative, 600 17th Street NW., Washington, DC 20508.

FOR FURTHER INFORMATION CONTACT: Ronald Baumgarten, Office of the United States Trade Representative, Office of Agricultural Affairs, telephone: 202–395–9583 or facsimile: 202–395– 4579.

SUPPLEMENTARY INFORMATION: Pursuant to Additional U.S. Note 5 to Chapter 17 of the Harmonized Tariff Schedule of the United States (HTS), the United States maintains WTO TRQs for imports of raw cane and refined sugar.

Section 404(d)(3) of the Uruguay Round Agreements Act (19 U.S.C. 3601(d)(3)) authorizes the President to allocate the in-quota quantity of a TRQ for any agricultural product among supplying countries or customs areas. The President delegated this authority to the United States Trade Representative under Presidential Proclamation 6763 (60 FR 1007).

On June 15, 2015, the Secretary of Agriculture established the FY 2016 TRQ for imported raw cane sugar at the minimum to which the United States is committed pursuant to the World Trade Organization (WTO) Uruguay Round Agreements (1,117,195 metric tons raw value (MTRV)). On July 15, 2015, USTR provided notice of country-by-country allocations of the FY 2016 in-quota quantity of the WTO TRQ for imported raw cane sugar. Based on consultation with quota holders, USTR has determined to reallocate 86,533 MTRV of the original TRQ quantity from those countries that are unable to fill their FY 2016 allocated raw cane sugar quantities. USTR is allocating the 86,533 MTRV to the following countries in the amounts specified below:

Country	FY 2016 reallocation
Argentina	3,884
Australia	7,497
Belize	994
Brazil	13,097
Colombia	2,168
Costa Rica	1,355
Dominican Republic	15,897
Ecuador	994
El Salvador	2,348
Fiji	813
Guatemala	4,336
Guyana	1,084
Honduras	903
India	723
Jamaica	994
Malawi	903
Mauritius	1,084
Mozambique	1,174
Nicaragua	1,897
Panama	2,619
Peru	3,703
Philippines	12,194
South Africa	2,078
Swaziland	1,445
Thailand	1,265
Zimbabwe	1,084

These allocations are based on the countries' historical shipments to the United States. The allocations of the raw cane sugar WTO TRQ to countries that are net importers of sugar are conditioned on receipt of the appropriate verifications of origin. Certificates for quota eligibility must accompany imports from any country for which an allocation has been provided.

Conversion factor: 1 metric ton = 1.10231125 short tons.

Michael Froman,

United States Trade Representative. [FR Doc. 2016–05203 Filed 3–7–16; 8:45 am] BILLING CODE 3290–F6–P

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

Aviation Rulemaking Advisory Committee; Meeting

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of Aviation Rulemaking Advisory Committee (ARAC) meeting.

SUMMARY: The FAA is issuing this notice to advise the public of a meeting of the ARAC.

DATES: The meeting will be held on March 23, 2016, starting at 1:00 p.m. Eastern Daylight Savings Time. Arrange oral presentations by March 16, 2016.

ADDRESSES: The meeting will take place at the Federal Aviation Administration, 800 Independence Avenue SW., Washington, DC 20591, 10th floor, MacCracken Conference Room.

FOR FURTHER INFORMATION CONTACT:

Giles Strickler, Federal Aviation Administration, 490 L'Enfant Plaza SW., Washington, DC 20024, telephone (202) 267- 5883; fax (202) 267–5075; email *Giles.D.Strickler@faa.gov.*

SUPPLEMENTARY INFORMATION: Pursuant to Section 10(a)(2) of the Federal Advisory Committee Act (5 U.S.C. App. 2), we are giving notice of a meeting of the ARAC taking place on March 23, 2016, at the Federal Aviation Administration, 800 Independence Avenue SW., Washington, DC 20591.

The Agenda includes:

- 1. Recommendation Report
 - a. Rotorcraft Occupant Protection Working Group Interim Report
 - b. Airman Certification Systems Working Group Interim Report
- 2. Status Reports From Active Working Groups
 - a. Aircraft Systems Information Security/Protection Working Group
 - b. Air Traffic Controller Training Working Group
 - c. Transport Airplane and Engine Subcommittee
 - i. Airworthiness Assurance Working Group
 - ii. Engine Harmonization Working Group- Engine Endurance Testing Requirements
 - iii. Flight Test Harmonization Working Group—Phase 2 Tasking
 - iv. Transport Airplane Metallic and Composite Structures Working Group—Transport Airplane Damage-Tolerance and Fatigue Evaluation
- v. Transport Airplane Crashworthiness and Ditching Evaluation Working Group 3. New Tasks
- a. Rotorcraft Bird Strike Working Group
- b. Special Cargo
- i. Special Cargo Report
- ii. Load Master Certification Working Group
- 4. Status Report from the FAA

Attendance is open to the interested public but limited to the space

available. Please confirm your attendance with the person listed in the **FOR FURTHER INFORMATION CONTACT** section no later than March 16, 2016. Please provide the following information: full legal name, country of citizenship, and name of your industry association, or applicable affiliation. If you are attending as a public citizen, please indicate so.

For persons participating by telephone, please contact the person listed in the FOR FURTHER INFORMATION CONTACT section by email or phone for the teleconference call-in number and passcode. Callers are responsible for paying long-distance charges.

The public must arrange by March 16, 2016 to present oral statements at the meeting. The public may present written statements to the Aviation Rulemaking Advisory Committee by providing 25 copies to the Designated Federal Officer, or by bringing the copies to the meeting.

If you are in need of assistance or require a reasonable accommodation for this meeting, please contact the person listed under the heading **FOR FURTHER INFORMATION CONTACT**. Sign and oral interpretation, as well as a listening device, can be made available if requested 10 calendar days before the meeting.

Issued in Washington, DC, on March 2, 2016.

James Crotty,

Designated Federal Officer, Aviation Rulemaking Advisory Committee. [FR Doc. 2016–05081 Filed 3–7–16; 8:45 am] BILLING CODE 4910–13–P

DEPARTMENT OF TRANSPORTATION

Maritime Administration

[Docket No. MARAD-2016 0023]

Requested Administrative Waiver of the Coastwise Trade Laws: Vessel MISTY; Invitation for Public Comments

AGENCY: Maritime Administration, Department of Transportation. **ACTION:** Notice.

SUMMARY: As authorized by 46 U.S.C. 12121, the Secretary of Transportation, as represented by the Maritime Administration (MARAD), is authorized to grant waivers of the U.S.-build requirement of the coastwise laws under certain circumstances. A request for such a waiver has been received by MARAD. The vessel, and a brief description of the proposed service, is listed below.

DATES: Submit comments on or before April 7, 2016.

ADDRESSES: Comments should refer to docket number MARAD-2016-0023. Written comments may be submitted by hand or by mail to the Docket Clerk, U.S. Department of Transportation, Docket Operations, M-30, West Building Ground Floor, Room W12–140, 1200 New Jersey Avenue SE., Washington, DC 20590. You may also send comments electronically via the Internet at http://www.regulations.gov. All comments will become part of this docket and will be available for inspection and copying at the above address between 10 a.m. and 5 p.m., E.T., Monday through Friday, except federal holidays. An electronic version of this document and all documents entered into this docket is available on the World Wide Web at http:// www.regulations.gov.

FOR FURTHER INFORMATION CONTACT:

Bianca Carr, U.S. Department of Transportation, Maritime Administration, 1200 New Jersey Avenue SE., Room W23–465, Washington, DC 20590. Telephone 202– 366–9309, Email *Bianca.carr@dot.gov*.

SUPPLEMENTARY INFORMATION: As

described by the applicant the intended service of the vessel MISTY is:

Intended Commercial Use of Vessel: "6passenger vessel for Bed and Breakfast and short duration cruises in protected waters." Geographic Region: "California"

The complete application is given in DOT docket MARAD-2016-0023 at http://www.regulations.gov. Interested parties may comment on the effect this action may have on U.S. vessel builders or businesses in the U.S. that use U.S.flag vessels. If MARAD determines, in accordance with 46 U.S.C. 12121 and MARAD's regulations at 46 CFR part 388, that the issuance of the waiver will have an unduly adverse effect on a U.S.vessel builder or a business that uses U.S.-flag vessels in that business, a waiver will not be granted. Comments should refer to the docket number of this notice and the vessel name in order for MARAD to properly consider the comments. Comments should also state the commenter's interest in the waiver application, and address the waiver criteria given in § 388.4 of MARAD's regulations at 46 CFR part 388.

Privacy Act

Anyone is able to search the electronic form of all comments received into any of our dockets by the name of the individual submitting the comment (or signing the comment, if submitted on behalf of an association, business, labor union, etc.). You may review DOT's complete Privacy Act

AVIATION RULEMAKING ADVISORY COMMITTEE

RECORD OF MEETING

MEETING DATE:	March 23, 2016			
MEETING TIME:	1 p.m.			
LOCATION:	Federal Aviation Administration 800 Independence Avenue SW. 10th Floor MacCracken Conference Room Washington, DC 20591			
PUBLIC ANNOUNCEMENT:	The Federal Aviation Aviation Rulemaking Federal Register notic	The Federal Aviation Administration (FAA) told the public of this Aviation Rulemaking Advisory Committee (ARAC) meeting in a Federal Register notice published March 8, 2016 (81 FR 12191).		
ATTENDEES:	Committee Member	Committee Members		
	Todd Sigler	The Boeing Company (Boeing), ARAC Chair		
	Dr. Tim Brady	Embry-Riddle Aeronautical University (ERAU), <i>ARAC Vice Chair</i>		
	Ali Bahrami	Aerospace Industries Association (AIA) Transport Airplane and Engine (TAE) Subcommittee, Chair		
	Ambrose Clay	National Organization to Insure a Sound Controlled Environment (NOISE)		
	Damon Cox	Airline Dispatchers Federation (ADF)		
	Mack Dickson*	Experimental Aircraft Association (EAA)		
	Gail Dunham*	National Air Disaster Foundation (NADF)		
	Stéphane Flori*	AeroSpace and Defence Industries Association of Europe (ASD)		
	Robert Frenzel	Federal Aviation Administration (FAA) <i>Office of the Chief Counsel, AGC–200</i>		

Jens Hennig*	General Aviation Manufacturers Association (GAMA)
Paul Hudson	FlyersRights.org
Robert Ireland	Airlines for America (A4A)
Lirio Liu	Federal Aviation Administration (FAA) Office of Rulemaking, ARM–1 Designated Federal Officer (DFO)
Sarah MacLeod	Aeronautical Repair Station Association (ARSA)
David Oord	Aircraft Owners and Pilots Association (AOPA)
George Paul	National Air Carrier Association (NACA)
Ric Peri	Aircraft Electronics Association (AEA)
Lorelei Peter	Federal Aviation Administration (FAA) Office of the Chief Counsel, AGC-200
Phil Poynor	National Association of Flight Instructors (NAFI)
Bob Robeson	Federal Aviation Administration (FAA) Office of Aviation Policy and Plans, Economic Analysis Division, APO–300
Yvette Rose	Cargo Airline Association (CAA)
Jennifer Sunderman	Regional Airline Association (RAA)
Attendees	
Douglas Anderson*	Federal Aviation Administration (FAA) Northwest Mountain Region, Regional Counsel, AGC-210
Mike Begier	United States Department of Agriculture (USDA) Wildlife Services, Airport Wildlife Hazards Program
Jorge Castillo	Federal Aviation Administration (FAA) Southwest Region—Rotorcraft Directorate, ASW

Anthony Chu	Federal Aviation Administration (FAA) Air Traffic Organization, AJI–231
Martin Crane*	Federal Aviation Administration (FAA) Southwest Region—Rotorcraft Directorate, ASW
Maryanne DeMarco	Coalition of Airline Pilots Associations (CAPA)
John Donnell	Federal Aviation Administration (FAA) Northwest Mountain Region–Transport Airplane Directorate, ANM–111
David Floyd*	The Boeing Company (Boeing)
Ralen Gao	Federal Aviation Administration (FAA) <i>Office of Rulemaking, ARM</i>
Paul Greer	Federal Aviation Administration (FAA) <i>Office of the Chief Counsel, AGC–210</i>
Stephen Grota	Federal Aviation Administration (FAA) Aircraft Maintenance Division, AFS-330
Keira Jones	Federal Aviation Administration (FAA) <i>Office of Rulemaking, ARM–100</i>
Sandra Lamparello	PAI Consulting
Rolandos Lazaris	Federal Aviation Administration (FAA) <i>Flight Standards Service, AFS–300</i>
Sandra Long	Federal Aviation Administration (FAA) <i>Office of Rulemaking</i>
Joan Lowy	Associated Press (AP)
Sol Maroof	Federal Aviation Administration (FAA) Aircraft Certification Service, AIR-110
Suzanne Masterson	Federal Aviation Administration (FAA) Northwest Mountain Region–Transport Airplane Directorate, ANM–111
Sid McGuirk	Embry-Riddle Aeronautical University (ERAU)

George Padalec	Federal Aviation Administration (FAA) Flight Standards Service, AFS–300
Susan Parson	Federal Aviation Administration (FAA) Flight Standards Service, AFS–3A
Kenneth Ready	Federal Aviation Administration (FAA) Mission Support Services, AJV–113
Gary Roach	Federal Aviation Administration (FAA) Southwest Region—Rotorcraft Directorate, ASW
Lee Roskop	Federal Aviation Administration (FAA) Southwest Region—Rotorcraft Directorate, ASW
Kristen Sanders	Aurora Sciences, LLC
Mary Schooley*	Federal Aviation Administration (FAA) Northwest Mountain Region–Transport Airplane Directorate, ANM–111
Dennis Shanahan*	Injury Analysis, LLC
Sandra Shelley*	Federal Aviation Administration (FAA) Southwest Region—Rotorcraft Directorate, ASW
Walter Sippel*	Federal Aviation Administration (FAA) Northwest Mountain Region–Transport Airplane Directorate, ANM–111
Charles Smith	Federal Aviation Administration (FAA)
Randy Smith	Federal Aviation Administration (FAA) Air Traffic Organization, AJI–2
Priscilla Steward	Federal Aviation Administration (FAA) Aircraft Certification Service, AIR–112
Paul Takemoto	Federal Aviation Administration (FAA) Office of Communications, AOC–100

*Attended via teleconference.

WELCOME AND INTRODUCTION

Mr. Todd Sigler, ARAC Chair, called the meeting to order at 1:03 p.m. and thanked the ARAC members and the public for attending. He invited the attendees to introduce themselves. Mr. Sigler stated although it did not appear on the agenda, the ARAC would discuss the material submitted by Mr. Paul Hudson, FlyersRights.org, at the end of the meeting. Ms. Lirio Liu, DFO, read the required Federal Advisory Committee Act, Title 5, United States Code (5 U.S.C.) Appendix 2 (2007) statement.

Ratification of Minutes

Mr. Sigler stated the first item on the agenda is ratification of the minutes from the December 17, 2015, meeting. He asked for any revisions or amendments to the draft minutes circulated before the meeting. Without any revisions or questions, the ARAC ratified the minutes.

RECOMMENDATION REPORT

Rotorcraft Occupant Protection Working Group (ROPWG) Interim Report

Mr. Dennis Shanahan, Injury Analysis, LLC, presented the ROPWG interim report. He stated this interim report includes the working group's cost/benefit analysis for crashworthiness. Mr. Shanahan noted the ROPWG analyzed costs and benefits separately. He added it divided its cost analysis according to compliance with crash resistant fuel system requirements and crash resistant seats and structure (CRSS) requirements.

Mr. Shanahan explained the ROPWG only studied aircraft currently in production and expected to remain in production after implementation of the rules. He reviewed the performance data and cost estimates provided by the rotorcraft manufacturers and noted the recurrent costs vary widely by manufacturer. Mr. Shanahan stated the recurrent costs were per aircraft, while the one-time and labor costs were for all aircraft produced by the manufacturer. He stated some costs may be inflated, but the ROPWG worked with the data provided by the manufacturers.

Mr. Shanahan noted the National Transportation Safety Board (NTSB) data on fatal rotorcraft crashes lacks detail on crash kinematics and specific injury data, so it was not helpful to the benefit analysis.

Mr. Shanahan reviewed the ROPWG's cost/benefit summary. He noted the NTSB dataset showed 763 accidents from 2006 to 2015 involved helicopter models still in production and not fully compliant with the new requirements. Mr. Shanahan stated these crashes resulted in 226 fatalities and 146 serious injuries. He added 21 crashes involved fully compliant rotorcraft, resulting in 19 fatalities and 1 serious injury.

Mr. Shanahan explained the ROPWG was unable to locate benefit information for CRSS requirements, so it used data from the Notice of Proposed Rulemaking (NPRM), issued in 1985. He stated the ROPWG was unable to obtain the docket for the NPRM, which may provide more valuable information.

Mr. Shanahan stated full compliance with current regulations is not economical for some platforms. He explained if full compliance is required, those platforms will go out of production. Mr. Shanahan noted the ROPWG found there is a considerable benefit to full compliance, but partial compliance is acceptable.

Mr. Shanahan noted 10 ROPWG members concurred with the cost/benefit analysis and 1 member did not. He stated 10 weeks was inadequate time for a comprehensive cost/benefit analysis, and the ROPWG needs more data from manufacturers to reach a more accurate estimate. Mr. Shanahan added there are non-economic, unquantifiable costs associated with loss of human life, which analysts must consider in any cost/benefit analysis.

Ms. Gail Dunham, NADF, asked if the ROPWG used FAA guidance on the statistical value of a human life in its analysis. Mr. Shanahan replied the ROPWG used an FAA guide dated September 2015.

The ARAC discussed the high value of recurrent costs reflected in the ROPWG report. Mr. Bob Robeson, FAA, stated increased maintenance costs are included in the recurrent costs. The ARAC discussed items included in recurrent costs as reflected in the ROPWG report, including payload reduction leading to loss of revenue, the amount of time required to bring rotorcraft into compliance.

Mr. Ambrose Clay, NOISE, asked if crash prevention would be a better investment than survivability. Mr. Shanahan stated prevention is important, but it is not possible to prevent all crashes.

Mr. Sigler expressed concern with the aggressive timeframe for the ROPWG to complete its work and asked how long the working group would need to produce a report based on fully vetted data. Mr. Shanahan replied it would take 6–12 months. Mr. Ric Peri, AEA, asked Mr. Jorge Castillo, FAA, for his opinion on ROPWG progress. Mr. Castillo suggested that manufacturers either do not have more data, or have limitations that prevent further sharing, so giving the ROPWG more time does not mean the report will be any more helpful.

The ARAC accepted the ROPWG's interim report and extended its timeline by 9 months.

Airman Certification Systems Working Group (ACSWG) Interim Report

Mr. David Oord, AOPA, presented the ACSWG interim report to the ARAC. He stated work is complete on recommendations for the private pilot airplane and instrument rating airplane airman certification standards (ACS), including the handbooks, guidance documents, and testing supplements. Mr. Oord noted the standards are set for implementation in June 2016 and the ACSWG tasking remains in place until December 2016.

Mr. Sigler expressed his appreciation for the work done and progress made by the ACSWG. The ARAC accepted the ACSWG interim report.

STATUS REPORTS FROM ACTIVE WORKING GROUPS

Aircraft Systems Information Security/Protection (ASISP) Working Group (ASISPWG)

NOTE: This update occurred at the end of the ARAC meeting, but is covered here according to its place in the meeting agenda.

Mr. Jens Hennig, GAMA, and Mr. David Floyd, Boeing, provided the update for the ASISPWG. Mr. Floyd reviewed the ASISPWG's scope, tasking, schedule, membership, technical areas under review, and next steps. He added the ASISPWG is on schedule to meet its August 2016 report due date. Mr. Hennig and Mr. Floyd noted the ASISPWG was meeting concurrently with the ARAC.

Air Traffic Controller Basic Qualification Training Working Group (ATCWG)

Mr. Sid McGuirk, ERAU, provided the update for the ATCWG. He stated the Administrator approved him as ATCWG Chair on January 12, 2016. Mr. McGuirk noted he is establishing working group membership. He emailed potential members and is awaiting their responses.

Mr. McGuirk reviewed the ATCWG tasking and noted the working group will make recommendations on ATC training and hiring. He asked for an extension because the working group will not hold its first meeting until May 2016, and its first report is due in June 2016. Mr. McGuirk noted the working group is currently reviewing the training portion of its tasking. Mr. George Paul, NACA, asked if the ATCWG is working on the hiring portion of its tasking, and Mr. McGuirk replied it has not yet started work on hiring.

Mr. Sigler asked if Mr. McGuirk would like a 6-month extension. Mr. McGuirk replied he would, because the working group has just started working. Ms. Sarah MacLeod, ARSA, asked if the ARAC can extend the tasking by motion. Mr. Sigler responded it could. Ms. MacLeod noted the start date of the tasking should be the date the FAA approves the chair.

Mr. Clay asked if the ATCWG could work on both training and hiring at the same time. Mr. McGuirk replied there is a dependency issue, and both issues are controversial, so the working group would like to review each individually.

Mr. Peri stated the working group is 6 months off schedule, so the ARAC should extend the tasking by 6 months. The ARAC approved the extension and requested Mr. McGuirk present an interim report at the December 2016 ARAC meeting. Ms. Dunham asked for an update on membership once it is established. Mr. Sigler stated Mr. McGuirk may send that to the ARAC electronically.

TAE Subcommittee

Mr. Ali Bahrami provided the TAE update. He noted the Engine Harmonization, Metallic and Composite, Material Flammability, and Crashworthiness and Ditching Working Groups are proceeding on schedule. Mr. Bahrami stated the Airworthiness Assurance and Flight Test Harmonization Working Groups are experiencing some scheduling issues but are still working to complete all tasks. He then reviewed the status of the various TAE working groups.

Engine Harmonization Working Group (EHWG) (TAE)—Engine Endurance Testing Requirements—Revision of Section 33.87

Mr. Bahrami stated the EHWG is on schedule but the schedule is tight. He told the ARAC the proposed engine endurance test is being finalized.

Airworthiness Assurance Working Group (AAWG) (TAE)

Mr. Bahrami stated the AAWG is currently considering options related to its tasking while supporting the Metallic and Composite Working Group. He noted Mr. Mark Yerger, FedEx Corporation, has moved on to a new position and is no longer the working group chair. He stated the working group will discuss a new chair at its next meeting.

Flight Test Harmonization Working Group (FTHWG) (TAE)-Phase 2 Tasking

Mr. Bahrami stated the FTHWG has reprioritized the scope of its remaining work pursuant to a TAE request. He noted the first 10 working group taskings will be complete by the due date, but the last 2 will not be completed in time and need additional time to complete. Mr. Bahrami stated the FTHWG will present new proposals to the TAE at its June 22, 2016, meeting. He asked for ARAC input on extending the schedule so the FTHWG has enough time to address the Handling Qualities Compliance Finding and the Pilot Induced Oscillation/Airplane Pilot Coupling tasks.

Transport Airplane Metallic and Composite Structures Working Group (TAMCSWG)

Mr. Bahrami stated work continues on schedule for the TAMCSWG. He noted the working group has defined subteams to address specific items in the tasking and will assess their progress at its next meeting.

<u>Transport Airplane Crashworthiness and Ditching Evaluation Working</u> <u>Group (TACDEWG) (TAE)</u>

Mr. Bahrami stated the TACDEWG held a productive meeting in December 2015, during which there were detailed discussions about the tasking. He noted the working group established subteams to develop a schedule in support of the work plan, and the next meeting will be held April 5–7, 2016.

Mr. Sigler asked if Mr. Bahrami could reschedule the next TAE meeting to align with the next ARAC meeting, currently scheduled for June 16, 2016. Mr. Bahrami replied some TAE members are not available before the ARAC meeting. Ms. Liu stated the ARAC could revise its meeting schedule to every 4 months rather than every 3 months, to give working groups more time to hold their meetings and report to the ARAC.

NEW TASKS

Rotorcraft Bird Strike Working Group (RBSWG)

Mr. Gary Roach, FAA, briefed the ARAC on a proposed tasking to form the RBSWG. He noted the discussion at the December 17, 2015, ARAC meeting led to changes in the original proposed tasking, including reference to academic studies, information on the increase in rotorcraft bird strikes from 2010 through 2014, and updates on other bird strike research within the FAA. Mr. Roach stated the revised tasking covers the same scope with increased clarity.

Mr. Roach stated rotorcraft certificated under Title 14, Code of Federal Regulations (14 CFR) part 27, which comprise 9 percent of the existing fleet but which experience 75 percent of bird strikes, currently have no bird strike requirements. He added the RBSWG would review bird size requirements for 14 CFR part 29 rotorcraft. He noted these two tasks were separated after the discussion at the December 17, 2015, ARAC meeting.

Mr. Roach explained the tasking now specifies which tasks apply to three types of aircraft: newly designed/newly type-certificated aircraft, newly manufactured aircraft, and the aircraft in the existing fleet. He added the RBSWG will consider existing technology only, and it will review flight manual limitations.

ARAC members discussed including small unmanned aircraft systems (sUAS) in the RBSWG tasking. Mr. Roach stated the FAA had considered including sUAS, but decided against this because the structure of an sUAS is different from the structure of a bird. The ARAC members suggested the RBSWG could briefly review the inclusion of sUAS and include a footnote in the report explaining why it was rejected.

Mr. Hudson asked if bird strikes involving birds weighing less than 4 pounds are currently reported. Mr. Roach replied there is currently no bird strike reporting requirement, and all reports are voluntary. Mr. Lee Roskop, FAA, noted there are very few bird strike accidents in comparison to the number of close calls. He added in some instances of near or total pilot incapacitation, another pilot was on board and able to take over the controls to prevent an accident from occurring. Mr. Roskop stated the number of close calls is high. Mr. Roach added helmets and visors have saved some pilots from an injury that would have resulted in an accident after a bird strike.

Mr. Mike Begier, USDA, stated his office manages the FAA bird strike database and although reporting is voluntary, if a pilot reports a bird strike on approach, a 14 CFR part 139 airport is required to report that to the FAA.

The ARAC accepted the RBSWG tasking.

Special Cargo Working Group (SCWG) Loadmaster Certification Briefing and Loadmaster Certification Working Group (LMCWG) Tasking

Mr. Paul briefed the ARAC on work completed by the SCWG. Mr. Steve Grota, FAA, briefed the ARAC on the proposed LMCWG tasking. Mr. Paul stated he met with the FAA and provided copies of all SCWG notes, and the FAA agreed to allow the LMCWG to review these notes as part of its tasking. He added the SCWG members will be available to the LMCWG as subject matter experts as needed. The ARAC agreed to provide the SCWG recommendations and meeting materials to the LMCWG for review and to accept, reject or modify them.

Mr. Paul noted the LMCWG tasking applies only to special cargo loads, not to all loadmasters, and stated if the certification is specific to each cargo carrier, the SCWG will not object. Ms. Yvette Rose, CAA, asked whether the LMCWG's intent is to initiate rulemaking. Mr. Grota stated he believes that will be the outcome. He noted the SCWG has completed much of the work of its tasking, and the LMCWG will document that work.

Mr. Paul stated the FAA has agreed to use the existing framework in 14 CFR § 61.103 as a model for special cargo loadmaster certification. Mr. Grota stated the FAA could create a new subpart G to cover special cargo loadmasters. Ms. Rose asked why this topic was before the ARAC. Mr. Grota replied the major concerned parties are already on the SCWG, and its work has indicated rulemaking may enhance safety.

ARAC members discussed the transferability of loadmaster certification and its effect on recruiting. Mr. Paul stated keeping the certification specific to each cargo carrier provides continual review of the cargo carrier's training program. Mr. Sigler stated the LMCWG could review the transferability of the certification as part of its work.

Ms. Rose expressed concern with the scope of the LMCWG tasking, specifically the review of sections 2.7, 2.8, 2.12.3, and 2.13.4.6 of Advisory Circular (AC) 120–85A, Air Cargo Operations. She asked if this review is within the scope of special cargo loadmaster certification. Mr. Grota replied the LMCWG would review only the special cargo portions of the AC, and consider them when making its recommendation. Mr. Paul noted the SCWG would review the AC separately and report its findings to the LMCWG if necessary.

Ms. Dunham asked if the ARAC was being asked to approve two working groups. Mr. Paul explained the ARAC was being asked only to approve the LMCWG. He explained the SCWG is a group of associations that has existed for 3 years and will provide notes and subject matter expertise to the LMCWG.

The ARAC agreed the LMCWG will deal with special cargo only, and if the definition of special cargo changes, the working group must follow the new definition. Mr. Grota and Mr. Paul agreed the current definition is acceptable to all parties and is not likely to change.

The ARAC accepted the LMCWG tasking.

FlyersRights.org Petition for Rulemaking: Limitation of Seat Size Reductions

Mr. Hudson briefed the ARAC on a petition by FlyersRights.org to initiate rulemaking to limit reductions in airplane seat size. Mr. Sigler stated the issue currently before the ARAC is whether to discuss this petition at the next ARAC meeting. Mr. Paul stated the discussion may be premature because of language currently under consideration in a Senate bill. Ms. MacLeod asked about the agenda of the discussion.

Mr. Hudson stated he would like the FAA to establish an advisory working group on minimum standards for airplane seat sizes. He noted the FAA left the door open to further consideration in its denial of the petition and added there is a great deal of public support for such a rulemaking. Mr. Hudson stated he would like the ARAC to form an advisory working group to consider minimum standards for airplane seat size and impose a moratorium on further reduction in seat size while its work is pending.

Mr. Peri expressed discomfort with the ARAC reviewing FAA rulemaking petition rejections. Ms. Dunham stated the FAA did not address child safety, which is an important issue. Mr. Paul stated requirements exist and this is not a safety issue.

Mr. Sigler stated the ARAC always has the opportunity to offer suggestions to the FAA. He asked the ARAC members if they were interested in engaging in further discussion at the next ARAC meeting. ARAC noted they were not opposed to the petition, but were opposed to discussing it during an ARAC meeting.

FAA STATUS REPORT

Ms. Liu stated the FAA has used the rulemaking priority tool, which the ARAC helped develop, to identify the number of new rulemaking projects to initiate. Ms. Liu told the ARAC that in addition to rules requested by the lines of business for prioritization, the FAA gives special consideration to projects included in the FAA reauthorization and to the FAA's strategic initiatives. She stated ARM expects UAS rulemaking to be a large amount of work for the near future.

Ms. Liu noted the FAA follows 14 CFR § 11.73 when determining whether to grant a petition for rulemaking. She stated the FAA weighs safety, security, urgency, and priority against its available resources when deciding whether to grant a rulemaking petition.

Ms. Liu stated Ms. Renee Pocius has transferred from ARM to the FAA Office of International Affairs, and thanked Ms. Ralen Gao for covering this meeting. She noted ARM hopes to have a new focal point in place for the next ARAC meeting.

Ms. Liu stated, as discussed earlier in the meeting, the ARAC will review whether to change its meeting schedule from quarterly to every 4 months. She reminded the ARAC members the next meeting is currently scheduled for June 16, 2016, but with the conflict of the TAE meeting, they may look at dates in July 2016.

Mr. Sigler asked if the FAA could provide the ARAC with a list of rulemaking recommendations that have not yet entered the rulemaking stage, and the date the ARAC submitted their recommendation reports. Ms. Liu stated ARM will prepare this list for the next ARAC meeting.

ADJOURNMENT

Mr. Sigler adjourned the meeting at 3:16 p.m.

Approved by: /s/ Todd Sigler, Chair

Dated: _6/20/2016_____

Ratified on: _7/19/2016_____

Rotorcraft Occupant Protection Working Group (ROPWG) Update for ARAC

March 23, 2016

Presented by: Dennis F. Shanahan, M.D., M.P.H. ROPWG Chairman

ROPWG Tasking

- March 2016 Present cost/benefit analysis
- May 2017 Recommend how occupant protection standards should be made effective for newly manufactured rotorcraft
- December 2017 Follow-on task
 - Recommend how to incorporate rotorcraft occupant protection improvements and standards into the existing rotorcraft fleet

ROPWG Members

NAME	COMPANY/ REPRESENTING	NAME	COMPANY/ REPRESENTING
Dennis F. Shanahan	Injury Analysis, LLC	Pierre Prudhomme-	Airbus Helicopters
Robert J.	Safety Research Corporation of	Lacroix	
Rendzio	America (SRCA)	David Shear	Robinson Helicopter Company
Harold (Hal) L. Summers	Helicopter Association International	Chris Meinhardt	Air Methods
Jonathan Archer	General Aviation Manufacturers Association (GAMA)	John Heffernan	Air Evac Lifeteam
Daniel B.	Airborne Law Enforcement	John Becker	Papillon Airways Inc
Schwarzbach	Association's (ALEA) Survivors Network for Air &	Christopher Hall	PHI Air Medical, LLC
Krista Haugen Joan Gregoire	MD Helicopters	Bill York	Robertson Fuel Systems
John Wittmaak	Bell Helicopter Textron, Inc.	Randall D. Fotinakes	Meggitt Polymers & Composites
Matthew Pallatto	Sikorsky	Marv Richards	BAE Systems
William Taylor	Enstrom Helicopter Corporation	Laurent Pinsard	EASA Structures Engineer
Martin Crane	FAA Structures Engineer	Rémi Deletain	EASA Powerplant & Fuel Engineer

ROPWG Meetings

- Initial Meeting January 21-22, 2016 at the Rotorcraft Directorate in Fort Worth
 - Developed Work Plan
 - Split into two Task Groups to analyze sub-tasks:
 - Costs
 - Benefits
 - Set schedule for remainder of activities
 - Began work on sub-tasks
- 2nd Meeting March 1, 2016 at the HeliExpo Conference
 - Reviewed and commented on Final Draft of Cost/Benefit report on direct incorporation into future production
 - Followed by e-mail and telephonic coordination of final report

ROPWG COST/BENEFIT REPORT

COSTS



- A list of all current production rotorcraft manufactured or exported to the US was produced.
- Each affected OEM was queried as to the average cost of making all currently produced rotorcraft compliant with current regulations.
 - These included one-time costs and recurrent per aircraft costs for Part 27 and Part 29 rotorcraft.
 - Some OEM's are already partially compliant with the regulations
- Costs were divided according to compliance with:
 - 2x.952—Crash Resistant Fuel System (CRFS)
 - 2x.561, 2x.562, 2x.785—Crash Resistant Seats & Structure (CRSS)
- OEM's were also asked to provide average performance degradation of compliance to their currently produced rotorcraft
- Not all OEM's responded.

Table 4. Performance Data				
OEM	Part 27/29	Useful Payload (.561, .562, .785)	Useful Payload (27/29.952)	Fuel capacity change
Agusta Westland	27	-3.2%	-0.9%	-4 liters
Airbus	27	-10.3%	-3.5%	0%
	29	-5.9%	-2.7%	-3%
Bell	27	-8.2%	0 %	-7.2 %
	29	-1.1%	0 %	0%
Enstrom	27	-1.3%	-0.6%	-2%
MDHI	27	0%	-0.5%	-0.7%
Robinson	27	-4.8%	-0.8%	0%
Sikorsky	27	-25%	-5%	-6%
	29	-5%	-1%	-6%

OEM data demonstrated a nearly identical amount for "empty weight" and "useful load." Depending on configuration requirements, empty weight may differ from useful load. Thus, empty weight could remain unchanged, but useful load may be decreased due to configuration requirements (which may take up useful space).

Table 5					
OEM	Part 27/29	Overall One-time Cost (.561, .562, .785)	Overall One-time Cost (27/29.952)	Parts & Labor (USD)	Recurrent Costs (USD)
OEM A	27	0	3.2M	(not reported)	(not reported)
OEM B	27	9.5M	6M	(not reported)	126,000
OEM C	27	53M	23M	210K (0.3%)	6,000
	29	1.7M	0.6M	175K (7%)	1,000
OEM D	27	1M	0.2M	18K (2%)	25,800
OEM E	27	(not reported)	(not reported)	(not reported)	(not reported)
OEM F	27	2M	0.2M	8K (0.3%)	7500
OEM G	27	13M	13M	(not reported)	25%
	29	63M	63M	(not reported)	5%
Totals (ba averages i	sed upon reported)	>143M	>109.2M	>411K	>167,000

Cost Issues

• Two main costs are presented:

- One-Time development costs:
 - Design
 - Analysis/Testing
 - Certification
- Recurrent per unit increase in cost of production over previous designs.

• Final total cost calculation not presented due to:

- Time schedule (Effectively 10 weeks).
- Difficulty of coalescing OEM provided data due to different types of data.
- Failure of OEM's to report complete data.
- Assumptions made about unreported data.
- Inadequate data available to perform separate analysis for Part 27 and Part 29 rotorcraft.
- Lack of estimated production numbers for future years.
- Apparently high recurrent costs per unit manufactured.

BENEFITS

METHODS

- Considering the time constraints, the Benefits Task Group relied entirely upon the last 10-years of NTSB database data as well as previously published reports and regulations.
- The NTSB database does not contain data relating to crash kinematics nor does it provide specific injury information.
 - There is no way to discern a minor crash from a very severe crash.
 - Injury is only listed as fatal, severe, major or minor.
 - The definitions of all injury categories except fatal are vague, at best.
- Benefits were estimated according to DOT published values of injury and upon the Value of a Statistical Life (VSL).
- Non-economic benefits were considerable but these have no identifiable monetary basis and were not included in costs saved calculations.

Methods (Continued)

- Benefits were divided and reported separately according to compliance with:
 - 2x.952—Crash Resistant Fuel System (CRFS)
 - 2x.561, 2x.562, 2x.785—Crash Resistant Seats & Structure (CRSS)
- Based on available data and certain assumptions, cost reductions from thermal trauma could be estimated and reported separately.
- There was no data available to estimate injury reductions from implementation of CRSS in newly manufactured helicopters except that presented in the 1995 Final Rule for CRSS.
 - In this document the FAA estimated 30% to 85% reduction in fatalities and injuries with the implementation of CRSS.
 - These ranges were used in the ROPWG analysis.

Benefits

- CRFS incorporated into helicopter models still in production would have prevented 24 thermal fatalities and 8 serious injuries for a benefit of \$253M.
- If a thermal injury is prevented, that individual probably sustains some blunt force injury. Consequently, it was assumed that all thermally related fatalities would become blunt severe injuries, and all thermal serious injuries would become minor blunt injuries.
- CRSS in these models still in production would have prevented 61-172 fatalities but increased serious injuries between 36 and 58 for a total cost benefit range of \$739M to \$1.7B depending on whether CRSS effectiveness was assumed to be 30% or 85%.

CRFS: Crash Resistant Fuel Systems 2X.952 CRSS: Crash Resistant Seats & Structure 2X.561/2X.562/2X.785

Cost/Benefit Summary

- There were 763 accidents in 2006-2015 for non-compliant helicopter models still in production in the NTSB dataset resulting in 226 fatalities and 146 serious injuries.
- There were only 21 crashes of fully compliant rotorcraft resulting in 19 fatalities and 1 serious injury.
- Total economic benefits and OEM conversion costs are shown:

<u>Benefits</u>	<u>Costs</u>
CRFS Pt. 27/29: \$253 Million	One time Development Costs: >\$109.2 Million
CRSS Pt. 27/29: \$739 Million (30%) o \$1.7 Billion (85%)	One time Development Costs: >\$143 Million

Recurring Costs: >\$167,000 per aircraft

Note: All costs supplied by OEM's. See Table 5.

Major Conclusions

- NTSB accident data collection is inadequate to accurately determine benefits provided by the introduction of crash safety upgrades. Unlike the National Highway Traffic Administration (NTHSA) database, the NTSB database lacks:
 - Impact data (crash kinematics)
 - Specific injury data
- A significant finding of this project is that implementation of a CRFS compliant with 27/29.952 should eliminate most, if not all post-crash fires in survivable accidents.
- Some existing rotorcraft with crash-resistant fuel cells already provide significant protection over those that do not.
- Adding full CRSS to an existing production helicopter will be difficult, if not impossible for some platforms. However, the potential benefit may be significant.
- There are considerable non-economic, unquantifiable costs associated with death and injury in aircraft crashes that should be considered in decisions related to cost/benefit analyses.
- Ten weeks was inadequate time for the ROPWG to perform a comprehensive cost/benefit analysis.
- More comprehensive data from OEM's will be required for a more accurate estimate of costs of compliance.

ROPWG Concurrence

- Complete concurrence with the cost benefit report was not achieved:
 - 18 members concurred with the report
 - One member, Sikorsky, non-concurred for a variety of reasons:
 - Sikorsky believes the report significantly understates implementation costs of the suggested changes;
 - The Report has not demonstrated the basis of the purported derived safety benefits;
 - The Report fails to consider and take into account the significant differences between Part 27 and Part 29 aircraft

Next Steps

- If accepted by the ARAC, the report will be forwarded to the FAA.
- Upon FAA acceptance, the FAA will initiate the next tasks for the ROPWG.
- Next In-Person Meeting of the ROPWG is Tentatively Scheduled for July 26-27, 2016.
 - Meeting will establish Work Plan and organize for remaining tasks.
 - Discuss ARAC and FAA findings of ROPWG Tasks 1 and 2.

ROTORCRAFT OCCUPANT PROTECTION WORKING GROUP

TASKS 1 AND 2

COST-BENEFIT ANALYSIS REPORT TO THE AVIATION RULEMAKING ADVISORY COMMITTEE (ARAC)

Submitted March 13, 2016

ROTORCRAFT OCCUPANT PROTECTION WORKING GROUP

TASKS 1 AND 2

COST-BENEFIT ANALYSIS REPORT TO THE AVIATION RULEMAKING ADVISORY COMMITTEE (ARAC)

INTRODUCTION

The FAA requested the Aviation Rulemaking Advisory Committee (ARAC) to provide recommendations related to occupant protection rulemaking in normal and transport category rotorcraft with older certification basis type designs and that are still in production.¹ In the 1980's and 1990's, the FAA amended rotorcraft regulations related to emergency landing conditions and fuel system crash resistance (14 CFR 27/29.561; .562; .785; .952) to incorporate occupant protection rules in newly certificated rotorcraft. Newly manufactured rotorcraft with older certification bases or derivative type designs still in production, however, were excluded from the requirements of the new rules. By the end of 2014 only 16% of the U.S. rotorcraft fleet were in compliance with the upgraded fuel system requirements established 20-years earlier and only 10% were in compliance with the upgraded emergency landing requirements effective 25-years earlier.

Based upon recent crashes of non-compliant rotorcraft resulting in severe and fatal thermal and blunt force trauma as well as a recent FAA fatal injury study showing that the upgraded rules would have been effective in saving lives in rotorcraft crashes, the FAA tasked the ARAC to consider the effect of requiring compliance with the current rules for all newly manufactured rotorcraft regardless of certification basis.

To explore these issues, the Rotorcraft Occupant Protection Working Group (ROPWG) was formed to study a wide range of issues related to compliance with the current, upgraded rules. The first two tasks for the ROPWG were to: 1) perform a cost-benefit analysis for incorporating the existing protection standards (14 CFR 27/29.561, .562, .785, .952) in newly manufactured rotorcraft; 2) develop a cost-benefit report to be presented to ARAC. In performing this analysis, the ROPWG was tasked to:

- 1. Estimate what the regulated parties would do differently as a result of the proposed regulation and how much it would cost.
- 2. Estimate the improvement in survivability of future accidents.
- 3. Estimate any other benefits (e.g., reduced administrative burden) or costs that would result from implementation of the occupant protection standards identified above.

The ROPWG was formed in response to an announcement published in the federal register on November 5, 2015. The announcement requested interested parties with appropriate expertise to

¹ Department of Transportation, Federal Aviation Administration. Aviation Rulemaking Advisory Committee— New Task. Federal Register, 80 (214): 68599-68602, November 5, 2015.
apply to the FAA for membership on the ROPWG. From the list of respondents, a chairman was selected and he, along with the FAA Advisor to the working group, selected a committee consisting of 19 voting members and 3 non-voting advisors (including the FAA Advisor). The list of members is at Appendix A. To accomplish Tasks 1 and 2 the Working Group was divided into two Task Groups, the Cost Task Group and the Benefits Task Group. Each Task Group elected a chair who reported to the ROPWG Chairman and each was tasked to produce a separate report with cross-collaboration between both Task Group members. The general content of each Task Group report was discussed and modified at a ROPWG meeting on March 1, 2016. The ROPWG Chairman then combined the two reports and submitted the final report to the entire membership for final approval.

COST ANALYSIS

Members of the Cost Task Group queried original equipment manufacturers (OEM's) and suppliers and reviewed existing literature to obtain the data obtained in the cost analysis report. OEM and supplier responses were quite variable. The weight, volume, and performance cost analysis below are average costs for Part 27 and Part 29 helicopters based on input from multiple OEM's. This means that the relative costs will be lower for smaller aircraft within those groups and higher for larger aircraft. Costs are reported in 2015 U.S. dollars.

Fuel Systems Compliance Costs (Part 27.952/29.952)

Transition from aluminum skin fuel tanks or from fuel tanks compliant with the Technical Standard Order, TSO-C80, Flexible Fuel and Oil Cell Material to full compliance with Part 27.952 and 29.952 incurs additional weight and costs due to increased thickness of fuel bladder material and application of breakaway fittings. Structural changes to the airframe may also be required to retain the mass of the fuel system under the higher g-loads specified by the current amendment to 27/29.952 and 27/29.561. Compliance also frequently results in an overall loss in useful fuel capacity. Lastly, compliance requires significant certification testing of newly designed Part 27/29 fuel systems, further increasing per airframe costs (Table 1).

Crash resistant bladder construction requires a doubling of the thickness of bladder material from 1.0 to 2.0 mm. Soft goods weight nearly doubles, increasing from 3.63 lbs. to 7.04 lbs. for Part 27 (50 gallon) bladders and from 10.15 lbs. to 19.71 lbs. for Part 29 (200 gallon) bladders. While the number of fittings remains unchanged, the hard goods weight of crashworthy fittings increases by 56.6% for Part 27 systems (from 6.6 lbs. to 10.3 lbs), and by 42.3% for Part 29 systems (from 23.6 lbs. to 33.6 lbs.). This increase in total weight of the fuel system for Part 27.952 is nearly 70%, ranging from 10.2 to 17.3 lbs. and Part 29.952 weight increase is 58%, ranging from 33.8 to 53.3 lbs. Based on the above considerations, compliance could potentially affect airframe design and construction for rotorcraft manufacturers as well as aircraft utilization by rotorcraft operators.

Thicker material affects bladder construction by changing the radii of seams, which reduces overall available volume per surface area and useful volume (measured in gallons). Useful capacity loss is projected to be approximately 1 gal for Part 27 fuel systems and approximately 3 gal for Part 29 fuel systems. Loss of useful fuel capacity will have an impact on operator ranges and capabilities.

Since many operators report they currently operate close to gross weight, compliance with the current regulations increasing weight and decreasing range may render their current fleet uneconomical by decreasing payload and range.

Table 1. Fuel Systems Costs						
	TSO-C80	27.952	Est. Change	TSO-C80	29.952	Est. Change
Material thickness (mm)	1.0	2.0	0.04 (100%)	1.0	2.0	1.0 (100%)
Soft goods weight (lbs.)	3.63	7.04	3.41 (94%)	10.15	19.71	9.56 (89%)
Hard goods weight (lbs.)	6.6	10.3	3.7 (56%)	23.6	33.6	10 (42%)
Total Wt. (lbs.)	10.2	17.3	7.1 (70%)	33.8	53.3	19.5 (58%)
Volume loss (gal)	0.53	1.06	0.53 (100%)	1.49	2.98	1.49 (100%)
Cost of bladder material, avg. (US\$)	\$2,059	\$3,289	\$1,309 (59.7%)	\$6,863	\$10,963	\$4,363 (59.7%)
Cost of CRFS fittings	0	\$5 <i>,</i> 820	\$5,820	0	\$7,100	\$7,100
Total cost CRFS		\$9,100			\$18,000	
Costs of Testing	Impact	S-V ²	TOTAL	Impact	S-V ²	TOTAL
Cost of testing 27/29.952 compliant fuel systems (US\$)	10,789	20,645	31,434	18,663	25,231	43,894

When compared with data from the 1994 study of Crash Resistant Fuel Bladder Costs, overall costs for bladder construction to meet compliance with Part 27.952 and 29.952 are increased by an inflation index of 60%.³ This represents an increase in cost of construction from \$2,059 to \$3,289 for Part 27 fuel systems, and an increase from \$6,863 to \$10,963 for Part 29 fuel systems. Compliance with 27/29.952 also requires new application of breakaway fittings, to minimize potential fuel spillage. Costs for breakaway valves for Part 27 (8 required x \$600) and Part 29 (10 x \$600) and rollover vent valves (\$500) combine for an average total of \$5,300-6,500. Flexible fuel lines for Part 27 (8 x \$75) and Part 29 (10 x \$75) and crash resistant gravity filler caps (\$300) total approximately \$1,100. Crash resistant fuel system components, in total, result in additional costs of approximately \$5,800-7,100 per aircraft.

Costs for certification testing of crashworthy fuel systems includes costs for impact testing and slosh and vibration testing. Impact testing costs include the cost of the testing process and materials costs (i.e., the wooden platform and the bladder model tested). Slosh and vibration testing costs include the cost of the testing process and the bladder model tested. For Part 27.952 crashworthy fuel system testing, the total cost is approximately \$31,434. This total combines the cost of crash impact testing (\$10,789) and slosh and vibration (S-V) testing costs (\$20,645; avg.). For Part 29.952 crashworthy fuel system testing, the total cost is approximately \$43,894. This total combines the cost of crash impact testing (\$18,663) and slosh & vibration (S-V) testing costs (\$25,231; avg.). These estimates do not include the costs of "in-structure" fuel tank drop testing. FAA requirements for "in-structure" testing are not uniformly applied between fuel systems manufacturers and rotorcraft manufacturers. "In-structure" testing will increase testing costs

² Slosh and vibration testing

³ Department of Transportation, Federal Aviation Administration. Airworthiness Standards; Crash Resistant Fuel Systems in Normal and Transport Category Rotorcraft. 14 CFR Parts 27 and 29; Docket No. 26352; Amendment No. 27-30, 29-35, 1994

beyond these estimates. These costs may be amortized over the life of an aircraft model type certificate.

One pilot training operator reports having completed seventeen (fuel system) bladder retrofits for Part 27 helicopters in the past 2-3 years, with completion of the operator fleet by end of year 2016. This operator estimates the cost at \$7,000 per aircraft, plus 40 labor hours.

Seat Costs

Incorporating seats to meet the requirements of 27/29.562 requires purchasing or developing stroking seats that protect the occupant as required by 27/29.562 and increasing the strength of the surrounding structure, thereby requiring an increase in the empty weight of the helicopter, and significant monetary costs for the design, certification, and manufacturing of the new structure. Data was requested from six seat manufacturers, but was provided by only one. This manufacturer makes two models of seats that comply with Parts 27/29.785. These models are listed by weight and cost in Table 2:

Table 2. Seat Costs			
Manufacturer	Model	Weight (lbs.)	Cost (USD)
Manufacturer A	Utility	14	\$3,000-3,500
	VIP	21	\$4,000-4,500

This manufacturer makes seats that are relatively inexpensive because they are not tailored to a particular rotorcraft. It is expected that the actual costs for compliant seats will be considerably greater for certain applications depending on whether separate pilot seats or bench seats for occupants are required and whether specially manufactured seats are required.

Structural Change Costs

Revising older designs to meet the requirements of 27.561 and 27.785 requires increasing the strength of the helicopter structure in numerous locations, thereby requiring an increase in the empty weight of the helicopter, and significant monetary costs for the design, certification, and manufacturing of the new structure. The weight and monetary costs for these changes is included in the overall cost of compliance presented in the subsection below.

Total Cost of Compliance

Data was provided by seven rotorcraft manufacturers: Agusta Westland, Airbus, Bell, Enstrom, MDHI, Robinson, and Sikorsky. These manufacturers currently produce aircraft complying with current sections of FAA Parts 27 and 29 (.561, .562, .785, and .952). These rotorcraft are referred to as "compliant" or "fully compliant". The following analysis considers the costs for newly manufactured non-compliant rotorcraft to become fully compliant with current regulations. Models of each currently manufactured aircraft (as of 02/19/2016) are listed in Table 3.

Raw data collected was divided into two sets—performance data and cost data. Analysis of this data is presented in the accompanying Tables 4 and 5, which represent overall cost estimates and percentages for each participating manufacturer:

• Performance Data: data is presented in units and percentages, as available. Factors presented include changes in weight (empty and gross, as available), useful payload, fuel capacity, and mission capability, primarily range. This data was shared with rotorcraft operators to estimate potential impact to direct operating costs, mission profiles and associated downstream revenue. Some OEM's also reported on reductions in seating and cruise speeds. Overall data is presented in Table 4.

Table 3 Currently Manufactured Helicopters			
Type Certificate Holder	Model	Part27/29	Notes
AgustaWestland	A109	27	
AgustaWestland	A119	27	
Airbus Helicopters	H155 (EC155)	29	Only EC155 B1 still manufactured
Airbus Helicopters	H225 (EC225)	29	
Airbus Helicopters	H215 (AS332)	29	Only AS332 C1 L1 still manufactured
Airbus Helicopters	H125 (AS350)	27	Only AS 350 B3e still manufactured
Airbus Helicopters	AS355 ⁴	27	Only AS 355 NP still manufactured
Airbus Helicopters	AS365	29	Only AS 365 N3 still manufactured
Bell	206L4	27	
Bell	407	27	
Bell	412	29	
Enstrom	F-28F	27	
Enstrom	280FX	27	
Enstrom	480B	27	
MDHI	369E, 369FF	27	
MDHI	MD900	27	
MDHI	500N	27	
MDHI	600N	27	
Robinson Helicopter Co.	R22	27	
Robinson Helicopter Co.	R44	27	
Sikorsky	269C	27	
Sikorsky	S-76	29	

⁴ Airbus AS355 will no longer be manufactured after 2016.

• Cost Data: direct costs to Rotorcraft OEM's for changes in design, manufacturing (including parts, labor and retooling), certification (testing and conformity), and maintenance (training and schedule costs) as well as recurring costs per airframe. This data was compiled and overall estimates are presented in Table 5.

Performance Data

Performance Data reporting is not uniform, due to OEM concerns about release of potentially sensitive proprietary data. OEM'S varied in reporting actual weights/capacities or percentages, or both. The data in Table 4 is presented where uniform criteria were available, with accompanying narrative where needed to capture additional OEM specific data. It should be recognized that these are OEM estimates only, and attempts to extrapolate conclusions from these data may not be universally applicable.

Table 4. Performance Data				
OEM	Part 27/29	Useful Payload (.561, .562, .785)	Useful Payload⁵ (27/29.952)	Fuel capacity change
Agusta Westland	27	-3.2%	-0.9%	-4 liters
Airbus	27	-10.3%	-3.5%	0%
	29	-5.9%	-2.7%	-3%
Bell	27	-8.2%	0 %	-7.2 %
	29	-1.1%	0 %	0%
Enstrom	27	-1.3%	-0.6%	-2%
MDHI	27	0%	-0.5%	-0.7%
Robinson	27	-4.8%	-0.8%	0%
Sikorsky	27	-25%	-5%	-6%
	29	-5%	-1%	-6%

AgustaWestland reports that compliance for Models AW119 and AW109E are as follows:

- Model AW119 will incur an increased empty weight of 791 lbs. Overall useful payload will decrease by 7 lbs. Fuel Capacity is expected to decrease by 4 liters (~1.1 gal.), with a reduction of range of 2 nm.
- Model AW109E will incur an increased empty weight of 841 lbs. Overall useful payload will decrease by 8 lbs. Fuel Capacity is expected to decrease by 4 liters, with a reduction of range of 2 nm.

Airbus Helicopters reports that compliance for Airbus Models AS350 (5 & 6 seat configurations), AS365, EC155, AS332L1, and EC225 are as follows:

• Model AS350 (5-seats) overall useful payload will decrease by 13%. Fuel Capacity remains unchanged, but increased weight will reduce range by approximately 17%.

⁵ OEM data demonstrated a nearly identical amount for "empty weight" and "useful load." Depending on configuration requirements, empty weight may differ from useful load. Thus, empty weight could remain unchanged, but useful load may be decreased due to configuration requirements (which may take up useful space).

- Model AS350 (6-seats) overall useful payload will decrease by 15%. Fuel Capacity remains unchanged, but increased weight will reduce range by approximately 21%.
- Model AS365 overall useful payload will decrease by 13%. Fuel capacity will decrease by 6%. This, combined with increased weight will reduce range by 15%.
- Model EC155 overall useful payload will decrease by 14%. Fuel capacity will decrease by 6%. This, combined with increased weight will reduce range by 17%.
- Model AS332L1 overall useful payload will decrease by 11%. Fuel capacity will decrease by 3%. This, combined with increased weight will reduce range by 15%.
- Model EC225 overall useful payload will decrease by 1%. Fuel capacity remains unchanged. Range is expected to be reduced by 1%.

Bell reports that compliance for Models 206L4, 407, and 412 are as follows:

- Models 206L4 and 407 will incur an increased empty weight of 205 lbs. Overall useful payload will decrease by 205 lbs. Fuel Capacity is expected to decrease by 180 lbs.
- Model 412 will incur an increased empty weight of 75 lbs. Overall useful payload will decrease by 75 lbs. Fuel Capacity remains unchanged.

Enstrom Helicopters reports that compliance for Enstrom Models F-28X/280FX and 480B are as follows⁶:

- Model F-28X/280FX overall useful payload will decrease by 4%. Fuel Capacity is expected to decrease by 4%. Of note, Enstrom also expects a reduction in seating capacity from three to two occupants.
- Model 480B overall useful payload will decrease by 3%. Fuel Capacity is expected to remain unchanged. Of note, Enstrom also expects a reduction in seating capacity from five to four occupants.

MDHI reports that compliance for Models 369E, 369FF, 500N, 600N, and MD900 are as follows:

- Models 369E, 369FF, and 500N overall useful payload will decrease by 0.5%. Fuel Capacity is expected to decrease by 0.7%.
- Models 600N and MD900 overall useful payload will decrease by less than 1%. Fuel Capacity is expected to remain unchanged.

Robinson Helicopters reports that compliance for Models R22 and R44 are as follows:

- Model R22 overall useful payload will decrease by 6.7%. Fuel Capacity is expected to remain unchanged. Due to increased empty weight, range is expected to decrease by 1.5%, and cruise speed is expected to decrease by 0.8%.
- Model R44 overall useful payload will decrease by 4.4%. Fuel Capacity is expected to remain unchanged. Due to increased empty weight, range is expected to decrease by 0.7%, and cruise speed is expected to decrease by 0.7%.

⁶ Enstrom notes that losing mission capability by losing the seating capacity is a primary concern. Increasing the cost of the aircraft while dramatically reducing its capability could drive a number of customers out of operation. By closing out the lower cost helicopters, the number of helicopter users will be dramatically reduced which they believe will affect any economy of scale, thus driving costs disproportionately higher.

Sikorsky Helicopters reports that compliance for Models S-76 and S-269c are as follows:

- Model S-76 overall useful payload (with a fixed range) will decrease by 34%. Fuel Capacity is expected to decrease by 6%. Range with a fixed payload is expected to decrease by 37%.
- Model S-269C overall useful payload (with a fixed range) will decrease by 52%. Fuel Capacity is expected to decrease by 6%. Range with a fixed payload is expected to decrease by 86%.

Cost Data

Cost Data reporting, as with performance data, was not 100 percent, due to OEM concerns about release of potentially sensitive proprietary data. The data in Table 5 is solely based on data provided by the OEM's. Basically, two main costs were reported by the OEM's, 1) one-time primarily development costs and 2) recurrent costs associated with each airframe produced. One-time costs are average costs per OEM for all models produced and are shown separately for Parts 27/29.561; .562 compliance and for compliance with 27/29.952. "Parts & Labor" is also considered a one-time cost and is listed per OEM. The one-time cost data includes potential costs associated with manufacturing such as parts, labor, retooling, and certification (testing and conformity). Most OEM's also reported recurrent costs per aircraft unit produced and these costs are associated with maintenance (training and schedule costs) and the increased costs of parts and labor. Recurrent costs are also listed by manufacturer. The totals at the bottom of the chart are average costs for all reporting OEM's and may be considered an overall one-time industry cost except for recurrent costs, which occur on a per unit manufactured basis. The accuracy of these estimates is diluted by the absence of reporting by some OEM's and could be improved with complete participation of all rotorcraft OEM's building or exporting rotorcraft to the U.S.

Table 5					
OEM	Part 27/29	Overall One-time Cost (.561, .562, .785)	Overall One-time Cost (27/29.952)	Parts & Labor (USD)	Recurrent Costs (USD)
OEM A	27	0	3.2M	(not reported)	(not reported)
OEM B	27	9.5M	6M	(not reported)	126,000
OEM C	27	53M	23M	210K (0.3%)	6,000
	29	1.7M	0.6M	175K (7%)	1,000
OEM D	27	1M	0.2M	18K (2%)	25,800
OEM E	27	(not reported)	(not reported)	(not reported)	(not reported)
OEM F	27	2M	0.2M	8K (0.3%)	7500
OEM G	27	13M	13M	(not reported)	25%
	29	63M	63M	(not reported)	5%
Totals (based upon averages reported)		>143M	>109.2M	>411K	>167,000

Robinson Helicopter Company (RHC), along with other smaller rotorcraft manufacturers, have expressed that the monetary costs listed are not the primary concern for smaller aircraft (e.g., RHC R22). Rather, RHC is concerned that the required increase in gross weight, especially for the R22, could have the following consequences:

- 1. The R22 will have a significantly reduced useful load, and as a result:
 - a. Operators that respect the gross weight limitation will likely find that at least 50% of their current operations with the maximum (2) occupants (such as flight training) will no longer be possible.
 - b. Operators that do not respect the gross weight limitation will likely fly (illegally) at weights even further above the limit, increasing the risk of an accident.
- 2. The R44 will also have a reduced useful load, and will have similar (though less severe) problems as outlined for the R22 above.

It is the opinion of RHC that these consequences are far more significant than the monetary costs outlined, and that incorporation of current requirements could force discontinuation of certain models of rotorcraft. The cost of these consequences are difficult to predict and are not included in this cost/benefit analysis.

Based on the data presented in Table 5, it is estimated that, the total one-time cost of complying with the current regulations for rotorcraft currently in production would be greater than \$252M. Recurrent costs will be in excess of an average of \$167,000 per compliant airframe produced. This estimate includes only OEM costs and is based solely upon their input to the ROPWG. Operators would incur additional costs as well. In some cases, these costs would be considerable if not unsustainable.

Rotorcraft Operator Data

Data was collected from operators representing governmental contracting, corporate contracting, tour operations, pilot training and air medical services. Data provided from fuel system manufacturers, crashworthy seat manufacturers and OEM's was used by operators to estimate cost impact of full compliance (Parts 27/29, sections .561, .562, .785 and .952) to rotorcraft operations.

It must be understood that imposition of the current regulations upon newly manufactured rotorcraft certified to older standards will impose significant economic and operational costs upon certain models of rotorcraft. In fact, according to input from OEM's, certain airframes will have to be substantially redesigned to meet the increased structural demands of 27/29.561. As an example, based upon OEM data presented in the above OEM section, full compliance for the AS350B incurs an additional weight load that has a significant impact on tour and utility operations for this Part 27 aircraft. For government utility operations, the additional weight of the AS350B virtually eliminates its application with currently bid US government contracts already in place. If governmental agencies are unwilling to reduce payload requirements currently published for contract use for the purposes of meeting new Part 27 compliance, operators will have great difficulty competing for future bids utilizing currently published (unrevised) U.S. Government specifications. Aviation companies utilizing the AS350B will likely have to identify an alternative aircraft for this business line. Replacement of a rotorcraft fleet incurs significant, and yet to be estimated, additional costs. These costs are associated with replacement of the current fleet, retraining of maintenance and aviation staff, adoption of new maintenance schedules and retooling. Further costs associated with implementation of replacement aircraft cannot be fully predicted at this time, as a suitable replacement aircraft (with similar capabilities to the AS350B) is yet to be determined. However, even in the absence of this data, it is expected that the economic impact to affected operators will be in the millions and the total industry cost will be much greater.

For tour operations, the additional weight incurred effectively reduces the passenger payload by one. This passenger reduction is required to optimize safe operations of the AS350B during takeoff and landing operations. Using the passenger count from 2015 operations, one operator estimates that this passenger reduction will affect not only capacity for tour operations, but scheduling of tour operations. The economic impact of this change for the AS350B is predicted to result in a potential loss of gross revenue of \$4.4M per year. Considering all the tour operators operating in the U.S., the losses sustained by the entire helicopter tour industry will be considerably greater.

Assuming similar maintenance/inspection procedures for compliant seats and fuel tanks, it is estimated that direct operating cost (DOC) is not impacted by installed equipment. Installation of compliant seats and fuel tanks will drive minimal or no change to pilot training procedures, with nominal costs, if any. With regard to aircraft insurance costs, for large fleet operators, adjustment of premium for the implementation of an individual safety system is negligible to not applicable. The insurance markets would anticipate that the better operations would systematically implement the best safety features as they came on the market. Each operator is underwritten as an entire package and not on specific safety systems.

BENEFITS ANALYSIS

Introduction

The Benefits Task Group was tasked with determining the approximate benefits in dollars as well as other benefits of all newly manufactured rotorcraft complying with current Part 27 and Part 29 regulations. The general approach was to examine all rotorcraft crashes in the NTSB database over the past 10-years and use that as a basis for determining levels of injury and establishing the cost of each injury incurred in these crashes. This effort was complicated by the fact that the National Transportation Safety Board (NTSB) database and, indeed dockets, do not contain information on impact velocity or aircraft orientation at impact, nor do they contain any specificity as to injury as will be discussed later in this report. Previously published studies and FAA rulemaking documents were also used as a basis for some data.

Compliance levels of current production rotorcraft

Since different rotorcraft currently under production have different levels of compliance with current regulations ranging from none to fully compliant, the rotorcraft involved in crashes from the NTSB database were divided into levels of compliance as shown in Table 6.

Dataset Preparation and Filtering

The data was extracted from the NTSB's Microsoft Access database, current through 2/1/2016. The initial filter criteria were as follows:

- regis_no = N* (all U.S. registered only)
- acft_category = heli (helicopters only)
- ev_type = *acc* (accidents only, not incidents)
- $ev_date = Between 1/1/2006 and 12/31/2015 (most recent 10 year data available)$
- homebuilt = *N* or is null (excludes homebuilt helicopters that were not type certificated and also catches cases where NTSB inadvertently left the field unpopulated)

The above query resulted in 1,442 accident records. The dataset was then filtered retaining only rotorcraft currently in production resulting in 793 records.

The initial review of the dataset showed that eight accidents included either rotorcraft damage as "minor" or "none." However, there were five fatalities included in these eight accidents. The accident narratives were reviewed and all injuries were not related to a crash event, such as being struck by a main or tail rotor. These accidents were removed from the dataset resulting in 785 records as shown in Table 7.

Table 6. Current Production Rotorcraft and Compliance Levels							
Maka	Madal	Compliance Level					
IVIAKE	Model	27/29.561	27/29.562	27/29.785	27/29.952		
Agusta Westland	A109	С	N	N	N		
Agusta Westland	A109 S/SP	С	С	С	С		
Agusta Westland	A119	С	N	Ν	N		
Agusta Westland	AW139	С	С	С	С		
Agusta Westland	AW189	С	С	С	С		
Airbus Helicopters	BK117 ⁽¹⁾	С	С	С	С		
Airbus Helicopters	H120 / EC120	С	С	С	С		
Airbus Helicopters	H130 / EC130 ⁽²⁾	С	С	С	С		
Airbus Helicopters	H135 / EC135 ⁽³⁾	ССС		С	С		
Airbus Helicopters	H155 / EC155 ⁽⁴⁾	P ⁽⁹⁾	Р	P ⁽¹⁰⁾	N		
Airbus Helicopters	H225 / EC225	P ⁽⁹⁾	N	N	N		
Airbus Helicopters	H215 / AS332 ⁽⁵⁾	P ⁽⁹⁾	N	N	N		
Airbus Helicopters	H125 / AS350 ⁽⁶⁾	Р	Р	P ⁽¹⁰⁾	N		
Airbus Helicopters	AS355 ⁽⁷⁾	Р	Р	P ⁽¹⁰⁾	N		
Airbus Helicopters	AS365 ⁽⁸⁾	P ⁽⁹⁾	N	Ν	N		
Bell	206L4	Ν	N	Ν	P ⁽¹¹⁾		
Bell	407	Ν	Ν	P ⁽¹²⁾	P ⁽¹³⁾		
Bell	412	Р	Р	P ⁽¹⁴⁾	P ⁽¹¹⁾		
Bell	429	С	С	С	С		
Enstrom	F-28	Ν	N	N	N		
Enstrom	280	Ν	N	Ν	Ν		
Enstrom	480	Ν	Ν	Ν	Р		
MDHI	369E, 369FF	Ν	N	N	N		
MDHI	MD900	Р	С	С	С		
MDHI	500N	Ν	N	N	N		

Table 6. Current Production Rotorcraft and Compliance Levels (Continued)						
Maka	Madal	Compliance Level				
IVIAKE	Model	27/29.561	27/29.562	27/29.785	27/29.952	
MDHI	600N	Ν	Ν	Ν	С	
Robinson	R22	Р	N	Р	Р	
Robinson	R44	Р	N	Р	Р	
Robinson	R66	С	С	С	С	
Sikorsky	269/300/TH-55	N	N	N	N	
Sikorsky	S-76	Р	N	N	N	
Sikorsky	S-92	С	С	С	С	
Notes : 1) C 2) P 3) N 4) C n 5) C 6) C 8) C 9) C	=fully compliant =partially compliant l=non-compliant only BK 117 C2 C2e D2 D2m still nanufactured only EC130 T2 still manufactured only EC135 P2+ T2+ P3 T3 still nanufactured only EC155 B1 still manufactured only AS332 C1 L1 still manufactured only AS 350 B3e still manufactured	 10) Only 11) Only 12) Only 13) Only 14) Fuel struct 15) Amd 16) Fully 17) All ai 29.75 	AS 355 NP still r AS 365 N3 still r heavy masses 2 forward seats 2 bladders were c ture t. 27-21 compliant exce rcraft delivered 85 to Amend 29	manufactured manufactured 7/29.561 complia 7/29.785 complia Irop tested 50ft v pt for 27.952(b)1 with seat kit = 29 -29; 29.562 to Ar	ant ant vithout 9.561(b) & nend 29-41	

The dataset was also reviewed for duplicate injuries. When two aircraft collide, the NTSB generates a report for each aircraft involved, but lists the combined number of injuries in each record, thus creating duplicate injuries in the record. The accidents in the dataset contained 13 records with duplicate injuries. By reviewing the narrative of each of these accidents, the correct number and level of injury could be assigned to each rotorcraft occupant involved in the accident. Table 8 provides a list of these records and the corrected injuries. The corrected data was incorporated into the analysis dataset of 785 records. A Microsoft Excel file was created and fields were added for each rotorcraft compliance level shown in Table 6. This allowed filtering the dataset accidents based on compliance levels of the involved rotorcraft.

Table 7. Details of eight Accidents removed from the Dataset						
Event ID	Injuries					
20070319X00305	A Eurocopter EC-120B, U. S. registration N263CP, and a Robinson R-22 BETA, Netherlands registration PH-JGR, collided while hovering at the Stadtlohn Airport, Vreden, Germany. The R-22 sustained substantial damage while the EC-120 sustained minor damage. <i>Note: The U.S. registered accident was the EC-120B and it had only</i> <i>minor damage and no injuries. From the standpoint of the EC-120s</i> <i>damage and injuries, it was not considered an NTSB recordable</i> <i>accident.</i>	None onboard the EC120B 2 minor aboard the R22				
20130928X12809	As the relieved pilot was walking away from the helicopter and between the 10- and 11-o'clock position forward of the helicopter, he came into contact with a rotating main rotor blade.	1 fatal				

Table 7. Details of eight Accidents removed from the Dataset					
Event ID	Narrative Portion / Notes	Injuries			
20100525X54249	During the descent the helicopter hit unseen power lines on its left side, breaking the power lines and seriously injuring the passenger in the left seat. Note: the NTSB public docket for this accident described the passenger's injuries as 3rd degree burns on his shoulder and his calf. Presumably these were from the power line since there is no mention	1 serious			
	nor documentation of a post-crash fire				
20071227X01994	While walking toward the unoccupied helicopter, the pilot was struck by the idling main rotor.	1 fatal			
20081014X22933	The paramedic had been struck by the main rotor blades.	1 fatal			
20140408X81146	The hoist operator was unable to release the hoist cable quickly enough to prevent pulling the ship pilot off the deck and had to cut the cable. The ship pilot fell a few feet to the deck and fractured his scapula.	1 serious			
20110830X71207	The wing walker subsequently fell, impacting a grass area within the air show performance area. Both aircraft involved landed safely after the accident, without damage to either aircraft.	1 fatal			
20150428X84204	The hoist operator stated that the spin had almost stopped, and he noticed that the flight nurse was riding in a position lower than normal. The flight nurse then fell from the line.	1 fatal			

Table 8. NTSB Database Records with Duplicate Injury Reporting											
Event ID Make Model DESCRIPTION		NTSB Database Injuries				Corrected Injuries					
				F	s	м	Ν	F	S	м	Ν
20080715X01051	Bell	407	Two 407's struck midair	7				3			
20080715X01051	Bell	407	Two 407's struck midair	7				4			
20090202X21409	Robinson	R22	R-22 and T-6G on runway				4			2	
20070614X00722	Robinson	R22 Beta	R-22's collided on runway				4				2
20070614X00722	Robinson	R22 Beta	R-22's collided on runway				4				2
20120220X14409	Robinson	R22 Beta	R22 midair with Beechcraft				3				1
20150129X05038	Robinson	R22 Beta	R22 midair with Piper PA-28				4				2
20141023X01333	Robinson	R44 II	R44 midair with Cirrus SR22	3		1	1	3			
Totals				17	0	1	20	10	0	2	7

Valuation of Injuries

There is presently little data on the economic and non-economic costs of injuries including fatal injuries, to occupants involved in helicopter crashes. Because there is a lack of research in this area, this analysis relies heavily upon, and uses direct content from, <u>Economic Values for FAA</u> <u>Investment and Regulatory Decisions, A Guide - Final Report</u>, Sept. 2015, and <u>The Economic & Societal Impact of Motor Vehicle Crashes, 2010 (Revised)</u>, L. Blincoe, et al, 2015. While the

latter document is specific to injuries sustained in motor vehicle crashes, the methods and figures utilized to make calculations are relevant to the discussion of occupant injuries sustained in helicopter crashes. It is important to consider, however, that the accuracy of these figures will be impacted by the lack of specific data on injury level in the NTSB database. Consequently the true costs of injury in rotorcraft crashes are likely underestimated in this report.

Value of Life

The benefit of preventing a fatality is measured by what is conventionally called the Value of a Statistical Life (VSL), defined as the additional cost that individuals would be willing to bear for improvements in safety (that is, reduction in risks) that, in the aggregate, reduce the expected number of fatalities by one. This conventional terminology has often provoked misunderstanding on the part of both the public and decision-makers. What is involved is not the valuation of life as such, but the valuation of reduction in risks.

The VSL is a measure of the implied value consumers place on their lives as revealed by the price they are willing to pay to avoid risk of death. A wide range of estimates of the value of VSL have been derived from numerous studies conducted over the past three decades. These "willingness to pay" studies (WTP) are most frequently based on wage rate differentials for risky jobs, or on studies of the prices consumers pay for products that reduce their risk of being fatally injured.

From an analysis conducted in 2015, the Office of the Secretary of Transportation (OST) guidance suggests that \$9.4 million be used as the current estimate for the VSL, measured in 2014 dollars. To address the issue of uncertainty, OST noted that the value ranges from \$5.2 million to \$13 million should be used when conducting sensitivity analysis.

Value of Injuries

Nonfatal injuries are far more common than fatalities and vary widely in severity, as well as probability. OST guidance has established a procedure for valuing averted injuries based on the current value of life and the Maximum Abbreviated Injury Scale (MAIS). MAIS is a comprehensive system for rating the severity of accident related injuries recognizing the six levels of injury severity in the Abbreviated Injury Scale (AIS). It classifies nonfatal injuries into five categories (1-5) depending on the short-term severity of the injury in terms of risk of death for that particular injury. A sixth category corresponds to injuries that are considered "maximum" and almost always result in death. For practical reasons, a person is counted as fatal if his injuries result in death 30 days after the accident, since FAA and NTSB usually do not follow-up beyond that period. MAIS is determined on an injured individual as the highest AIS level of injury that person suffered. MAIS does not consider the risk of death for the combined injuries a person may suffer. Table 9 provides sample injuries based on MAIS for reference.

One barrier to accurately ascertaining the cost of injuries sustained in helicopter crashes is the inconsistency between the AIS/MAIS scale utilized by The National Highway Safety Administration (NHTSA), and the less comprehensive scale used by the NTSB. The NTSB scale

utilizes only four categories: fatal, serious, minor, and none. There is no direct relationship between the scale used by the NTSB and the more extensive and widely used AIS and MAIS utilized by NHTSA. Per the NTSB Form 6120.1, the definitions of fatal and severe injuries are as follows:

Table 9.	Table 9. Selected Sample of injuries by the Abbreviated injury Scale (MAIS)					
MAIS	Injury Severity	Selected Injuries				
1	Minor	Superficial abrasion or laceration of skin, digit sprain, first-degree burn; head				
		trauma with headache or dizziness (no other neurological signs).				
2	Moderate	Major abrasion or laceration of skin, cerebral concussion (unconscious less than				
		15 minutes), finger or toe crush/amputation. Closed pelvic fracture with or				
		without dislocation.				
3	Serious	Major nerve laceration; multiple rib fracture (but without flail chest); abdominal				
		organ contusion; hand, foot, or arm crush/amputation.				
4	Severe	Spleen rupture; leg crush; chest-wall perforation; cerebral concussion with				
		other neurological signs (unconscious less than 24 hours).				
5	Critical	Spinal cord injury (with cord transection); extensive second- or third-degree				
		burns; cerebral concussion with severe neurological signs (unconscious more				
		than 24 hours).				
6	Maximum	Currently untreatable injuries such crushed skull with loss of skull contents or				
		destruction of the heart.				

"Fatal injury" refers to any injury that results in death within thirty days of the accident.

"Serious injury" means any injury that (1) requires hospitalization for more than 48 hours, commencing within 7 days from the date the injury was received; (2) results in a fracture of any bone (except simple fracture of fingers, toes, or nose); (3) causes severe hemorrhages, nerve, muscle, or tendon damage; (4) involves injury to any internal organ; or (5) involves second- or third-degree burns, or any burns affecting more than 5 percent of the body surface.

It should be noted that it is likely that injuries are under reported. There are anecdotal examples of occupants whose injuries were not immediately apparent, but caused disability beyond the immediate post-crash timeframe such as neck strains and other musculoskeletal injuries. Even "minor" injuries can be career ending for those who work in aviation or physically challenging occupations. Another major complex of problems faced by crash survivors are psychological. The occurrence of Post-Traumatic Stress Disorder (PTSD) related issues is either not reported or under reported in the wake of crashes and may require additional research. Unmitigated PTSD can have costly ramifications; whereas, if identified and treated early, PTSD can be managed effectively with far less costly consequences. Further, addiction to pain medications can arise as people try to manage their pain from injuries, leading to another costly variable.

To establish a valuation for each MAIS injury severity level, the MAIS level can be related to the loss of quality and length of life resulting from an injury typical of that level. This loss is expressed as a fraction of the value placed on an avoided fatality. These disutility factors are reported in Table 10 along with their corresponding dollar values (based on a \$9.4 million VSL). The fractions shown in column 3 of Table 10 should be multiplied by the current VSL to obtain the values of preventing injuries of the types affected by the government action being analyzed. For example, if an analyst were seeking to estimate the value of a "serious" injury (MAIS 3), he or she would

multiply the fraction of VSL for a serious injury (0.105) by the VSL (\$9.4 million) to calculate the value of the serious injury (\$987,000). Values for injuries in the future would be calculated by multiplying these fractions of VSL by the future values of VSL as defined above.

Table 10. Relative Disutility Factors by Injury Severity Level					
MAIS Code	Description	Fractional Fatality Values Value of Life	Dollar Value		
1	Minor	0.003	\$28,200		
2	Moderate	0.047	\$441,800		
3	Serious	0.105	\$987,000		
4	Severe	0.266	\$2,500,400		
5	Critical	0.593	\$5,574,200		
6	Maximum	1.000	\$9,400,000		
The disutility factors or fractions are based on work conducted by Rebecca S. Spicer and Ted R. Miller "Final					
Report to the National Highway Traffic Safety Administration Uncertainty Analysis of Quality Adjusted Life Years					
Lost "Pacific Institute for Research and Evaluation. February 5" 2010.					

Although the methodology specified above should be used when possible, aviation injury data is often incomplete and/or unavailable at the MAIS level. Most frequently, aviation injuries are reported by the number of victims suffering "serious" and "minor" injuries as reported by the NTSB and defined by the International Civil Aviation Organization (ICAO). Under this classification, serious injury victims are typically those with at least one injury at MAIS 2 or higher, whereas minor injury victims typically have injuries at the MAIS 1 level only.

To calculate economic values for the ICAO serious injury categories, the Office of Aviation Policy and Plans (APO) took a simple average of the disutility factors for MAIS 2 through MAIS 5 and used these values to create a simple average level of disutility.⁷ These values were then applied to current VSL to estimate the value of preventing serious injuries as defined by ICAO. Table 11 reports these values along with those values where there is direct match in terminology between MAIS Codes and the NTSB Classifications. Values for injuries in the future would be calculated by multiplying these modified Fractional Fatality VSLs by the future values of VSL as described in the formula above.

Table 11. Recommended Injury Values Based on the NTSB Classification of injuries.									
MAIS Code	NTSB Classification	Modified Fractional Fatality Dollar Value Values of Life							
MAIS 1 – Minor	Minor	0.003	\$28,200						
MAIS 2 – Moderate									
MAIS 3 – Serious	Carious	0.252	¢2 270 200						
MAIS 4 – Severe	Serious	0.253	\$2,378,200						
MAIS 5 – Critical									
MAIS 6 – Fatal	Fatal	1.000	\$9,400,000						

As the injury data for victims of helicopter crashes are generally unavailable in the NTSB record and definitely not at the MAIS level, for the purposes of this paper we will be utilizing the values

⁷ It should be noted, however, that the recommendation of the author of the NHTSA paper, Larry Blincoe, is to use a weighted average rather than a simple average. The values reflected in this paper utilize the simple average. For future study, a weighted average should be considered since it is probably more accurate.

in Table 10 to determine the costs of injuries and fatalities. There are limitations to this approach, but because of the lack of data it appears to be the most reasonable approach possible at this time.

Non-Economic Considerations

Economic costs represent only one aspect of the consequences of helicopter crashes. People injured in these crashes often suffer physical pain and emotional anguish that is beyond any economic recompense. The permanent disability of burns, spinal cord damage, loss of mobility, and serious brain injury can profoundly limit a person's life, resulting in dependence on others for routine physical care and activities of daily life. More commonly, less serious injuries, can cause physical pain and limit a victim's physical activities for years after the crash. Serious burns or lacerations can lead to long-term discomfort and the emotional trauma associated with permanent disfigurement. For an individual, these non-monetary outcomes can be the most devastating aspect of surviving a helicopter crash.

The family and friends of the victim feel the psychological repercussions of the victim's injury acutely as well. Caring for an injured family member can be very demanding for others in the family, resulting in economic loss and emotional burdens for all parties concerned. It can change the very nature of their family life and the emotional difficulties of the victim can affect other family members and the cohesiveness of the family unit. When a crash leads to death, the emotional damage is even more intense, affecting family and friends for years afterward and sometimes leading to the breakup of previously stable family units.

Action taken by society to alleviate the individual suffering of its members can be justified in and of itself; in order to increase the overall quality-of-life for individual citizens. In this context, economic benefits from such actions are useful to determine the net cost to society of programs that are primarily based on humane considerations. If the focus of policy decisions was purely on the economic consequences of helicopter crashes, the most tragic, and, in both individual and societal terms, possibly the most costly aspect of such crashes would be overlooked.⁸

Benefit Based on Overall Dataset Review

The dataset supporting this effort was filtered to allow a binary overall comparison between fully compliant and all non-fully complaint (including partially compliant) rotorcraft accidents (Table 12). This simple approach allows direct comparison of occupant injury rates between the two groups, but has the following limitations:

• NTSB accident data does not include crash kinematics information (impact velocities, impact attitude, etc.). Crash kinematics greatly affect crash performance and occupant injury levels. For instance the NTSB database does not distinguish between a crash with minor structural deformation and a high velocity impact with the ground resulting in total destruction of the aircraft. The introduction of crash safety upgrades alone is not expected to significantly influence the crash kinematics; however, crash kinematics are often platform dependent.

⁸ The Economic and Societal Impact Of Motor Vehicle Crashes, 2010 (Revised), pg. 1-21

- A large quantity of data (number of crashes) is required so that the crash kinematics extremes and injury cost extremes will be statistically identical when comparing different models of rotorcraft.
- Other rotorcraft features other than those governed by 27/29.561, 27/29.562, 27/29.785, and 27/29.952 can influence injury rates during a crash. This would include such factors as landing gear energy absorption, propensity to rollover during a crash, blade strike potential, occupant shell crushing strength (from barrier impact), and other factors.

Table 12.	Table 12. Accident and Injury Summary, Grouped by Compliance Level														
Maka	Model	Comp	liance I	_evel		Total	Total	Fatal		Serio	us	Mino	r	None	:
IVIAKE	would	.561	.562	.785	.952	Incdt	Occpt	No.	Pct	No.	Pct	No.	Pct	No.	Pct
Agusta	A109S	С	С	С	С	0	0	0	0%	0	0	0	0	0	0
Agusta	AW139	С	С	С	С	1	2	0	0	1	50.0%	0	0	1	50.0%
Agusta	AW189	С	С	С	С	0	0	0	0	0	0	0	0	0	0
Airbus	BK117	С	С	С	С	4	13	0	0	0	0.0%	0	0	13	100.0%
Airbus	EC120	С	С	С	С	7	17	8	47.1%	0	0.0%	3	17.6%	6	35.3%
Airbus	EC130	С	С	С	С	0	0	0	0	0	0	0	0	0	0
Airbus	EC135	С	С	С	С	3	9	1	11.1%	0	0	3	33.3%	5	55.6%
Bell	429	С	С	С	С	1	4	0	0	0	0	0	0	4	100.0%
Robinson	R66	С	С	С	С	5	11	8	72.7%	0	0	0	0	3	27.3%
Sikorsky	S-92	С	С	С	С	0	0	0	0	0	0	0	0	0	0
Subtotal Fi	ully Compli	ant				21	58	19	32.8%	1	1.7%	6	10.3%	32	55.2%
Agusta	A109	С	Ν	Ν	Ν	8	22	8	36.4%	4	18.2%	0	0	10	45.5%
Agusta	A119	С	Ν	Ν	Ν	3	11	0	0.0%	0	0	0	0	11	100.0%
Airbus	EC155	Р	Р	Ν	Ν	0	0	0	0	0	0	0	0	0	0
Airbus	EC225	Р	Ν	Ν	Ν	0	0	0	0	0	0	0	0	0	0
Airbus	AS332	Р	Ν	Ν	Ν	0	0	0	0	0	0	0	0	0	0
Airbus	AS350	Р	Р	Р	Ν	44	102	20	19.6%	9	8.8%	15	14.7%	58	56.9%
Airbus	AS355	Р	Р	Р	Ν	0	0	0	0	0	0	0	0	0	0
Airbus	AS365	Р	Ν	Ν	Ν	0	0	0	0	0	0	0	0	0	0
Bell	206L4	Ν	Ν	Ν	Р	19	41	13	31.7%	4	9.8%	1	2.4%	23	56.1%
Bell	407	Ν	Ν	Р	Ρ	38	96	25	26.0%	7	7.3%	14	14.6%	50	52.1%
Bell	412	Р	Р	Р	Ρ	4	22	13	59.1%	0	0.0%	7	31.8%	2	9.1%
Enstrom	F-28	Ν	Ν	Ν	Ν	21	34	0	0.0%	4	11.8%	4	11.8%	26	76.5%
Enstrom	280	Ν	Ν	Ν	Ν	13	24	2	8.3%	4	16.7%	4	16.7%	14	58.3%
Enstrom	480	Ν	Ν	Ν	Р	2	3	1	33.3%	0	0.0%	0	0.0%	2	66.7%
MDHI	MD900	Р	С	С	С	2	5	0	0.0%	0	0.0%	1	20.0%	4	80.0%
MDHI	600N	Ν	Ν	Ν	С	8	19	4	21.1%	4	21.1%	7	36.8%	4	21.1%
MDHI	369	Ν	Ν	Ν	Ν	44	109	12	11.0%	17	15.6%	24	22.0%	56	51.4%
MDHI	500N	Ν	Ν	Ν	Ν	4	11	0	0.0%	0	0.0%	1	9.1%	10	90.9%
Robinson	R22	Р	Ν	Р	Р	219	376	28	7.4%	26	6.9%	76	20.2%	246	65.4%
Robinson	R44	Р	Ν	Р	Р	194	417	77	18.5%	46	11.0%	70	16.8%	224	53.7%
Sikorsky	269	Ν	Ν	Ν	Ν	129	221	12	5.4%	18	8.1%	46	20.8%	145	65.6%
Sikorsky	S-76	Р	Ν	Ν	Ν	11	68	11	16.2%	3	4.4%	2	2.9%	52	76.5%
Subtotal Partial/Non-Compliant				763	1581	226	14.3%	146	9.2%	272	17.2%	937	59.3%		
Overall Total				784	1639	245	14.9%	147	9.0%	278	17.0%	969	59.1%		

Table 12 provides the summary data comparing injury rates for the fully compliant and all nonfully complaint rotorcraft accidents. Of the total only 2.7 percent (21 accidents of 785 total) involved aircraft that are fully compliant. Evaluating data with so few data points results in a relatively high margin of error.

While the number of accidents with full crash safety compliance is relatively low, an increased number of accidents may not lead to decreased injury rates as recorded by the NTSB when compared to the non-fully complaint rotorcraft. Some additional issues to consider include:

- The low fidelity of the NTSB injury levels tend to mask significant improvements even though costly injuries may be avoided. Consider a crash severe enough to cause occupant spinal compressive fracture and consequent paraplegia. Introduction of an energy absorbing (EA) seat may prevent the spinal fracture in a similar crash, but less severe injuries (such as a broken arm) are still likely. In this a case, the EA seat is providing significant injury reduction value (paraplegia vs. broken arm), but both injuries would be reported as "serious" implying that there is little to no benefit to an EA seat.
- Low severity crashes are more likely to cause substantial damage in early compliant 27/29.561 rotorcraft. As low severity crashes generally cause lower occupant injuries, this may lead to the false conclusion that these rotorcraft would not benefit from increased crash safety (i.e., have a low injury rate due to inclusion of low severity accidents).

Benefits of Implementing 27/29.952 Compliance

Due to the low number of Part 29 certificated rotorcraft, both Part 27 and Part 29 certified rotorcraft are examined collectively. Only the Bell 412, Sikorsky S-76 and the Airbus H155, H215 and H225 are certified to Part 29. None the less, the NTSB data can be used to show the capability of the Crash Resistant Fuel System (CRFS) to reduce fire during a crash event. As shown in Table 13 only two out of 30 accidents (6.7%) involving compliant rotorcraft had a ground fire. In addition, there were six other accidents with no survivors that were considered non-survivable by the ROPWG due to their significant impact velocity. Table 14 shows excerpts from the narratives for these six accidents. The three non-survivable accidents in Table 14 without fire indicate that the 27/29.952 compliant CRFS are preventing ground fires in severe accidents at least up to the survivability level of these rotorcraft.

If data from Textron Bell Helicopter whose aircraft include bladder-equipped fuel systems including the Bell 206, 412 and the Bell 407 are added to the analysis in Table 13, there are 90 total accidents of 27/29.952 compliant rotorcraft in the dataset. It should be pointed out that only the Bell 407 is nearly compliant, whereas the Bell 206 and 412 have bladders only. These bladders reportedly meet the 50 foot drop standard. Although not fully compliant, these aircraft are closer to compliance than rotorcraft without fuel bladders. Based on this assumption, verified by a previous study showing a 50 percent decrease in post-crash fires for Bell 206 models after the bladders were integrated, the ROPWG felt that the bladder-equipped aircraft should be considered.⁹ These 90 accidents including full and partially 27/29.952 compliant are illustrated in Table 15 due to the minimal amount of data available for Part 29 crashes. To separate the two

⁹ Hayden, M.S. et al. Crash-resistant fuel system effectiveness in civil helicopter crashes. Aviat Space Environ Med 2005; 76:782-5

certification Parts at this time would cause significant data dilution. Aircraft certified to Part 29 standards include the Bell 412, Sikorsky S-76 and the Airbus H155, H215, and the H225. This analysis brings the total number of ground related fires to six (6.7%). Five (5) of these accidents did not have survivors, and in the other incident (N607BP), both the pilot and passenger exited with minor or no injury.

Table 13. 27/29.952 Compliant Rotorcraft Injuries and Fires										
Make	Model	Event ID	Reg. No.	Fatal	Serious	Minor	None	Fire		
AgustaWestland	AW139	20121023X30148	N385RH		1		1	NONE		
Airbus	EC135	20151119X93456	N36RX				5	NONE		
Airbus	EC120	20060516X00584	N514AL			1		NONE		
Airbus	EC120	20061226X01846	N171AE				2	NONE		
Airbus	EC120	20091016X45106	N871SA	3				NONE		
Airbus	EC120	20111005X91033	N3925A			2		NONE		
Airbus	EC120	20120726X62312	N8899	3			1	NONE		
Airbus	BK117	20110105X95224	N854EC				3	NONE		
Airbus	EC135	20080612X00843	N238AM			3		NONE		
Airbus	EC135	20080520X00702	N135UW	3				NONE		
Airbus	BK117	20110113X14327	N145SM				3	NONE		
Airbus	BK117	20120724X52626	N455MH				3	NONE		
Airbus	BK117	20130215X30422	N481LF				4	NONE		
Airbus	EC120	20070307X00258	N491AE				3	NONE		
Airbus	EC120	20070223X00214	N690WR	2				NONE		
Bell	429	20150901X73122	N429AR				4	NONE		
MDHI	900	20141204X91829	N902LC			1	2	NONE		
MDHI	900	20060403X00379	N912LH				2	NONE		
MDHI	600N	20090220X14000	N608BP		2	1		NONE		
MDHI	600N	20091013X04846	N613BP			1	1	NONE		
MDHI	600N	20070328X00342	N451DL				2	NONE		
MDHI	600N	20080410X00451	N160KC			2		NONE		
MDHI	600N	20120808X44331	N737TV	1				NONE		
MDHI	600N	20140427X71558	N606BP		1	2		NONE		
MDHI	600N	20151208X01729	N607BP			1	1	GRD		
Robinson	R66	20110713X53504	N810AG	2				NONE		
Robinson	R66	20130728X45845	N646AG	5				NONE		
Robinson	R66	20111001X63448	N266CY	1				GRD		
Robinson	R66	20141222X43102	N64HF				1	NONE		
Robinson	R66	20141105X83801	N67GA				2	NONE		

Table 14. Narrative Summary for 27/29.952 Compliant Rotorcraft with no Survivors									
Event ID	Narrative Excerpt / Summary	Crash Severity / CRFS Result							
20091016X45106	The accident occurred in the Dominican Republic. The NTSB has no additional details about the event published on their website.	Unknown crash severity No ground fire							
20080520X00702	The helicopter had impacted trees along a sparsely populated ridgeline with 50- to 60-foot tall trees in the area initially struck by the helicopter. Distribution of the wreckage was consistent with the helicopter impacting the trees in a nearly level flight attitude under controlled flight. The cockpit and cabin areas were completely compromised.	Considered non-survivable. No ground fire							
20070223X00214	The helicopter and its occupants were later located and recovered from 101 feet of water, approximately 2,900 feet from the platform. An autopsy of the pilot listed the cause of death as "multiple blunt force trauma."	While considered a severe crash, unable to determine if CRFS performed properly as fires after water impact are rare							
20110713X53504	The accident occurred in the country of Colombia. The NTSB credits the foreign authority as the source for the following information: A Robinson Helicopter Company R66 collided with terrain near Girardot, Colombia. The helicopter sustained substantial damage, and the commercial pilot and one passenger were fatally injured.	Considered non-survivable. No ground fire							
20130728X45845	Major parts of the helicopter consisting of the main rotor assembly, mast, transmission, tail rotor assembly, and horizontal and vertical stabilizers were separated from the helicopter and located along the energy path southwest of the resting portion of the main wreckage. Numerous cockpit and cabin furnishings as well as cockpit and cabin doors, landing gear pieces, and personal effects were also located along the energy path.	Considered non-survivable. No ground fire.							
20111001X63448	The helicopter was on a cross-country flight when it experienced a separation of the main rotor mast 8 inches below the teeter bolt, and the main rotor blade assembly separated from the flying helicopter. A ground observer estimated the helicopter to be flying 1,000 ft. AGL about 30 seconds prior to the accident.	Considered non-survivable. Included ground fire.							

Table 15. 2	Table 15. 27/29.952 Compliant and Partial Compliant (Bell only) Rotorcraft Injuries and Fires										
Make	Model	Event ID	Reg. No.	Fatal	Serious	Minor	None	Fire			
Agusta	AW139	20121023X30148	N385RH		1		1	NONE			
Airbus	EC135	20151119X93456	N36RX				5	NONE			
Airbus	EC120	20060516X00584	N514AL			1		NONE			
Airbus	EC120	20061226X01846	N171AE				2	NONE			
Airbus	EC120	20091016X45106	N871SA	3				NONE			
Airbus	EC120	20111005X91033	N3925A			2		NONE			
Airbus	EC120	20120726X62312	N8899	3			1	NONE			
Airbus	BK117	20110105X95224	N854EC				3	NONE			
Airbus	EC135	20080612X00843	N238AM			3		NONE			
Airbus	EC135	20080520X00702	N135UW	3				NONE			
Airbus	BK117	20110113X14327	N145SM				3	NONE			
Airbus	BK117	20120724X52626	N455MH				3	NONE			
Airbus	BK117	20130215X30422	N481LF				4	NONE			

Table 15. 27/29.952 Compliant and Partial Compliant (Bell only) Rotorcraft Injuries and Fires										
Make	Model	Event ID	Reg. No.	Fatal	Serious	Minor	None	Fire		
Airbus	EC120	20070307X00258	N491AE				3	NONE		
Airbus	EC120	20070223X00214	N690WR	2				NONE		
Bell	206	20090310X83102	N410RL				1	NONE		
Bell	206	20140912X72236	N64AW				2	NONE		
Bell	206	20150101X15630	N57AW	2				NONE		
Bell	206	20081013X24743	N6ZV	2				GRD		
Bell	206	20130620X92326	N467AE				3	NONE		
Bell	206	20140612X31159	N207MY	2				NONE		
Bell	206	20150604X51830	N73AW				1	NONE		
Bell	206	20060207X00171	N225GH				2	NONE		
Bell	206	20080821X01273	N94PD				2	NONE		
Bell	206	20081211X45825	N180AL	5				NONE		
Bell	206	20070824X01235	N1813		2	1		NONE		
Bell	206	20071227X01999	N95CH				4	NONE		
Bell	206	20090309X04818	N863H	1				NONE		
Bell	206	20110303X04000	N154MW				1	NONE		
Bell	206	20110513X45549	N266P		2		1	NONE		
Bell	206	20120529X90616	N7077F	1				NONE		
Bell	206	20130514X15720	N2036F				2	NONE		
Bell	206	20130606X65516	N720RL				2	NONE		
Bell	206	20140521X35335	N55SL				2	NONE		
Bell	407	20060913X01334	N407SH				1	NONE		
Bell	407	20061109X01634	N407KH				3	IFLT		
Bell	407	20061222X01838	N407JJ	2				NONE		
Bell	407	20071108X01772	N407LL				3	NONE		
Bell	407	20080122X00087	N801DS				2	NONE		
Bell	407	20080613X00858	N416PH	4			_	NONE		
Bell	407	20080715X01051	N407GA	3				GRD		
Bell	407	20080715X01051	N407MJ	4				NONE		
Bell	407	20081223X62856	N407GB		1			NONE		
Bell	407	20090311X25311	N2592T				4	NONE		
Bell	407	20090505X03225	N164RL				1	NONE		
Bell	407	20090925X05043	N6040Y				2	NONE		
Bell	407	20100512X45440	N31VA				2	NONE		
Bell	407	20101122X91647	N408UH				3	NONE		
Bell	407	20111214X21335	N8067Z			5		NONE		
Bell	407	20120216X03340	N407HL	1	2			NONE		
Bell	407	20120324X31438	N31PB			2		NONE		
Bell	407	20120414X64253	N509MT			1		NONE		
Bell	407	20120826X42003	N407N	1				NONE		
Bell	407	20120831X72351	N11SP			1		NONE		
Bell	407	20121005X04242	N406AL	1				NONE		
Bell	407	20121010X63824	N108MF	2	1			NONE		
Bell	407	20130101X65128	N534MT				4	NONE		
Bell	407	20130531X95830	N407HC				4	NONE		

Table 15. 27/29.952 Compliant and Partial Compliant (Bell only) Rotorcraft Injuries and Fires										
Make	Model	Event ID	Reg. No.	Fatal	Serious	Minor	None	Fire		
Bell	407	20130815X95202	N53LP			3		NONE		
Bell	407	20140912X71805	N142MA			1		NONE		
Bell	407	20150609X15345	N501PH				5	NONE		
Bell	407	20151104X14945	N496AE				3	NONE		
Bell	407	20121226X70416	N489AE				3	NONE		
Bell	407	20140508X30821	N407MH				3	NONE		
Bell	407	20150309X04646	N41BH				2	NONE		
Bell	407	20151104X84701	N420PH				1	NONE		
Bell	407	20151211X13514	N408FC	4				NONE		
Bell	407	20150702X05414	N311RL		1			NONE		
Bell	407	20130423X65502	N937GR				3	NONE		
Bell	407	20130102X35708	N445MT	3				GRD		
Bell	407	20091228X85137	N600CE		2	1		NONE		
Bell	407	20130102X23415	N407KS				1	NONE		
Bell	412	20100923X80619	N412PD			6		NONE		
Bell	412	20150819X23543	N412LA			1	2	NONE		
Bell	412	20061220X01815	N410MA	3				GRD		
Bell	429	20150901X73122	N429AR				4	NONE		
MDHI	900	20141204X91829	N902LC			1	2	NONE		
MDHI	900	20060403X00379	N912LH				2	NONE		
MDHI	600N	20090220X14000	N608BP		2	1		NONE		
MDHI	600N	20091013X04846	N613BP			1	1	NONE		
MDHI	600N	20070328X00342	N451DL				2	NONE		
MDHI	600N	20080410X00451	N160KC			2		NONE		
MDHI	600N	20120808X44331	N737TV	1				NONE		
MDHI	600N	20140427X71558	N606BP		1	2		NONE		
MDHI	600N	20151208X01729	N607BP			1	1	GRD		
Robinson	R66	20110713X53504	N810AG	2				NONE		
Robinson	R66	20130728X45845	N646AG	5				NONE		
Robinson	R66	20111001X63448	N266CY	1				GRD		
Robinson	R66	20141222X43102	N64HF				1	NONE		
Robinson	R66	20141105X83801	N67GA				2	NONE		

Fatality Reduction for 27/29.952 Compliance

For the non-compliant rotorcraft inclusive of both Parts 27 and 29, all fatalities during accidents with ground fires would not be prevented with introduction of a CRFS since an unknown portion of crashes are non-survivable. A recent FAA study evaluated the cause of pilot and pilot-certificated passenger fatalities in accidents where detailed autopsy data was available.¹⁰ Pilots and pilot rated passengers were chosen because FAA only has autopsies performed on those individuals. Other passengers are not autopsied unless the local medical jurisdictional authority

¹⁰ Roskop, Lee. "Post-Crash Fire and Blunt Force Fatal Injuries in U.S. Registered, Type Certificated Rotorcraft", Presentation by the FAA Safety Management Group, November 2015.

elects to perform additional autopsies at local expense. The accident data covered a five year span from October, 2008, to September, 2013, a representative subset of the same dataset reviewed for this project. The FAA study found at least 23.5% of the pilots and pilot-certificated passengers who were occupants in fatal accidents where the helicopter did not have a crash resistant fuel system and a post-crash fire occurred suffered fatal thermal injuries. Other occupants were not considered, but it was assumed that they would have approximately the same percentage of fatal thermal injuries. This analysis combines both Part 27 and Part 29 certified rotorcraft.

As previously discussed, a fully 27/29.952 compliant CRFS is expected to prevent post-crash fires up through the occupant survivable limit. Therefore, implementation of CRFS is expected to provide at least a 23.5 percent fatality reduction. This value is very close to the 26 percent reduction projected in the 27/29.952 Final Rule in 1994.¹¹ This result adds credibility to the Final Rule methodology of estimating the reduction in occupant fatalities by incorporating CRFS into rotorcraft. Filtering the dataset found a total of 104 fatalities in 50 accidents with ground fire where the rotorcraft was not fully compliant to 27/29.952 (Table 16). Implementation of full compliance to either 27/29.952 is expected to prevent 24 of these fatalities (23.5 percent of 104).

Table 16. Non-Compliant 27/29.952 Rotorcraft Accidents with Ground Fire and at least one Fatality											
Event ID	Make	Model	F	S	М	Event ID	Make	Model	F	S	м
20140717X70001	Agusta	A109E	3			20080908X01405	Robinson	R44 II	2		
20151118X05037 ⁴	Airbus	AS350B3E	2			20080925X01525	Robinson	R44 II	2		
20150703X00859	Airbus	AS350B3E	1	2		20120119X92431	Robinson	R44 II	2		
20100728X92614	Airbus	AS 350 B3	3			20090920X34134	Robinson	R22 BETA	2		
20131022X92949	Airbus	AS 350 B3	3			20091017X64138	Robinson	R22 BETA	2		
20060813X01237	Airbus	AS-350-B3	4			20110627X51003	Robinson	R22 BETA	1		
20100325X93604	Airbus	AS-350-B3	3			20120910X05133	Robinson	R22 BETA	2		
20081013X24743	Bell	206	2			20071119X01805	Robinson	R44	3		
20080715X01051	Bell	407	3(1)			20090724X05537	Robinson	R44	4		
20061220X01815	Bell	412SP	3			20100705X12909	Robinson	R44	1		
20130102X35708	Bell	407	3			20110926X50902	Robinson	R44	2		
20150128X02848	Enstrom	280FX	2			20140910X82654	Robinson	R44	2		
20090626X94114	Enstrom	480B	1			20141202X73240	Robinson	R44	2		
20131007X44153	MDHI	369	1			20100205X21110	Robinson	R44 II	2		
20090724X13440	MDHI	369FF	0(2)	0(2)		20100717X71900	Robinson	R44 II	1	3	
20080201X00130	Robinson	R22 BETA	1			20100806X55641	Robinson	R44 II	2		
20080321X00357	Robinson	R22 Beta II	1			20121126X75106	Robinson	R44 II	1		
20060111X00044	Robinson	R44	3			20130525X61706	Robinson	R44 II	2		
20060208X00181	Robinson	R44	1			20140529X73728	Robinson	R44 II	1		

¹¹ Department of Transportation, Federal Aviation Administration. Airworthiness Standards; Crash Resistant Fuel Systems in Normal and Transport Category Rotorcraft. 14 CFR Parts 27 and 29; Docket No. 26352; Amendment No. 27-30, 29-35, 1994

Table 16. Non-Cor	Table 16. Non-Compliant 27/29.952 Rotorcraft Accidents with Ground Fire and at least one Fatality											
Event ID	Make	Model	F	S	М	Event ID	Make	Model	F	S	м	
20080128X00108	Robinson	R44	2			20150322X92548	Robinson	R44 II	3			
20080505X00592	Robinson	R44	1		1	20080722X01096	Sikorsky	269B	2			
20130403X65155	Robinson	R44	2			20150701X20227	Sikorsky	269C	2			
20060209X00187	Robinson	R44 II	1			20080710X01015	Sikorsky	269 C-1	2			
20060419X00461	Robinson	R44 II	2	2		20150702X24434	Sikorsky	269C	2			
20070405X00374	Robinson	R44 II	2			20130315X34542	Sikorsky	S-76A++	3			
20070808X01151	0070808X01151 Robinson R44 II 4 Total 104 7 1									1		
1) Was a mid-fl	ight collision	3 occupants ab	oard rot	torcraf	t with	round fire					•	

This accident was found to not have a ground fire. 3 fatalities and 1 serious injury removed

3) Part 29 aircraft are shaded; Sikorsky S-76A and Bell 412A. All others are Part 27.

4) Further information on this crash indicates that there were only sparks and not a post-crash fire. Elimination of this crash does not change the final statistic of 24 lives saved.

Injury Reduction for 27/29.952 Compliance

Review of the dataset showed only 10 accidents for non 27/29.952 compliant rotorcraft that had a ground fire and included at least one serious injury (Table 17). As any second degree burn or more severe is considered a serious injury, these 10 accidents should include all potential thermal injuries that did not result in a fatality

Table 17. Non-Compliant 27/29.952 Accidents with Ground Fire and Serious Injury									
Event ID	Make	Model	Fatal	Serious	Minor				
20150703X00859	Airbus	AS350B3E	1	2	0				
20140110X63030	Airbus	AS350B3	0	1	2				
20130728X04056	Enstrom	F-28A	0	1	1				
20130729X84808	MDHI	369E	0	2	0				
20090724X13440 ⁽¹⁾	MDHI	369FF	O ⁽¹⁾	O ⁽¹⁾	0				
20080529X00755	Robinson	R22 Beta II	0	1	1				
20060419X00461	Robinson	R44 II	2	2	0				
20100717X71900	Robinson	R44 II	1	3	0				
20100917X24222	Robinson	R44 II	0	2	0				
20080603X00779	Sikorsky	S-76A ⁽²⁾	0	2	0				
Total 4 16 4									
 (1) Accident review found no ground fire for this case (2) In this table, only the S-76A is certified to Part 29 									

A detailed review of these accidents showed that eight of the 16 serious injuries were thermally related (remaining eight were blunt trauma). MAIS scores were assigned for the eight thermally injured occupants, and the MAIS cost values previously shown in Table 10 were applied to determine the injury cost as illustrated in Table 18.

Table 18. Injury Value			
Event ID	Occupant No.	MAIS	Injury Value
20150703X00859	1	5	\$5,574,200
20120728204056	1	3	\$987,000
20130728804056	2	3	\$987,000
20080529X00755	1	3	\$987,000
20000410200401	1	5	\$5,574,200
20060419200461	2	6(1)	\$11,778,200 ⁽¹⁾
20100017824222	1	2	\$441,800
20100917824222	2	3	\$987,000
Total			\$27,316,400 ⁽²⁾
Notes:			

Occupant died after 18 months in the hospital. Valuation based on value of NTSB serious injury 1) (\$2,378,200) plus fatality value (\$9,400,000).

2) Average cost per thermal injury calculated to be \$3,414,550, however, due to the wide range of types of thermal injuries, the costs can range from the approximate equivalent of MAIS 3, \$987,000, to costs associated with prolonged hospitalization in a Burn ICU, which can reach tens of millions of dollars.

As described previously, all fires are expected to be prevented for survivable accidents with the introduction of 27/29.952 compliance. Therefore, all eight thermal injuries should be prevented by implementation of full 27/29.952 compliance.

Benefit of Implementing 27/29.561, 27/29.562, and 27/29.785 Compliance

There was insufficient data to permit division of Part 27 and Part 29 certified aircraft in this analysis. Simply put there are just a few rotorcraft certified to Part 29: Bell 412, Airbus H-155, H-215, H-225 and the Sikorsky S-76 representing less than one percent of the total airframe count. Combining the two certification standards (Part 27 and Part 29) still did not yield sufficient information in the current NTSB crash database to estimate the benefit of implementing the subject safety upgrades. Detailed information of the crash kinematics and occupant injuries will be required to make this assessment. Even if the improved data collection were to begin now, it may take several years to obtain the desired number of crash data points as there are relatively few fully compliant rotorcraft in operation today. For these reasons and because there is no new detailed crash data, ROPWG recommends that the injury reduction projections presented in the 27/29.562 Final Rule be utilized. Note that in the current analysis projections are based on the upgrades to 27/29.561, 27/29.562, and 27/29.785 inclusive.

The injury reduction projections presented in the 1994 Final Rule were based on years of research, and the methodology was well vetted by crash safety experts and industry representatives. Unfortunately, the projection has a broad range of 30 to 85 percent reduction in fatalities and injuries. Benefit values will be presenting for the extremes, with the understanding that a more precise value cannot be determined at this time.

Benefit Summary Calculations

The projected benefit value is calculated for all not fully compliant rotorcraft based on the expected net change in occupant injuries by implementation of full compliance to the current safety standards. Care must be taken to insure all occupants are accounted for. Table 19 and Table 20 provide the net benefit calculations for blunt trauma and thermal trauma utilizing the following procedure:

- 1. The NTSB occupant injuries were classified as thermal or blunt (all non-thermal considered blunt). Based on previously presented analysis, 23.5 percent of all fatalities in accidents with ground fire were expected to be thermally caused resulting in 24 thermal fatalities. There were eight serious injuries estimated to be thermally caused.
- 2. The benefit of introducing a CRFS was then applied. All thermally related fatalities became blunt severe injuries, and all thermal serious injuries became minor blunt injuries.
- 3. The benefit of introducing the Crash Resistant Seat and Structure (CRSS) was then applied at the FAA derived reduction value of 30 to 85 percent reduction in fatalities and injuries by calculating injuries at the two extremes (30% and 85%). The procedure of applying this benefit was as follows (using the 30 percent values in this example):
 - a. 30 percent of fatalities were reduced to serious injuries.
 - b. 30 percent of serious injuries were reduced to minor injuries.
 - c. No additional adjustments were made to minor injuries.
 - d. Serious thermal injuries estimated to be reduced to serious and minor blunt trauma were added into the blunt trauma calculation.
- 4. The net change in number of injuries was calculated by comparing the change in each injury category between the originally reported injuries and the calculated reduction in injuries incurred by introducing CRFS and CRSS (Tables 19 and 20).

Minor injuries were not reduced by introduction of CRSS based on the following rationale:

- Minor injuries are expected to be caused during low severity crashes by occupant flail and loading due to the deceleration of the crash event.
- During low severity crashes where non-CRSS helicopters produce minor injury, the CRSS will provide minimal benefit and will not eliminate most minor injuries, which are usually incurred through loading of the restraint system or limbs flailing into surrounding structure.

Table 19/	A. Calcu	lated Blunt Tra	uma Ber	nefit Value	e with 30%	Injury P	eduction				
Injury NTS	βB	Classification	Add CRFS	Add CRSS (30%)	Net	Value (EA)	Total Net Value				
Fatal	226	Blunt Trauma	202	202	141	-61	\$9,400,000	-\$573,400,000			
Serious	146	Blunt Trauma	138	162	174	36	\$2,378,200	\$85,615,200			
Minor	272	Blunt Trauma	272	280	329	57	\$28,200	\$1,607,400			
None	937	NO injury	937	937	937	0	\$0	\$0			
Total	Total 1581 1581 1581 Blunt Trauma Total Benefit -\$486,177,400										
CRFS = Crash Resistant Fuel System (full compliance to 27/29.952) CRSS = Crash Resistant Seat and Structure (full compliance to 27/29.561, 27/29.562, and 27/29.785)											

Table 19B. Calculated Thermal Benefit Value with 30% Injury Reduction								
Injury NTSB		Classification		Add CRFS	Add CRSS (30%)	Net	Value (EA)	Total Net Value
Fatal	226	Thermal	24	0	0	-24	\$9,400,000	-\$225,600,000
Serious		Thermal	8	0	0	-8	\$3,414,5501 (1)	-\$27,316,400
Minor	272	Thermal	272	280	329	57	\$0	\$0
None	937	No Injury	937	937	937	0	\$0	\$0
Total	1581		1581	1581	1581	Thermal Total Benefit-\$252,916,400		

CRFS = Crash Resistant Fuel System (full compliance to 27/29.952)

CRSS = Crash Resistant Seat and Structure (full compliance to 27/29.561, 27/29.562, and 27/29.785)

(1) Note: The average cost of a burn injury is based on Table 10.

Total Benefit for combined Blunt Trauma and Thermal CRFS AND CRSS: -\$739,093,800

Table 20A. Calculated Blunt Trauma Benefit Value with 85% Injury Reduction								
Injury NTSB		Classification		Add CRFS	Add CRSS (85%)	Net	Value (EA)	Total Net Value
Fatal	226	Blunt Trauma	202	202	30	-172	\$9,400,000	-\$1,616,800,000
Serious	146	Blunt Trauma	138	162	196	58	\$2,378,200	\$137,935,600
Minor	272	Blunt Trauma	272	280	418	146	\$28,200	\$4,117,200
None	937	No Injury	937	937	937	0	\$0	\$0
Total	1581		1581	1581	1581	Blunt Trauma Total Benefit -\$1,474,747,200		
CRFS = Crash Resistant Fuel System (full compliance to 27/29.952) CRSS = Crash Resistant Seat and Structure (full compliance to 27/29.561, 27/29.562, and 27/29.785)								

Table 20B. Calculated Thermal Benefit Value with 85% Injury Reduction								
Injury NTSB		Classification		Add CRFS	Add CRSS (85%)	Net	Value (EA)	Total Net Value
Fatal	226	Thermal	24	0	0	-24	\$9,400,000	-\$225,600,000
Serious	146	Thermal	8	0	0	-8	\$3,414,550(1)	-\$27,316,400
Minor	272	Thermal	272	280	418	\$0	\$0	\$0
No Injury	937	No Injury	937	937	937	\$0 \$0		\$0
Total	1581		1581	N/A	N/A	Thermal Total Benefit -\$252,916,400		
CRFS = Crash Resistant Fuel System (full compliance to 27/29.952)								
CRSS = Crash Resistant Seat and Structure (full compliance to 27/29.561, 27/29.562, and 27/29.785)								
Note: The average cost of a burn injury is based upon Table 13.								

As can be deduced from Tables 19 and 20, the total reduction in injury costs realized by full compliance of newly manufactured rotorcraft with current regulations over a 10-year period ranged from \$739M to \$1.7 billion based on the extremes of the predicted range of effectiveness of the CRSS estimated by the FAA (30% and 85%). Table 21 shows a simplified summary of costs and benefits.

Table 21. Cost/Benefit Summary					
 There were 763 accidents in 2006-2015 in the NTSB data set for non-compliant helicopter models still in production resulting in 226 fatalities and 146 serious injuries. There were only 21 crashes of fully compliant Rotorcraft resulting in 19 fatalities and 1 serious injury. 					
Benefits	<u>Costs</u>				
CRFS Pt. 27/29: \$253 Million	One-time Development Costs: >\$109.2 Million				
CRSS Pt. 27/29: \$739 Million (30%) to \$1.7 Billion (85%)	One time Development Costs: >\$143 Million				
	Recurring Costs: >\$167,000 per aircraft				
Note: All costs supplied by OEM's. See Table 5.					

Other Benefits

There are other significant potential benefits of implementing CRFS other than injury reduction savings for on-board occupants. Some examples from actual crash narratives include:

- 1. Fully compliant rotorcraft that crash will probably sustain less damage than non-compliant rotorcraft in some cases allowing the rotorcraft to be repaired and returned to operation at a fraction of the total loss cost.
- 2. "Many fixed-wing aircraft were parked on apron & 2 other helicopters were parked on grassy area at southern edge of asphalt apron."

There is significant potential for additional destruction of property if a fuel fire is involved, depending on where the crash occurs, as in this example, at an airport. There was potential for multiple other aircraft and property to be involved with an uncontained post-crash fire.

3. "The Aero-Med Sikorsky S-76 impacted the helipad atop the 11-story Spectrum Health Butterworth Hospital in downtown Grand Rapids. Patients on the seventh, eighth, and ninth floors were relocated to other floors due to damage from the fire, water runoff, and fuel leakage. There was also fuel that ran down a hospital elevator shaft."

Many helicopters frequent rooftop helipads. The impact of fuel leakage and/or post-crash fire on a hospital or other occupied structure is an important consideration. Although significant effort has been put into establishing robust fire suppression systems on rooftop helipads, uncontained fire fed by the aircraft's fuel system can have profound consequence to the structure and its occupants.

CONCLUSIONS/RECOMMENDATIONS

- 1. Primarily based on input from OEM's and suppliers, it is estimated that in implementing current Part 27/29 standards into all newly manufactured rotorcraft, each OEM would incur the following costs (Table 5):
 - a. The total one-time cost of complying with the current regulations for rotorcraft currently in production would be greater than \$252M.
 - b. Recurrent costs would be in excess of \$167,000 per rotorcraft produced.
 - c. This estimate includes only OEM costs.
 - d. Operators would also incur additional costs that are quite variable from operator to operator. In some cases, the operator costs would be considerable, if not unsustainable.
- 2. Most currently manufactured rotorcraft can meet the requirements of 27/29.952, however some rotorcraft will require structural changes and the increased weight and/or loss of fuel capacity that may render them obsolete.
- 3. A number of currently manufactured rotorcraft will require substantial structural modifications to meet the requirements of Part 27/29.561 and 27/29.562 (CRSS).
 - a. Such modifications may be too impractical and costly for the OEM to continue manufacturing some rotorcraft.
 - b. Discontinuation of a current model may force the involved OEM's to undergo the considerable expense and time required to design, test, and produce a replacement rotorcraft.
 - c. Loss of a current model rotorcraft may have a dramatic operational and/or economic impact on current operators of the discontinued models.
- 4. Adding the full CRSS requirements to existing production helicopters will be difficult, if not impossible for some platforms. However, the potential benefit may be significant. A systems approach to crash safety enhancement is required to achieve maximum benefit, i.e., installing an EA seat alone may not provide a significant benefit if the surrounding structure is not also enhanced.
- 5. Based on the ROPWG benefits analysis, the total reduction in injury and fatality costs realized by full compliance of newly manufactured rotorcraft with current regulations over

a 10-year period ranged from \$739M to \$1.7B based on the range of effectiveness of the CRSS (30-85%) estimated by the FAA (Tables 19 and 20).

- a. The ROPWG considers that costs of injuries and fatalities determined by the DOT grossly underestimate the actual costs of hospitalization, continued medical care and support to accomplish activities of daily living required by many injured patients.
- b. A significant finding of this project is that implementation of a CRFS compliant with 27/29.952 should eliminate most, if not all post-crash fires in survivable accidents. However, data for only three rotorcraft models in known high severity crashes was captured in the current database filter.
- c. Implementing CRFS alone would have saved over \$253M in thermal injury costs. This is based on an FAA study that showed that CRFS produces an estimated 23.5% reduction in fatalities (reduced to serious blunt trauma injury) as well as elimination of serious thermal injuries (reduced to minor trauma injuries). Thermal injuries require very long term and expensive medical care, suggesting that the "Relative Disutility Factors" may significantly understate the actual cost of such injuries. The non-economic factors of chronic pain and disfigurement also cannot be overstated. In addition, there are potential benefits to reducing ground fires, including limiting the damage to airframes and reducing collateral damage at the crash location. But even with possible underestimates of benefits, the cost-benefit analysis appears to be favorable with respect to CRFS alone. Implementation of CRFS is recommended.
- d. This analysis also does not include the huge psychological and physical burden placed on the patient, family and friends when an individual is seriously injured in a crash.
- 6. It is recommended that rotorcraft with partially compliant CRFS also be reviewed, to determine if partial 27/29.952 compliance is acceptable, and/or what portions of 27/29.952 compliance are most critical to preventing post-crash fire. Unfortunately, lack of crash kinematic data as well as specific injury data may make this task extremely difficult.
- 7. The current NTSB accident data collection is inadequate to accurately determine benefits provided by the introduction of crash safety upgrades. Detailed information on crash kinematics, occupant injuries, and injury causation for each crash will be required to make this determination. It is strongly recommended that the NTSB and/or FAA accident collection system be upgraded to allow more precise evaluation of crash safety performance.
- 8. The lack of impact data for the rotorcraft as well as detailed injury data for all occupants of the crash greatly inhibited the ROPWG analysis and, indeed, will undermine any cost/benefit analysis expected to determine reasonable new regulations to improve aircraft safety. The lack of data inhibits the identification of crashworthiness problems associated with specific aircraft and prevents effective rulemaking to improve safety in newly designed aircraft. If you cannot identify the problems, how can you fix them? Consequently, current regulatory changes are based more on anecdotal data and personal bias than on scientific, epidemiological data. The current system is totally inadequate for supporting meaningful rulemaking decisions!
- 9. Automotive safety has increased dramatically over the past decades compared to aviation safety. This is primarily because NHTSA has a vigorous surveillance program where a

statistical sample of crashed cars are studied in detail. Injuries, impact conditions and vehicle deformations are all carefully analyzed and recorded. Design and manufacturing problems are determined rapidly, although not always acted upon in a timely manner. NTSB/FAA should adopt a crash investigation/data collection process similar to that used by NHTSA, specifically the National Automotive Sampling System-Crashworthy Data System (NASS-CDS).

Membership Concurrence/Non-Concurrence with the ROPWG Report

All members of the ROPWG reported to the Chairman on concurrence/non-concurrence with the report. Eighteen (18) voting members gave full concurrence. One member representing Sikorsky, strongly non-concurred with the report. The following are the Sikorsky objections verbatim:

Sikorsky Aircraft strongly supports the goals of reducing helicopter accident rates and increasing survivability when an accident occurs. With those goals in mind, Sikorsky has reviewed the contents of the report, but does not concur. Please see the following comments:

- Sikorsky believes the report significantly understates implementation costs of the suggested changes;
- The Report has not demonstrated the basis of the purported derived safety benefits;
- The Report fails to consider and take into account the significant differences between Part 27 and Part 29 aircraft:
- 1. Part 27 Aircraft vs Part 29 Aircraft. Combining Part 27 and Part 29 aircraft does not promote accurate data analysis. To this point---Table 16 clearly highlights the significant difference between Part 27 and Part 29 aircraft statistics---only 6 of the 104 Fatalities are Part 29 aircraft. These may be attributable to other differences in the design (single vs dual engine, single vs dual pilot, larger aircraft, other safety related subsystems, etc.) or operational employment of the aircraft that should be considered as part of the overall fleet safety analysis and resultant conclusions/recommendations.
- 2. Statistical methods. The cost estimates exclude significant concerns, such as the operational impact of the reduced range/performance of the aircraft, requiring additional flights to accomplish the same mission requirements, leading to more exposure. Additionally, the reported statistics/metrics are not representative of the industry. Instead of a \$/incident cost/benefit numeration, it would be more appropriate to present the data as the cost or benefit per incident per flight-hours (\$/incident/Flight-hour) or the cost or benefit per incident per Seat-mile (\$/incident/Seat-mile).
- 3. Total Cost Summary. Sikorsky Aircraft believes that the Cost Analysis summary (page 29) of One Time: \$253M, Recurring cost: \$167,000/ac/year and Amortized cost: \$810,000/ac/year dramatically understates the actual cost of implementation notwithstanding the peripheral cost associated with replacement programs, DOC, etc. It would seem more appropriate to present a roll up of this cost. Assuming a 20 year total market of 300-400 aircraft/year, the total Cost is more accurately portrayed as \$1.25-1.5B.

Sikorsky agrees that accident survivability is a key helicopter concern and we design with that in mind. Sikorsky also believes, however, that accident prevention should be the primary focus. There is no need to survive an accident that never occurs. It is understood that the ARAC tasking may not have included the cost-benefit analysis of preventing mishaps in the first place, but Sikorsky strongly believes that the cost benefit relationship of preventing rotorcraft mishaps through technologies such as EGPWS/HTAWS, health usage monitoring systems, flaw tolerant parts, reduced pilot workloads is a far more compelling cost/benefit relationship.

APPENDIX A

ROPWG COMMITTEE MEMBERS

	NAME	COMPANY/REPRESENTING	Task Group	Position
1	Dennis F. Shanahan	Injury Analysis, LLC		Chair
2	Robert J. Rendzio	Safety Research Corporation of America (SRCA)	Benefits	Voting Member
3	Harold (Hal) L. Summers	Helicopter Association International	Benefits	Voting Member
4	Jonathan Archer	General Aviation Manufacturers Association (GAMA)	Benefits	Voting Member
5	Daniel B. Schwarzbach, SPO	Airborne Law Enforcement Association's (ALEA)	Benefits	Voting Member
6	Krista Haugen	Survivors Network for Air & Surface Medical Transport	Benefits	Voting Member
7	Joan Gregoire	MD Helicopters, Inc.	Costs	Voting Member
8	John Wittmaak	Bell Helicopter Textron, Inc.	Costs	Voting Member
9	Matthew Pallatto	Sikorsky	Costs	Voting Member
10	William Taylor	Enstrom Helicopter Corporation	Costs	Voting Member
11	Pierre Prudhomme-Lacroix	Airbus Helicopters	Costs	Voting Member
12	David Shear	Robinson Helicopter Company	Costs	Voting Member
13	Chris Meinhardt	Air Methods	Costs	Voting Member
14	John Heffernan	Air Evac Lifeteam	Benefits	Voting Member
15	John Becker	Papillon Airways Inc	Costs	Voting Member
16	Christopher Hall	PHI Air Medical, LLC	Costs Chair	Voting Member
17	Bill York	Robertson Fuel Systems	Costs	Voting Member
18	Randall D. Fotinakes	Meggitt Polymers & Composites	Costs	Voting Member
19	Marv Richards	BAE Systems	Benefits Chair	Voting Member

20	Laurent Pinsard	EASA Structures Engineer	Benefits	Non-Voting Member
21	Rémi Deletain	EASA Powerplant & Fuel Engineer	Costs	Non-Voting Member
22	Martin R. Crane	FAA Structures Engineer	Advisor	Non-Voting Member



Work Accomplished and Developments since last briefing

• Airman Certification Standards

- PAR and IRA set for implementation in June 2016
- Authorized Instructor ACS
 - Continued work on knowledge, risk management, and skill elements
 - Moving toward "tabletop prototype" capability
- CAX and ATP

• Testing

- All active PAR and IRA test questions have been aligned with ACS
- Other banks mostly delayed by FAA focus on small UAS requirements

• Guidance

- Student Pilot Application Requirements
 - Advisory Circular 61-65: Certification: Pilots and Flight and Ground Instructors
 - CFI Aviation Instructor Handbook
 - Student Pilot Guide (FAA-H-8083-27A)
 - Pilots Handbook of Aeronautical Knowledge
- Instrument Flying Handbook and Instrument Procedures Handbook mission statements

• Prototyping Effort

- Third prototype phase IFR ACS
 - Seattle and Orlando
 - Airmen enrolled 64
 - Knowledge test complete 33
 - Instrument rating completions 14
 - Surveys being completed
 - Positive responses

• Change Management

- Ongoing
 - Awareness, Desire, Knowledge, Ability, and Reinforcement

• Implementation Plan

- Prototype Subgroup drafted recommendations for ACS implementation
- ADKAR consideration
- External/Public Stakeholder Outreach Recommendations
- Internal/FAA Stakeholder Outreach Recommendations

• External Communication

- Multiple industry member communications and publications
- FAA Safety Team electronic newsletter
- FAA AFS-630 Webpage
 - Briefing, FAQ, Brochure, what's new and upcoming
 - Will continue to be updated

\circ $\,$ AMT ACS Tasking $\,$

- FAA has received requests for membership
- Comment period closes March 7
- FAA and ARAC ACS WG leads will confer on selection of up to five new members (per Federal Register Notice)

Next Meetings

- May 3-4, 2016, NBAA, DC
- September 13-14, 2016, GAMA, DC
- December 6-7, NBAA, DC

Submitted on behalf of the ACS working group March 3, 2016 By David Oord Vice President, Regulatory Affairs Aircraft Owners and Pilots Association ACSWG Chair




Aviation Rulemaking Advisory Committee

Airman Certification System Working Group

Interim Recommendation Report

March 1, 2016

EXECUTIVE SUMMARY

The following recommendations comprise the interim report of the Airman Certification System working group (ACS WG) to the Federal Aviation Administration (FAA). Formal recommendations for the following were submitted to the FAA's Airman Testing Standards branch (AFS-630) -

- Airline Transport Pilot (ATP) Airman Certification Standards
- Private Pilot Airplane (PAR) FAA Knowledge Exam
- Commercial Airman Certification Standards
- Instrument Procedures Handbook (FAA-H-8083-16)
- Instrument Flying Handbook (FAA-H-8083-15C)
- Advanced Avionics Handbook (FAA-H-8083-6)
- Aircraft Weight and Balance Handbook (FAA-H-8083-1A)
- Helicopter Flying Handbook (FAA-H-8083-21A)
- Airplane Flying Handbook (FAA-H-8083-3B)
- Pilot's Handbook of Aeronautical Knowledge (FAA-H-8083-25B)
- FAA Guidance Documents priorities and future development efforts
- Commercial Airman Knowledge Testing Supplement (CT-8080-1D)
- Instructor Airman Knowledge Testing Supplement (CT-8080-5G)
- Private, Sport, Recreational Pilot Airman Knowledge Testing Supplement (CT-8080-2G)
- New Student Pilot Application Requirements
 - Advisory Circular 61-65, Certification: Pilots and Flight and Ground Instructors
 - CFI Knowledge Exam test item bank
 - Student Pilot Guide (FAA-H-8083-27A)
 - Pilot's Handbook of Aeronautical Knowledge (FAA-H-8083-25B)
- Harmonization of 8083-15, 8083-16, and 8083-6 Handbooks
- Implementation Recommendations
- Aviation Instructor's Handbook (FAA-H-8083-9A)

This report also contains a formal recommendation from the working group chair and sub-group leads to the ARAC executive committee, for transition from the current practical test standards (PTS) to new Airman Certification Standards (ACS) for Private Pilot Airplane and Instrument Rating Airplane.

The working group and its leadership strongly feel that once all components of the new airman certification system are in place, the safety of aviation will markedly be improved.



March 1, 2016

Todd D. Sigler Chairman, Aviation Rulemaking Advisory Committee Federal Aviation Administration 800 Independence Avenue, SW Washington, DC 20591



Dear Mr. Sigler,

On behalf of the Airman Certification System Working Group (ACSWG), we submit the following recommendation to the Aviation Rulemaking Advisory Committee (ARAC) for consideration and implementation.

The FAA and the Aviation Industry jointly seek to improve airman training and testing by establishing an integrated, holistic airman certification system that clearly aligns testing with the certification standards, guidance, and reference materials, and maintains that alignment.

As part of its ongoing effort, the ACSWG has drafted and finalized all of the major components of the system for the private pilot certificate (airplane category) and the instrument rating (airplane category). The new airman certification standards (ACS) have been drafted, vetted and finalized; test questions reviewed and edited as necessary; and guidance materials have been updated and aligned to the new standards.

With all of the necessary components of the new system in place, we strongly recommend the FAA transition from the current Practical Test Standards (PTS) to ACS for the Private certificate and instrument rating on June 15, 2016. We are confident that, by doing so, the safety of aviation will markedly improve.

Sincerely,

David Oord ACSWG Chair Vice President, Regulatory Affairs Aircraft Owners and Pilots Association

May !!

John "Mac" McWhinney ACSWG Subgroup Lead Senior Course Developer King Schools, Inc.

Eric Crump ACSWG Subgroup Lead Aerospace Program Director Polk State College

Jackie Spanitz ACSWG Subgroup Lead Curriculum Director Aviation Supplies & Academics, Inc.



Interim Recommendation Report of the ARAC Airman Certification System Working Group March 1, 2016 February 27, 2015

Robert L. Newell FAA Branch Manager, Airmen Testing Standards Systems Training Annex Bldg. 26 FAA Mike Monroney Aeronautical Center 6500 S. MacArthur Blvd. Oklahoma City, OK 73169



Dear Mr. Newell,

Oh behalf of the Aviation Rulemaking Advisory Committee's (ARAC) Airman Certification System Working Group (ACSWG), we submit the following documents for the Airline Transport Pilot (ATP) Airman Certification Standards (ACS).

In addition to the ATP ACS, we are also including the ATP Tracking Matrix, which details the changes made when transitioning from the current Practical Test Standards (PTS), FAA-S-8081-5F Changes 1-7, to this new ACS format.

We thank you and the agency for this opportunity to provide input into the new standards, part of the joint effort to improve the certification processes and system – resulting in testing and training that is more relevant and meaningful for today's aviator and flight technologies. We are confident, that from this effort and partnership, the safety of aviation will be improved.

Please let us know if we can provide anything further.

Sincerely,

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David Oord ACSWG Chair Vice President, Regulatory Affairs Aircraft Owners and Pilots Association

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Jackie Spanitz ACSWG Subgroup Lead Curriculum Director Aviation Supplies & Academics, Inc.

Enclosed: ATP ACS Draft (150226 ATP ACS_WG.docs) ATP PTS to ACS Tracking Matrix (150226 ATP PTS to ACS Tracking Matrix.xlsx)



Interim Recommendation Report of the ARAC Airman Certification System Working Group March 1, 2016 March 1, 2015

Robert L. Newell FAA Branch Manager, Airmen Testing Standards Systems Training Annex Bldg. 26 FAA Mike Monroney Aeronautical Center 6500 S. MacArthur Blvd. Oklahoma City, OK 73169



Dear Mr. Newell,

Oh behalf of the Aviation Rulemaking Advisory Committee's (ARAC) Airman Certification System Working Group (ACSWG), we submit the following recommendations for the Private Pilot Airplane (PAR) FAA Knowledge Exam.

During the summer of 2014, the ACS working group (WG) was tasked with applying an ACS code to every question in a public sample of test data.

The WG reviewed the FAA's release of the sample exam with the ACS codes and would like to offer the following recommendations for your consideration. These may be particularly useful as the Aviation Exam Board (AEB) continues the exercise of coding questions on the official FAA form tests as well as the public sample test and the overall ACS process evolves.

Thank you for this opportunity to provide input and please let us know if we can provide anything further.

Sincerely,

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David Oord ACSWG Chair Vice President, Regulatory Affairs Aircraft Owners and Pilots Association

Jackie Spanitz ACSWG Subgroup Lead Curriculum Director Aviation Supplies & Academics, Inc.





Aviation Rulemaking Advisory Committee Airman Certification System Working Group Publications and Documentation ACS Subgroup

PAR Sample Exam with ACS Codes – January 29, 2015

Description:ARAC ACS WG – Publication/Documentation Subgroup RecommendationsDate:March 1, 2015

Overview

The FAA posted a new Private Pilot Sample Exam to include ACS codes on the AFS630 website: <u>http://www.faa.gov/training_testing/testing/test_questions/media/PARSampleExam.pdf</u>

The ACS WG understands this Sample Exam represents the ACS coding methodology the FAA will use to code all questions in the Private Pilot Airplane item bank. The FAA Sample Exam is the basis on which the training industry will align to ensure training and testing remain correlated. It is also assumed this Sample Exam is representative of the form tests currently being issued, as well as how the FAA will move forward as they transition to the new test development program. To this end, we offer the following feedback and recommendations for your consideration in your continued refinement and review of the form tests and the public sample exam.

Test Map

The sample exam has a different "weighting" of subjects from past tests – and is not consistent with the recommendations made by the previous ARAC (final report Appendix I). The Private ACS has evolved since the ARAC final report (area of operations are not the same as they were when the ARAC recommendations were made) but this map review is still a good way to see how the test seems to be currently weighted:

Subject	PAR Sample Exam	ARAC Recommendation
Preflight (PA.I)	41*	32
Preflight Procedures (PA.II)	4	
Airport Operations (PA.III)	5	5
Takeoffs, Landings, Go Arounds (PA.IV)	0	4
Performance Maneuvers (PA.V)	0	2
Navigation (PA.VI)	6	5
Slow Flight & Stalls (PA.VII)	0	4
Basic Instrument Maneuvers (PA.VIII)	0	
Emergency Operations (PA.IX)	4	5
Multiengine Operations (PA.X)	0	
Night Operation (PA.XI)	0	2
Postflight Procedures (PA.XII)	0	1
Total	60 questions, 2 hours	60 questions, 2 hours



*The Sample Exam does not appear to include any (0) questions on the subject of Aircraft Systems (to include things like engines, ignition and electrical systems, fuel induction systems, carburetor ice, aviation fuel, propellers, torque, preflight inspection procedures).

Recommendations

In light of the FAA's current goals of acquiring and implementing a new test development software and program, the ACS WG recommends the Sample Exam be reviewed to ensure it is:

- Accurately representing the "weighting" of subjects for the forms tests being issued.
- Review tests to ensure all intended subjects are included on the test.

Test Questions and ACS Code Assignment

Some of the questions in the PAR do not appear to have the correct ACS code assigned to them. This code is the only way for instructors and evaluators to know-what-the-applicant-didn't-know (as demonstrated on the FAA Knowledge Exam) so they may provide the correct retraining and retesting required by regulations.

The table below also includes comments and recommendations for the questions themselves, consistent with the ACS test development philosophies and approach.

Question	ACS Code Assigned	Recommended ACS Code
When executing an emergency approach to land in a single- engine airplane, it is important to maintain a constant glide speed because variations in glide speed A increase the chances of shock cooling the engine. B assure the proper descent angle is maintained until entering the flare. C nullify all attempts at accuracy in judgment of gliding distance and landing spot.	PA.IX.A.K1	PA.IX.B.K1 This question deals with emergency approach, not emergency descent.
(Refer to Figure 8.) What is the effect of a temperature increase from 35 to 50F on the density altitude if the pressure altitude remains at 3,000 feet MSL? A 1,000-foot increase. B 1,100-foot decrease. C 1,300-foot increase.	PA.VI.A.K4	PA.I.F.K1 This question deals with preflight preparation, not navigation.



Question (Refer to Figure 36.) Determine the approximate manifold pressure setting with 2,450 RPM to achieve 65 percent maximum continuous power at 6,500 feet with a temperature of 36F higher than standard. A 19.8" Hg. B 20.8" Hg.	ACS Code Assigned PA.VI.A.K13	Recommended ACS Code PA.I.F.K1 This question deals with preflight preparations/performance and limitations, not navigation/pilotage and dead reckoning.
The width of a Federal Airway from either side of the centerline is A 4 nautical miles. B 6 nautical miles. C 8 nautical miles.	PA.I.D.K8	PA.I.E.K1 This question deals with airspace, not cross-country flight planning. Also: Recommend removal of the question. The 4 NM width is only valid for the first 51 nm on the airway therefore all of the answers may be correct.
(Refer to Figure 38.) Determine the total distance required to land. OAT 32degreesF Pressure altitude 8,000 ft Weight, 2,600 lb Headwind component, 20 kts Obstacle, 50 ft A 850 feet. B 1,400 feet. C 1,750 feet.	PA.I.F.K1 14 questions of this nature	PA.I.F.S3 The WG recommends questions of this nature be coded as a Skill not Knowledge task element.
What information is contained in the Notices to Airman Publication (NTAP)? A Current NOTAM(D) and FDC NOTAMs. B All current NOTAMs. C Current FDC NOTAMs.	Ok	The correct answer is A; however, the AIM states "This part contains selected FDC NOTAMs that are expected to be in effect on the effective date of the publication" – suggest revising or removing this question.



Question	ACS Code Assigned	Recommended ACS Code
How far will an aircraft travel in 7.5 minutes with a ground speed of 114 knots? A 14.25 NM. B 15.00 NM. C 14.50 NM.	Ok	Answer A is correct but the distracter C is only .25 NM difference. If using a traditional E6B the difference between the two choices is not enough. It is not relevant if the test taker can be accurate to .25 NM. The questions should be removed or the distracter modified to a higher or lower value. The distracter 15 NM should be the final choice if it is the highest number. Best practices in test writing state that if you have number, dates etc. that they be listed in ascending order.
(Refer to Figure 21, area 3; and Figure 29.) The VOR is tuned to Elizabeth City VOR, and the aircraft is positioned over Shawboro. Which VOR indication is correct? A 2. B 5. C 9.	PA.VI.B.K2	PA.VI.B.K1 This question deals with ground- based navigation, not GPS/satellite.
When the course deviation indicator (CDI) needle is centered during an omnireceiver check using a VOR test signal (VOT), the omnibearing selector (OBS) and the TO/FROM indicator should read A 180 FROM, only if the pilot is due north of the VOT. B 0 TO or 180 FROM, regardless of the pilot's position from the VOT. C 0 FROM or 180 TO, regardless of the pilot's position from the VOT.	PA.I.G.K1g	PA.VI.B.K1 This question deals with navigation systems not preflight preparation/operation of systems
When making routine transponder code changes, pilots should avoid inadvertent selection of which code? A 7200. B 7400. C 7600.	PA.IX.A.K12	PA.III.A.K5 This question deals with communications not Emergency Descents.



Question	ACS Code Assigned	Recommended ACS Code
Unless otherwise authorized, if flying a transponder equipped aircraft, a pilot should squawk which VFR code? A – 1200. B – 7600. C – 7700.	PA.IX.A.K12	PA.III.A.K5 This question deals with communications not Emergency Descents.
When activated, an emergency locator transmitter (ELT) transmits on A 118.0 and 118.8 MHz. B 121.5 and 406 MHz. C 123.0 and 119.0 MHz.	PA.IX.A.K10	PA.IX.D.K6 This question deals with emergency equipment and survival gear not Emergency Descents.

Recommendations

In light of the FAA's current goals of acquiring and implementing a new test development software and program, the ACS WG recommends the Sample Exam be reviewed to ensure:

- The assigned ACS code accurately represents the Area of Operation and Task which defines the question intent; in first selecting the Area of Operation and Task, test writers may then determine a new task element is necessary (or needs to be moved from the Task where it currently is).
- Review questions identified for additional edits before using in iteration on the form tests.



March 3, 2015

Robert L. Newell FAA Branch Manager, Airmen Testing Standards Systems Training Annex Bldg. 26 FAA Mike Monroney Aeronautical Center 6500 S. MacArthur Blvd. Oklahoma City, OK 73169



Dear Mr. Newell,

Oh behalf of the Aviation Rulemaking Advisory Committee's (ARAC) Airman Certification System Working Group (ACSWG), we submit the following recommendations for the Commercial Airman Certification Standards.

Commercial Airman Certification Standards Overview

The FAA is in the process of validating the Commercial ACS the Working Group (WG) submitted November, 2014. This document did not include feedback specific to the Appendix 1: Flight Simulation Device Level chart; at the time the Commercial ACS was finalized, the new ruling on applicability and use of Flight Simulation Training Devices (FSTDs) in training and testing (Part 60) had not been rendered. The FAA review team asked for input from the WG to better understand how this chart is currently being used within the industry for training and testing.

Recommendations

The WG believes a Flight Simulation Training Device Chart is an important element for the Commercial and all the ACS. It should be updated to reflect the new policy (14 CFR part 60) and readily available to instructors, examiners, flight schools, and training centers. This information will be used to determine whether a given device can be used for training, checking, and testing on specific tasks and maneuvers at all certification levels.

The WG recommends the FAA develop the Task vs. FSTD Level for each ACS, and define what tasks would be appropriate to test using an FSTD.

Thank you for this opportunity and please let us know if we can provide anything further.

Sincerely,

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David Oord ACSWG Chair Vice President, Regulatory Affairs Aircraft Owners and Pilots Association

Jackie Spanitz ACSWG Subgroup Lead Curriculum Director Aviation Supplies & Academics, Inc.



Interim Recommendation Report of the ARAC Airman Certification System Working Group March 1, 2016 March 6, 2015

Robert L. Newell FAA Branch Manager, Airmen Testing Standards Systems Training Annex Bldg. 26 FAA Mike Monroney Aeronautical Center 6500 S. MacArthur Blvd. Oklahoma City, OK 73169 Brian Strack USAF Liaison, Flight Technologies and Procedures Registry Bldg. 26 FAA Mike Monroney Aeronautical Center 6500 S. MacArthur Blvd. Oklahoma City, OK 73169

Dear Mr. Newell and Mr. Strack,

On behalf of the Aviation Rulemaking Advisory Committee's (ARAC) Airman Certification System Working Group (ACSWG), we submit the following recommendations and offer congratulations on a job well done in creating the new edition of the FAA *Instrument Procedures Handbook* (FAA-H-8083-16).

The new edition of this important training guidance was completed and in FAA coordination/review when the working group (WG) was assigned this task. It is in the industry's best interest to release this 2014 edition as soon as the FAA coordination process is complete, implementing the recommendations that can only be accomplished without further delay in releasing this new edition. We understand some recommendations may not be implemented prior to release of this 2014 edition, but will be considered for future revisions to this book.

This handbook is currently published through the AFS-400 office. We believe future revisions should be done in collaboration with the AFS-630 office. Doing so will ensure consistent, coherent information without duplication in other FAA publications (such as the *Instrument Flying Handbook*, FAA-H-8083-15 and the *Advanced Avionics Handbook*, FAA-H-8083-6). Currently, these publications provide information on some of the same topics, but with variations in terms, descriptions, and depth of coverage. A single document may be unwieldy and overwhelming for a pilot in training – and may be overlooked by VFR or advanced pilots needing the information but not actively training. However, consolidating key topics to avoid redundancy between publications would result in a single resource for a given topic, with consistent language and descriptions for a given technology and/or procedure – not only eliminating redundancy in FAA workload, but also consistency within the aviation training community.

The ACSWG and its members welcome the opportunity to provide feedback for future editions of the *Instrument Procedures Handbook* to continue to streamline FAA publications affecting training and testing. Thank you for this opportunity and please let us know if we can provide anything further.

Sincerely,

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David Oord ACSWG Chair Vice President, Regulatory Affairs Aircraft Owners and Pilots Association

Jackie Spanitz ACSWG Subgroup Lead Curriculum Director Aviation Supplies & Academics, Inc.



Interim Recommendation Report of the ARAC Airman Certification System Working Group March 1, 2016



Aviation Rulemaking Advisory Committee Airman Certification System Working Group Publications and Documentation ACS Subgroup

Instrument Procedures Handbook (FAA-H-8083-16, 2014 Edition)

Description:ARAC ACS WG – Publication/Documentation Subgroup RecommendationsDate:March 6, 2015

Recommendation

Content – Overall

- Cover, change part number to FAA-H-8083-16A so readers immediately know this is a new edition.
- Title page, change release date from "2014" to "2015" even if completed in 2014, effective date should correlate with the release date.
- Change the chapter order: Emergency Procedures (currently Appendix A) should be Chapter 5, to follow Approaches renumbering the rest of the chapter accordingly. Instrument emergencies are some of the most misunderstood and dangerous situations in aviation. Moving this information in context will place more emphasis on learning the emergency procedures which would further manage risk.
- Keep the instrument books (FAA-H-8083-15, FAA-H-8083-16, FAA-H-8083-6) smaller and separate, but eliminate redundant information between them.

When first issued as FAA-H-8261-1A in 2007, the current version of this handbook could be viewed as a useful but not essential description of the TERPS process, procedure development, and other aspects of the construction of National Airspace System (NAS) procedures. However, this handbook is becoming increasingly essential in describing a NAS that is becoming more complex all the time, especially with the implementation of The NextGen modernization program. Subjects such as performance-based navigation (PBN), required navigation performance (RNP) and other elements of NextGen will become increasingly a part of pilot training and certification standards. It is especially useful and applicable to single-pilot operation of high-performance general aviation aircraft used for transportation purposes and crewed operation of larger business and air carrier aircraft, since the use of advanced instrument procedures, such as PBN/RNP, is migrating slowly into smaller general aviation aircraft. Accordingly, the *Instrument Procedures Handbook* should be retained as a standalone document and not merged with the *Instrument Flying Handbook* (FAA-H-8083-15).

It may be desirable to develop a "two-tier" approach to these handbooks. The basic text for training and certification for the instrument rating may be the *Instrument Flying Handbook*. The *Instrument Procedures Handbook* would be added as a reference text for the Airline Transport Pilot (ATP) certificate and aircraft type ratings. The *Instrument Procedures Handbook* could also be used as the reference text for certain NextGen pilot approvals such as RVSM and what is likely to be separate approvals for some automatic dependent surveillance broadcast



(ADS-B) applications such as in-trail spacing. There is too much material required for all of these ratings and approvals to place them in a single handbook that would be manageable and convenient to use.

Handbook Redundancy



- Review the Performance-based Operations Aviation Rulemaking Committee/Commercial Aviation Safety Team Flight Deck Automation Working Group (FDAWG) Final report for recommendations that could be brought into this document. Also, more in-depth coverage of NextGen technologies should be included with a focus on how to keep up with the changes.
- Introduction to RNAV and RNP: *IPH* needs a chapter that introduces the concepts and terminology related to RNAV and RNP. The current edition drops terminology and details about these important concepts into the middle of sections devoted to departures, en route, etc. But the terminology and concepts are confusing, and trying to define and explain them in all the separate discussions of, for example, DPs and IAPs, breaks up the flow and leads to clumsy diversions.

See, for example, the discussion of **Required Navigation Performance** on p. 2-34. It appears in a chapter about enroute operations, but the topic is really about different types of RNP levels and related topics that apply to all phases of flight.

 Add clarification on touchdown zone elevation, threshold elevation, height above threshold/touchdown, etc. Some company OpSpecs require specific altitudes above TDZE and this designation has been omitted from some recent IAPs complicating things. Training docs need to



reflect current, correct terms, use and definitions. Reference for further information: http://www.pilotsofamerica.com/forum/showthread.php?t=53814&referrerid=3196

• Increase use of lists to break up text-heavy descriptions: Substitute throughout bulleted/numbered lists for paragraphs that include long sequences of sentences that describe specific criteria. Providing such details in lists would make it easier for readers to grasp important information. For example: Pg. 1-14

...Unless specified otherwise, required obstacle clearance for all departures, including diverse, is based on the pilot crossing the departure end of the runway (DER) at least 35 feet above the DER elevation, climbing to 400 feet above the DER elevation before making the initial turn, and maintaining a minimum climb gradient of 200 feet per nautical mile (FPNM), unless required to level off by a crossing restriction[,] until the minimum IFR altitude is reached. Following ODP assessment, a SID may still be established for the purposes of ATC flow management, system enhancement, or noise abatement.

...Unless specified otherwise, required obstacle clearance for all departures, including diverse, is based on the pilot:

- Crossing the departure end of the runway (DER) at least 35 feet above the DER elevation
- Climbing to 400 feet above the DER elevation before making the initial turn
- Maintaining a minimum climb gradient of 200 feet per nautical mile (FPNM), unless required to level off by a crossing restriction, until the minimum IFR altitude is reached

Content – Specific Suggestions

Chapter 1: Departure Procedures

P. 1-3

Surface Movement Guidance Control System (SMGCS): This section includes important information for airline crews and others who operate at airports that serve air carriers. But placing it before the general discussions of Airport Signs, Lighting, and Markings, Runway Hotspots, Taxi and Movement Operations Change, and similar sections of interest to all pilots, especially GA aviators, gets into the trees before we have a chance to admire the forest.

(The same comment applies to the detailed discussion of TERPS criteria on p. 1-17. Wouldn't those technical details, including the math, work better as a sidebar or appendix? At present, they bring the description of departure procedures to a screeching halt before we've even learned about the **Categories of DPs**.)

Back to moving around on the airport. The topics related to taxiing would flow better and be much easier to digest if details that pertain to air carriers and operations at high-density airports followed the general discussion.



This general point is worth keeping in mind throughout the *IPH*. I understand the statement in the Preface about the handbook's purpose (see below). But taking a hard look at how each chapter is organized could help separate content aimed at typical GA pilots and aspiring ATPs from that which Part 135 and 121 operators learn about in their required training. Putting details about such topics as SMGCS after more general guidance would also make each chapter more readable and accessible to pilots in training and typical IFR pilots.

This handbook...is designed as a technical reference for all pilots who operate under instrument flight rules (IFR) in the National Airspace System (NAS). It expands and updates information contained in the FAA-H-8083-15B, Instrument Flying Handbook, and introduces advanced information for IFR operations. Instrument flight instructors, instrument pilots, and instrument students will also find this handbook a valuable resource since it is used as a reference for the Airline Transport Pilot and Instrument Knowledge Tests and for the Practical Test Standards.

P. 1-29

The discussion of DPs organized by equipment requirements reads like a non-sequitur. It's introduced without a heading or marker to make this important information stand out. I'd move it to an appropriate place under **Categories of Departure Procedures** (p. 1-22), perhaps immediately following the introductory paragraph (which, by the way, is another place where a bulleted list would be helpful):

There are two basic types of DPs:

- Obstacle departure procedures (ODP) developed to assist pilots in obstruction avoidance. ODP are printed as text descriptions or as charts.
- Standard instrument departures (SID) developed to communicate ATC clearances. SIDs are always charted.
- DPs are also categorized by equipment requirements as follows:
- Non-RNAV DP—established for aircraft equipped with conventional avionics using ground-based NAVAIDs. These DPs may also be designed using dead reckoning navigation. Some flight management systems (FMS) are certified to fly a non-RNAV DP if the FMS unit accepts inputs from conventional avionics sources, such as DME, VOR, and localizer (LOC). These inputs include radio tuning and may be applied to a navigation solution one at a time or in combination. Some FMS provide for the detection and isolation of faulty navigation information.

RNAV DP—established for aircraft equipped with RNAV avionics (e.g., GPS, VOR/DME, DME/DME).

P. 1-30-1-31

The graphics that describe ICAO flight plan codes are out of place and not especially useful here. Given that as of October 1, 2015, all flight plans must be filed using the ICAO format, the *IPH* should include a useful guide to filing that format, with special emphasis on the information that typical GA pilots need to understand about the RNAV and ADS-B equipment that many are using or preparing to install. The codes for RVSM, RNP, etc. are, once again, for the jet set (who don't typically file their own flight plans), and they're not the primary audience for this handbook.



In fact, the new *IPH* should include a section about preflight planning that discusses, at least generally, the emerging world of web-based weather briefings and flight plan filing. Given the FAA's recent announcements about forthcoming changes to Flight Services (see this <u>link</u>), this information with, at a minimum, references to documents such as AC 00-45G *Aviation Weather Services* and *Flight Services* (JO 7110.10X) seems in order.

P. 1-36

The section **SID Altitudes** does not include discussion of *climb via* clearances, *top altitudes*, etc. The relatively new *climb via* clearances still cause confusion among pilots and some air traffic controllers. These clearances are being issued at all airports with SIDs, and to all aircraft—even single-engine piston airplanes—flying those procedures. The new *IPH* should incorporate and, as needed, expanded guidance about *climb via* clearances and reference other official sources.

P. 1-43

The section **VFR Departures** also does not specifically address a point of confusion among many IFR pilots who depart under VFR and pick up a clearance in the air. When ATC issues an IFR clearance (which typically includes the question, "Can you maintain your own obstacle and terrain clearance until reaching...?), many pilots are confused about when they can enter clouds or operate in less than basic VMC. ATC won't assign a heading or clear an aircraft to a fix or route until the aircraft is identified and at or above a minimum IFR/vectoring altitude. But when ATC issues a clearance, the pilot is now operating under IFR and may enter clouds or fly in less than VMC, provided the pilot can safely avoid obstacles and terrain until reaching the minimum altitude at which ATC may begin to provide services. This section could also discuss filing a "departure fix" that isn't the departure airport, such as a VOR or other waypoint, provided the pilot can safely fly to that fix under VFR and arrive at an altitude that works for ATC. (See, for example, <u>Picking Up an IFR Clearance Enroute</u> at my blog.)

Chapter 2: Enroute Operations

P. 2-2

The discussion of the three strata of airways does not mention T-routes and Q-routes. T-routes should be introduced here as a complement to the description of Victor Airways. These topics don't show up until p. 2-14, and then without a distinct introduction/heading that would make them easy to spot. The sections that do describe T-routes, for example, are a muddle that's hard to...navigate.

Chapter 3: Arrivals

Again, I advocate discussing general information about this topic that applies to all operations putting the details appropriate to high-performance, high-altitude fliers into sections dedicated to the jet-setters.

Chapter 4: Approaches

The discussion of weather sources (p. 4-2–4-8) repeats information from chapter 1. This discussion could be consolidated and made easier to find and understand if it were placed in new chapter dedicated to preflight planning/briefing and weather-related matters. Only the approach-specific details should appear in chapter 4.



Chapter 5: Improvement Plans

This chapter doesn't discuss FAA's plans to decommission many VORs and to establish a minimum operational network (MON). This plan (discussed at my blog, <u>here</u>) hasn't been disseminated to pilots, and many aviators are under the mistaken impression that FAA plans to shut down the entire network of VORs, leaving no backup to GPS or for pilots who do not have an IFR-approved GPS. Key points that should be noted include:

- The VOR MON Program will implement the [minimum operational network of VORs] by decommissioning 30-50% of the VORs in the NAS by 2025 (although the current plan retains all VORs in the designated mountainous region of the U.S.—roughly the western third of the country).
- The reduction will begin gradually over the first five years during which time the bulk of the procedural/airway/airspace work will assessed. Then the plan is to accelerate the process, with 20-25 VORs shut down each year.
- Only FAA owned/operated VORs will be considered for shutdown.
- DMEs and TACANs will generally be retained.
- Many of the remaining VORs will be enhanced to supply increased service volume. VOR standard service volume (SSV) will become 77 NM radius at 5000 ft. AGL.
- Increase support for direct navigation between VORs without airways.
- Retain sufficient ILSs, LOCs, and VORs to support "safe-landing" at a suitable destination with a GPS-independent approach (ILS, LOC or VOR) within 100 NM of any location within CONUS.
- Provide seamless VOR coverage at and above 5000 ft AGL.
- More than 5,000 instrument approaches may be affected by the reduction in operational VORs.
- Nearly 1,300 SIDs, STARs, and ODPs may be affected by the reduction in operational VORs.
- FAA is considering how to refer to and chart DME-only facilities.

Chapter 6: Airborne Navigation Databases

P. 6-14

The section **Users Role** (see below) appears to be outdated by a change in 14 CFR Part 43 published in November 2012 (see notice in the Federal Register, <u>here</u>); viz.

SUMMARY: This action amends the maintenance regulations by removing from the preventive maintenance category the task of updating databases used in self-contained, front-panel or pedestal-mounted navigation equipment...

Users Role

Like paper charts, airborne navigation databases are subject to revision. According to Title 14 of the Code of Federal Regulations (14 CFR) Part 91, section 91.503, the end user (operator) is ultimately responsible for ensuring that data meets the quality requirements for its intended



application. Updating data in an aeronautical database is considered to be maintenance and all Part 91 operators may update databases in accordance with 14 CFR Part 91, section 43.3(g). Parts 121, 125, and 135 operators must update databases in accordance with their approved maintenance program. For Part 135 helicopter operators, this includes maintenance by the pilot in accordance with 14 CFR Part 43, section 43.3(h).

Production – Overall

- Suggest revising styles and typeface to be consistent with other FAA handbooks (FAA-H-8083-4 is an ideal example 8083-25, 8083-15, 8083-9A, and 8083-31/32 are also consistent with the recommended styles). In the 8083-16, the body text is sans-serif (probably Myriad); suggest changing to serif (Times Roman) and revising subheadings from just sans-serif to Helvetica for easier readability and to be consistent with other FAA handbooks.
- "[Figure XX]" and mentions of Figure XX in line text should be italicized
- Captions: boldface sans serif Figure number and italic serif caption text. Figure number and caption text should be the same size.
- Better differentiation of headers, especially level two and three (level 3 appears on page 1-11). Make subheads boldface
- V-speeds need to be found and subscripted
- Consistent space between titles and text for Preface, Acknowledgements, Notice, Table of Contents, Emergency Procedures (Appendix A), Acronyms (Appendix B), Glossary, and Index.
- Consistent spacing after paragraphs/headers/figures
- Consistent line-height and size to body text
- Consistent spacing before and after bulleted/numbered lists
- Columns should be all aligned at the top
- Red body text should be black
- Figures should never split paragraphs
- Decrease leading of figure caption text (line height appears to be equal to body text, text size is significantly smaller)
- Don't break up bullets that are 2-3 lines long.
- REVIEW THROUGHOUT THE BOOK TO MAKE SURE FIGURE PLACEMENT IS CORRECT. Typically, text where figures are referenced precedes the figure.

Production – Specific Suggestions

- iv: Too much space between paragraphs, space after title is much larger than on page iii
- v: space after title not consistent with previous pages

Vii: Bold chapter number and include chapter title in the Table of Contents:

- 1-1: Justify first paragraph.
- 1-2: More space between caption and text
- 1-8: Insert space "Reminder: You may"

1-10: widowed line at top of right-hand column, could be kept with paragraph on left-hand column. Figure 1-10 splits paragraph.

1-11: Should a new paragraph begin after "1-10]"? Ragged line in the first sentence of the paragraph before "Adequate Visual Reference"

1-12: Move Figure 1-12 to top of column to avoid 2 lines of text above it.

1-17: Italicized paragraph? Missing "NOTE:"? And, 4th line of second paragraph is not justified.

1-18: keep 2nd bullet paragraph together (enough space to reflow to left-hand column)

1-20: Add space between last two paragraphs in right column.

1-23: Add space between last two paragraphs in right column.

1-28: too much space before bulleted list, keep 2nd bullet together (don't break across columns)

1-29: widowed first line at end of page, push to next page

1-33: too much space before bulleted list

1-36: align rules above/below with numbers, correctly stack 7000 over 4600. Move last line in left column to top to right column to avoid a widow.

1-37: Widowed line at end of page, push to next page

1-38: Red text? Widowed line at top of right-hand column, push one more line from left-hand column over. Second paragraph in right column should be justified.

1-43: reflow a line to the end of the right-hand column

2-4: Bullets for the two indented bullets under "Vertically—" should also be indented or deleted.

2-5: Figures 2-10–12 split paragraph (two widowed lines at end of page). Move some of these figures to the next page so text comes before the figures.

2-8: fix widow at top of right column

2-9: fix widowed line at top of right-hand column

2-11: fix widowed line at top of left-hand column/columns should be aligned at top

2-13: Second paragraph isn't justified. This will probably cut a line and bring the widow from page 2-14.

2-14: fix widowed line at top of left-hand column, move a bullet from p2-16 up to end of page?

2-16: strange paragraph breaking here. Move 1 or 2 bullets back to 2-14 to reflow paragraphs better

2-17: First paragraph, delete space between "FL180" and period.

2-18: Figures 2-34 and 35 are splitting paragraph

2-21: fix widowed line at top of right-hand column

2-23: The second through fifth paragraphs should be justified.

2-25: Sixth line of NOTE paragraph in the right column isn't justified.

2-28: fix widowed line at bottom of left-hand column

2-29: ragged paragraph

2-38: Third line in last paragraph in right column is not justified.

2-39: fix widowed line at the top of right-hand column? First line of paragraph in right column is not justified.

2-40: something is happening at the bottom of the right-hand column, justify second to last line.

2-41: fix widow following "Minimum Vectoring Altitudes (MVA)"

2-43: remove space before quote mark in 29.92 "Hg (multiple instances on page). Second paragraph in right column should be justified.

2-44: remove space before quote mark in 29.92 " Hg

2-46: Figure 2-69 splits paragraph. This figure should probably be moved, to next page, it's referenced in the first paragraph of "Communication Failure"

2-50: Figure 2-72 splits paragraph causing a widow at the top of right-hand column. It seems like Figures 2-68 thru 2-73 are not placed correctly with the referenced text.

2-52: Too much space before bulleted list

3-6: No space after "LNAV/VNAV Equipment" 1st paragraph before "NOTE:", Figure 3-5 interrupts paragraph, columns not equal length. Justify the first paragraph. Move some of the first two paragraphs to the previous page so the text reference is with the figures?

3-8: columns not aligned

3-10: columns not quite aligned on baseline

3-13: insert space: Figure 3-11:"Cessna 32G,

3-16: columns not quite aligned on baseline

3-19: fix widow at end of page

3-20: fix widow at end of page

3-21: fix widow at top of right-hand column. Second line in left column is not justified.

3-26: "Figure 3-27" should be "Figure 2-23"

4-1: Third line is not justified.

4-5: fix widow at top of page

4-8: Subscript V-Speeds in 1st paragraph of "Airspeed Categories", fix split bullet. Left column, 3 lines above "Aircraft Approach Categories" subhead, delete the hyphen after "all"? Or should it be "all-engine", no space?

4-9: Align top of right column to top of figure.

4-11: fix split bullet

4-15: fix split bullet at bottom of left-hand column

4-19: More space between numbers and stroke above/below (see page 1-36), add space after last paragraph before "Minimum Descent Altitude (MDA), Decision Altitude (DA), And Decision Height (DH)" subhead

4-20: Push red subhead to next page/keep with text. Move Figure 4-10 to next page, closer to referenced text.

4-22: fix widow at the end of right-hand column

4-23: fix widow at top of page. Red text? Figure 4-11b is cut off, and the caption has an extra period. Add space between second and third paragraphs in right column.

4-25: Red text? Paragraph under "Wide Area Augmentation System" should be justified.

4-26: Red text? Fix widow at top of page

4-31: Red text? 3rd paragraph after "Baro-NAV" there is a return before the period, then Figures 4-17

and 4-18 are splitting text. Justify second paragraph in right column.

4-33: Red text? Ragged lines last two paragraphs. Top align two columns.

4-34: Red text? Fix ragged lines

4-35: If "Airport/Runway Information" is a level 1 subhead, add space below it. If it's a level 2 subhead, change to black.

4-39: No space between 2nd and 3rd paragraph on right-hand column

4-40: Body text size is not consistent? No space between last two paragraphs on left-hand side. Figure 4-21 is interrupting paragraph. Add space between last two paragraphs in right column.

4-43: delete space in [Figure 4-30]. Delete space in [Figure 2-26]. Delete space between Figure 4-27 and comma. Justify first line of last paragraph in left column. Justify fifth line from bottom of second paragraph in right column.

4-49: delete spaces in [Figure 4-31] and [Figure 4-32]

4-50: Widowed "protected airspace." Inconsistent line-height to body paragraphs?

4-53: Columns not aligned at top

4-54: Widowed "minimum altitude information." Remove space before em dash in second bullet. Justify two-line paragraph above bullets in right column.

4-55: No space before subhead "Approach Clearance". Subhead "Vectors to Final Approach Course" not kept with following text.

5-56: Add space between last two paragraphs in left column.

4-57: figure interrupts paragraph, no caption or number (are we sure it's in the correct spot?), fix widow at top of right-hand column, add space between last paragraphs at bottom of right-hand column. Delete line space between third from last and second from last paragraphs in right column, "... follow, in sight. In" and "the event pilots ..."

4-58: first line of last paragraph should flow to the next page

4-60: Red text? "REFERENCE—" is not a correct way to cite, these should be searched for and removed. Right-hand column not aligned with top. Delete space in [Figure 4-37]. Justify the last two paragraphs in right column.

4-61: Red text? Insert space in the last line "Operations: Two-way". Justify text on this page.

4-63: the last paragraph on the page should be flowed. Justify red text. Delete space in [Figure 4-39]

4-64: No space after NOTE paragraph, not enough space between text and page number (should be reflowed), "CAT II and III Approaches" header not kept with text. Delete spaces in [Figure 4-41] and [Figure 4-42]

4-65: delete spaces in [Figure 4-43], [Figure 4-44], [Figure 4-45] and [Figure 4-46]. Align columns at the top. Justify the second line in the second to last paragraph on page 4-65.

4-66: columns not aligned, big space after first paragraph on left-hand column. Remove spaces in [Figure 4-47], [Figure 4-48], [Figure 4-49], and [Figure 4-50]

4-69: Red text? Remove spaces in [Figure 4-51], [Figure 4-52], [Figure 4-53], [Figure 4-54]

4-71: Text should be below figure, but in this case, reflowed to the next page (no text)

4-72: Remove spaces in [Figure 4-55], and [Figure 4-56]

4-75: Delete space in [Figure 4-57]

4-76: Keep "Airport Surveillance Radar (ASR)" header with text. Delete space in [Figure 4-58]



4-78: Too much space before bullet list, remove space is [Figure 4-59], [Figure 4-60], [Figure 4-61], [Figure 4-62], and [Figure 4-63]

4-80: Figure 4-51 bad resolution? Move the figure to the right to align with the caption.

4-81: Figure 4-52 bad resolution?

4-84: Fix space between figure and caption.

4-86: Fix spaces between figures and captions

5-2: Last line in left column should be justified.

5-5: Fix widow at top of right column, bring text from page 5-3.

5-7: Figure 5-11 splits paragraph, move two lines at bottom of left column to above the figure.

5-8: Double-check that reference to page 4-20 at bottom of right column is still correct after changes are made to Chapter 4. The subhead referenced will maybe move since it's at the bottom of the page.

5-9: Figure 5-16 splits end of paragraph, "[Figure 5-16]" should be kept with paragraph before Figure. Reflow first bullet to next page. Top align columns.

5-10: widowed "Flight Bags;" should be kept with first bullet. Third line in right paragraph should be justified.

6-3: Red header and text should start on next page

6-5: "altitudes (MORAs)." should not be widowed in next column

6-6 thru 6-9: Text and Figures 6-5 thru 6-25 should be reformatted to avoid little blocks of type, text references should come before figures. Recommend keeping text flowing in larger blocks and figures grouped, similar to the right column on page 6-6.

6-7: Widows at the tops of both body columns, keep all bullet text together. Figures 6-12 and 6-13 split paragraphs

6-8: widowed lines should be kept together. Figures 6-18 and 6-20 split paragraphs

6-9: Figure 6-25 splits paragraph, single line on bottom of left-hand column

6-13: one more line of text should be allowed on bottom of left hand column to allow a third line to flow at bottom of right-hand column

6-15: Second paragraph in left column, use em dashes without spaces on either side instead of the spaces and en dashes, in three spots.

6-16: align columns at top

7-4: VMINI should change to $V_{\mbox{\scriptsize MINI}}$ in 3 spots.

7-5: dash should be an em dash in bottom paragraph of left hand corner, no spaces before or after "(RVR) - one"

7-8: Widowed line at top of left column, add space before next paragraph. Missing period at the end of "Helicopter IFR Takeoff Minimums" paragraph.

7-10: Sixth line in right paragraph should be justified.

7-13: V-speeds need to be subscript

7-14: V-speeds need to be subscript



7-17: too much space before bulleted list, don't split bullet, flow paragraph to end of left-hand column. Subscript V-speeds.

A-1: Change page layout to 2-column format.

A-2: too much space before bulleted list (see A-5 for correct spacing)

A-4: too much space before numbered and bulleted list (see A-5 for correct spacing)

A-6: fix widow

B-1: Change page layout to 2-column format with a hanging indent if listing wraps to second line.

B-2: Delete line space between "ATD" and "ATIS"

B-4: Avoid single line at top of page.

B-5: Delete line space between "MCA" and "MDA"

B-6: Delete extra space above "O", match space above "P"

B-7: Delete extra space above "S"

B-8: Subscript V-speeds

G-1: Use consistent space between title and start of text, match throughout the book.

G-1 thru G-11: Change the period at the end of the blue lead-in text to blue.

G-3: Widowed line at bottom of left-hand column. There is enough space at bottom of G-2 to keep last two lines of "Cockpit Display of Traffic Information (CDTI)" definition on the page (this would allow "Database Record" to fit without breaking on page G-3. Avoid breaking definitions from one page to the next. OK to break definitions from one column to the next.

G-4: too much space at end of right column, more than enough room for "Gateway Fix" definition at end of page

G-5: Widowed line should be reflowed to top of right-hand column, too much empty space at end of right column

G-6: Reflow "Minimum Reception Altitude (MRA)" to next page

G-7: Push "Pilot Briefing Information" to next page

G-9: Push "Standard Service Volume" to next column and "Synthetic Vision System (SVS)" to next page

I-2: Push "Helicopter Instrument approaches" to next page to keep with second level lines.

I-4: Push "Tower en route control (TEC)" to next page to keep 2nd level index line with it



March 20, 2015

Robert L. Newell FAA Branch Manager, Airmen Testing Standards Systems Training Annex Bldg. 26 FAA Mike Monroney Aeronautical Center 6500 S. MacArthur Blvd. Oklahoma City, OK 73169



Dear Mr. Newell,

On behalf of the Aviation Rulemaking Advisory Committee's (ARAC) Airman Certification System Working Group (ACSWG), we submit the following recommendations for the *Instrument Flying Handbook* (FAA-H-8083-15C) and *Advanced Avionics Handbook* (FAA-H-8083-6). We hope these recommendations will be useful to the FAA in preparation of the Statement of Work for new editions of these important training guidance documents.

The *Instrument Procedures Handbook* (FAA-H-8083-16) is currently published through the AFS-400 office. We believe future revisions of all three of these books should be done in collaboration with the AFS-630 office. Doing so will ensure consistent, coherent information without duplication between FAA publications. Currently, these publications provide information on some of the same topics, but with variations in terms, descriptions, and depth of coverage. A single document may be unwieldy and overwhelming for a pilot in training – and may be overlooked by VFR or advanced pilots needing the information but not actively training. However, consolidating key topics to avoid redundancy between publications would result in a single resource for a given topic, with consistent language and descriptions for a given technology and/or procedure – not only eliminating redundancy in FAA workload, but also consistency within the aviation training community.

The ACSWG and its members welcome the opportunity to provide feedback for future editions of the *Instrument Flying Handbook* and *Advanced Avionics Handbook* to continue to streamline FAA publications affecting training and testing. Thank you for this opportunity and please let us know if we can provide anything further.

Sincerely,

do

David Oord ACSWG Chair Vice President, Regulatory Affairs Aircraft Owners and Pilots Association

Jackie Spanitz ACSWG Subgroup Lead Curriculum Director Aviation Supplies & Academics, Inc.





Aviation Rulemaking Advisory Committee Airman Certification System Working Group Publications and Documentation ACS Subgroup

Instrument Flying Handbook (FAA-H-8083-15B), Advanced Avionics Handbook (FAA-H-8083-6)

Description:ARAC ACS WG – Publication/Documentation Subgroup RecommendationsDate:March 17, 2015

Recommendation

Overall: Both Books

- Incorporate current Errata (FAA-H-8083-15B 7/2/14, FAA-H-8083-6 05/2013)
- Add publishing schedule to AFS630 website (i.e. cycle for review and/or next edition).
- Throughout this handbook, the use of risk management techniques should be integrated with discussion of individual tasks, procedures and techniques, where appropriate.
- A proposal for the April 2015 Aeronautical Chart Form meeting includes a document that describes a suggested change in how VORs are depicted on charts, and the text also includes more details about how the national airspace system (NAS) and navigation will change under performancebased navigation (PBN), which is an enhanced version of today's area navigation (RNAV) concept. The following paragraph provides background for consideration when writing the next edition of the 8083-15 handbook:

The VOR MON program (AJM-324) is discontinuing the service of approximately half of the VOR facilities in the NAS. In parallel, the PBN Policy and Support Group (AJV-14) is planning to implement a new PBN Route Structure, which will provide "Structure where necessary and Point-to-Point where structure is not needed." The PBNRS will generally remove most Victor Airways and Jet Routes east of the Western Mountainous region of the CONUS. Q-Routes will be published where needed, particularly in high traffic density airspace east of Chicago to New York, Atlanta, etc. T-Routes will provide structure primarily around Metroplex areas, special use airspace, and for terrain avoidance in mountainous terrain areas. The rest of the NAS will likely fly point-to-point using RNAV.

The document then describes how VORs that are part of the MON but which are not points along named airways might appear on aeronautical charts. As this new strategy is implemented, many of the VORs retained for the MON will not have any VOR Airways associated with them, but pilots will need to use them to navigate VOR-to-VOR. Therefore a charting scheme is needed. The VOR MON Concept of Operations includes a proposed scheme for charting the MON VORs which is depicted in the figure below. The approach is to use feeder routes showing the MEA, course, and distance to each adjacent MON VOR.



Here's the figure:



- Handbook will need to be updated to reflect use of *MON*, used to distinguish VORs that are part of the MON and not associated with airways from other navaids. The use of a three-letter abbreviation may cause confusion when printed near a VOR symbol that is also associated with a three-letter identifier.
- Keep the books (FAA-H-8083-15, FAA-H-8083-16, FAA-H-8083-6) separate, but eliminate
 redundant information between them. It may be desirable to develop a "two-tier" approach to the
 instrument handbooks (FAA-H-8083-15 and FAA-H-8083-16). The basic text for training and
 certification for the instrument rating may be the *Instrument Flying Handbook*. The *Instrument
 Procedures Handbook* would be added as a reference text for the Airline Transport Pilot (ATP)
 certificate and aircraft type ratings. The *Instrument Procedures Handbook* could also be used as
 the reference text for certain NextGen pilot approvals such as RVSM and what is likely to be
 separate approvals for some automatic dependent surveillance broadcast (ADS-B) applications
 such as in-trail spacing. There is too much material required for all of these ratings and approvals
 to place them in a single handbook that would be manageable and convenient to use.



8083-15B	8083-16	8083-6
National Airspace System	DP's	Intro to Advance Avionics
ATC System	En Route Operations	Electronic Flight Instruments
Aerodynamic Factor	Arrivals	Navigation
Flight Instruments	Approaches	Automated Flight Control
Airplane Attitude Instrument Flying	/ Improvement Plans	Information Systems
Airplane Basic Flight Maneuvers	Airborne Navigation Databases	
Helicopter Attitude Instrument Flying	Helicopter Instrument Procedures	
Navigation System MO N	Emergency Procedures	
IFR Flight		
Emergency Operations		
Absorb 8083-6 into 8083-15B as an appendix.		



Instrument Flying Handbook (FAA-H-8083-15B)

- Pg vii, left column, 1st para expand on different benefits of rating in multiple paragraphs.
- Pg vii, left column, 3rd para rewrite to clarify current ground-based and satellite-based navigation systems; remove references to ADF, LORAN, INS, MLS
- Pg viii, left column, 3rd (full) para, update as needed to reflect current training devices.
- Pg viii, right column, 3rd para, update for current regs and change PTS to ACS. Include comment about meeting recency with training devices
- Pg viii, right column, 4th para, last sentence, remove "flying an approved flight training device" (sim time doesn't count for flight time)
- Pg 1-2, Airspace Classification: this whole section on airspace is just a rehash of the AIM and PHAK. It would be better if it was written with a slant towards why this knowledge is important to the instrument rated pilot. Right column, last sentence on the page is where text is relevant to IFR and not a rehash.
- Pg 1-2, right column, #6, this should include that flight in IMC is allowed in G without a flight plan.
- Pg 1-4, left column, para below #2 (starting with "Restricted areas...") through to Federal Airways rehash of material in AIM and PHAK.
- Pg 1-4, right column, last para: include mention victor airways based on ground-based VORs.
- Pg 1-5, left column, 2nd para, include mention it's called "Tango"
- Pg 1-5, left column, last para, move para: this is not about federal airways.
- Pg 1-5, right column, top para: move para, this is not about federal airways.
- Pg 1-5, right column, Other Routing move to planning routes.
- Pg 1-6, left column, top para: same as previous. Also, very limited. Most pilots will never use this.
- Pg 1-6, left column, 2nd para, this is not needed by beginners. create a chapter for high altitude and put it there
- Pg 1-6, left column, red heading: the header should relate to the NAS, not to charts
- Pg 1-6, left column, IFR Enroute Charts, delete 1st sentence: none of these terms have been defined. Phases of IFR flight have not been defined.
- Pg 1-8, Figure 1-4, typo in caption: "attitude" should be "altitude"
- Pg 1-9, Figure 1-5, typo in caption: "attitude" should be "altitude"
- Page 1-3, Airspace Classification Chart The line "Entry Requirements" for Class E should read "None" and the asterisk will then be accurate.
- Pg 1-10, right column, remove "and Transcribed Weather Broadcast (TWEB)"
- Pg 2-2, Communication Equipment: this section should be moved to Avionics Handbook (8083-6), as VFR pilots need to know this too.
- Pg 2-2, Communication Equipment, remove subheading "Navigation/Communication Equipment" – this section only covers Communications (and red heading already addresses this)



- Pg 2-2, Figure 2-1, update with several examples of different cockpits. Highlight the COMM
- Pg 2-2, right column, top para, update for current FSS.
- Pg 2-2, right column, 2nd para, change 1st sentence to read "An audio panel allows a pilot to adjust the volume of the intercom and to manage the audio portion of communications and navigation equipment in the aircraft. [Figure 2-2]
- Pg 2-3, left column, para below Figure 2-3, this is not accurate. These days, VFR pilots need to know this. Move to Avionics Handbook Explaining the basic idea of audio panels is good.
- Pg 2-4, left column, Communication Procedures, This should focus on differences between VFR and basic IFR communications. Don't repeat PHAK.
- Pg 2-4, left column, change 2nd red subheading from "Communication Facilities" to "ATC Facilities"
- Pg 2-4, left column, Flight Service Stations (FSS): update for the computer age. Emphasize differences with IFR vs VFR flight plans.
- Pg 2-4, left column, remove/rewrite "EFAS" (going away October 2015)
- Pg 2-5, left column, top para: this is not about communications delete para.
- Pg 2-5, left column, 2nd para, update to current system
- Pg 2-5, right column, top para: In a different section/chapter for advanced IFR, include digital methods of receiving clearance
- Pg 2-7, left column, Tower En Route Control (TEC): this is not a facility; move out of this section.
- Pg 2-12, right column, Approach Control Facility: this should be with Tower and ARTCC.
- Pg 2-13, left column, Control Sequence, This would be good earlier in the section on Communication procedures
- Pg 2-13, right column, add <u>www.1800wxbrief.com</u> wherever "1800-WX-BRIEF" is discussed online flight planning and briefings are more prevalent than phone calls.
- Pg 2-15, remove "EFAS" (2 occurrences this page)
- *Page 3-1* Last paragraph in Introduction should also reference Single-Pilot Resource Management (SRM).
- Chapter 4 Aerodynamics chapter is redundant with information in FAA-H-8083-25 8083-3; it may
 not be necessary to have in both books consider removing from FAA-H-8083-15, and instead
 refer readers to FAA-H-8083-25 to study aerodynamics, important for flight in IMC. The focus here
 should be on IFR related issues: effect of weather (humidity, icing, rain water) on wings, etc;
 translating cockpit information into knowing aircraft's aerodynamic performance; Standard rate
 turns, coordinated turns, and turning tendencies; the relationship between pitch, power and
 performance, i.e. airspeed and Vertical speed, and heading.
- Chapter 5 Flight Instruments chapter: Need to keep general information here and details in advanced avionics handbook or 8083-25 (PHAK); Take out the duplication of details from PHAK; Info on old mechanical instruments need to focus on interpretation, system errors, and failure modes, just like for advanced avionics; This chapter is about a lot more than flight instruments. Needs a better name



- Pg 5-3, right column, Pilot/Static Instruments: rename for mechanical altimeter or write it so its general theory related to both mechanical altimeter or air data computer (preferred), with the details in the avionics handbook (8083-6).
- Pg 5-4, right column, Altimeter Errors: most of this section applies to both mechanical and ADC. Make this clear.
- Pg 5-5, right column, ICAO Cold Temperature Error Table: remove; already covered in 8083-25.
- Pg 5-7, right column, Reduced Vertical Separation Minimum (RVSM), 1st sentence, "31,000": shouldn't this be FL290? RVSM is old news now. Move entire RVSM section to a chapter on advanced topics.
- Pg 5-8, left column, Vertical Speed Indicator (VSI): Make general and include both mechanical and ADC. Show different methods to display. Discuss the differences in flying an instantaneous vs damped VSI.
- Pg 5-8, right column, Dynamic Pressure Type Instruments: make general and include mechanical and ADC. A lot of this is about airspeed in general and needs to stay. Include overview of different display method.
- Pg 5-10, left column, Mach Number: Move to advanced chapter.
- Pg 5-10, right column, Magnetism: The header should be direction-seeking instruments, and magnetism a sub header under it.
- Pg 5-10, right column, Magnetism, 2nd para: dip (vertical component of flux) is an important characteristic. This is a characteristic of the magnet, not the lines of flux; change sentence to read "Lines of magnetic flux have two important characteristics: any magnet that is free to rotate aligns with them, and an electrical current is induced into any electrical conductor that moves through the lines of flux. Most direction..."
- Pg 5-10, right column, 2nd para from bottom: reg requires a 'magnetic direction indicator', not an old fashion compass. A wet compass is not required
- Pg 5-10, right column, bottom para "Magnetic Compass Overview": this whole section is word-forword identical to the 8083-25 (PHAK).
- Pg 5-11, Figure 5-16: it would be good to include the confusion of which way to turn with this type compass
- Pg 5-11, right column, bottom para: this is not in PHAK. But there is a whole section on deviation and pilots don't need to know this level of detail. Pilots need to know to not put metal objects near the compass and the problem it causes if they do.
- Pg 5-12, left column, Magnetic Compass Errors: this again is direct copy from PHAK
- Pg 5-12, right column, 2nd para starting with "Flying in Washing...": there needs to be discussion of change in variation with time. This example (identical to PHAK), as of 2015, is off by almost 1 degree in DC and 2 degrees for LA.
- Pg 5-12, Figure 5-17: add date to image; Never heard of a 'dip pole'. Why not 'magnetic south pole'?
- Pg 5-13, right column, line above "Northerly Turning Error": end of duplication from PHAK. If we are going to repeat the PHAK, then also include a discussion of magnetic Dip



- Pg 5-13, right column, Northerly Turning Error: this needs a summary of what is magnetic dip. It also needs techniques for using a magnetic compass. The mnemonic OSUN or (UNOS) and that the the error decreases to zero on headings of east/west. Include critical angle of bank and problems with exceeding critical critical angle of bank
- Pg 5-13, right column, Northerly Turning Error, delete last sentence. How to do compass turns is covered elsewhere. This rule of thumb example is only good for a heading of exactly north, but that is not stated.
- Pg 5-14, left column, last sentence: include error is max on east/west and decreases to zero on north/south headings
- Pg 5-15, left column, the Vertical Card Magnetic Compass: include this type of compass is still subject to dip errors.
- Pg 5-15, left column, The Flux Gate Compass System: move section to advanced avionics handbook
- Pg 5-15, left column, The Flux Gate Compass System, 1st para, last sentence, change to read "... a magnet aligns with these lines and an electrical current is induced, or generated, in a wire that moves through them."
- Pg 5-16, left column, 3rd line from top, change to "... referred to as a Horizontal Situation Indicator (HSI)."
- Pg 5-16, right column, 2nd para: same as phak through here
- Pg 5-16, Figure 5-26: this is considered a navigation instrument not a flight instrument. Move.
- Pg 5-16, right column, Gyroscopic Systems, 1st para, change "rigidity" to "rigidity in space"; change "rigid" to "rigid in space"
- Pg 5-16, right column, Gyroscopic Systems, 2nd para, 1st sentence, change to "rigidity in space"; 2nd sentence, change "rigid" to "fixed"; 3rd sentence, change "such as turn indicators" to "such as rate of turn indicators"
- Pg 5-17, left column, Power Sources: This discussion is NOT the same as PHAK. The PHAK has other relevant information on exactly the same topic.
- Pg 5-17, left column, Venturi Tube Systems: these are out-of-date; they should just be mentioned as a lead in to more modern systems.
- Pg 5-17, right column, Wet-Type Vacuum Pump: include advantages of using and failure mode. Many still in use on light aircraft.
- Pg 5-17, right column, bottom para, change subheading to "Electrically-Driven Systems"; change "electric rate indicators" to "electrically-driven gyros in rate indicators"
- Pg 5-19, right column, Heading Indicators, 1st para, 1st sentence, remove "used as backup instrument"; for free gyros, the mag compass is essential to set the heading. It is only backup in enroute navigation. Introduce the term free gyro.
- Pg 5-20, left column, top para, change to "Rigidity in space..."
- Pg 5-20, left column, 2nd para, change "Older directional gyros" to "Early directional gyros"; The ones being described in previous paragraph qualify as 'older'. the ones in this paragraph are antiques.



- Pg 5-20, left column, 3rd para, 2nd sentence: this is only true on north/south headings going to zero on east/west headings; needs to include effects of friction on precession and indicated heading.
- Pg 5-20, right column, top para, last sentence, change to "This instrument should be checked and adjusted about every 15 minutes to ensure it agrees with the magnetic compass."
- Pg 5-20, right column, Turn Indicators, 1st sentence, change to "... turn-and-slip indicator additionally operate on precession."
- Pg 5-20, right column, Turn-and-Slip Indicators: this instrument is an antique. write less about it an more about turn coordinator. focus on what the information means so it applies to mechanical and advanced displays. Are advanced displays turn and slip or turn coordinators?
- Pg 5-20, right column, Turn-and-Slip Indicators, 2nd para, "force of inertia caused": this doesn't make sense from a technical point of view
- Pg 5-20, right column, bottom para, last sentence (In a turn made with a bank angle...): not accurate. PHAK has a better description. Focus on higher level knowledge for instrument pilot.
- Pg 5-21, left column, 1st full para (The inclinometer does not...): wrong; this section is about gyro instruments, and the inclinometer is not a gyro instrument. Discuss it elsewhere
- Pg 5-21, left column, 3rd full para (The dial of these....): starting with 4th sentence: this is what's important earlier sentences aren't necessary.
- Pg 5-21, right column, bottom para, "relationship between the bank angle and the rate of yaw": not the way to present this. this is the same instrument as on the turn and bank, Combine the information in one place.
- Pg 5-22, left column, Flight Support Systems, remove "to new technologies": no longer new; over 20 years old
- Pg 5-22, right column, 2nd para: this is misleading. AHRS technology isnt the same as ring LASER gyro. this section should be in advanced avionics handbook
- Pg 5-22, right column, 3rd para, last sentence, change "satellite signal reception" to "use GPS information to improve the accuracy of the intertial sensors."
- Pg 5-22, Figure 5-36: use an example from an IFR training aircraft
- Pg 5-23, left column, 1st para: many acronyms not defined.
- Pg 5-23, left column, Horizontal Situation Indicator (HSI): update and generalize for electromechanical or electronic
- Pg 5-23, left column, Horizontal Situation Indicator (HSI), 2nd para, "VOR/Localizer(VOR/LOC)" update.
- Pg 5-24, left column, 5th para (One of the first widely...): drop discussion of antiques.
- Pg 5-24, left column, bottom para, "VOR/Localizer(VOR/LOC)" update.
- Pg 5-25, left column, Integrated Flight Control System: put details in avionics handbook.
- Pg 5-26, Figure 5-43: this system has two servos. Only one shown. Labels would improve clarity.
- Pg 5-26, left column, Flight Management System (FMS): nice history. better in avionics handbook. This is about air transport/corporate FMS. Need to address flight training aircraft Navigation management system



- Pg 5-26, left column, 2nd para, "Loran": LORAN was never used by airlines and never for long range navigation. It was only used in GA aircraft, and in the late 80's early 90s.
- Pg 5-26, right column, top para, change to "The concept of a master navigation system employed..."
- Pg 5-27, left column, bottom para, 1st line, remove "has"; update whole paragraph.
- Pg 5-27, right column change "Practical Test Standards (PTS)" to "Practical Test Standards (PTS) and/or Airman Certification Standards (ACS)" (or depending on timing of new edition, replace PTS with ACS.
- Pg 5-28, left column, Advanced Technology Systems: move to avionics handbook; the surveillance system doesn't belong here.
- Pg 5-29, left column, Safety System: poor word choice for header.
- Pg 5-29, left column, Safety System, 1st para, "commonly referred to as a radar altimeter": "radar" is a misnomer and should not be used.
- Pg 5-29, right column, 1st line and 2nd para: change "radar altimeter" to "radio altimeter"
- Pg 5-29, right column, Traffic Advisory System: not a flight instrument. Rename chapter.
- Pg 5-30, Figure 5-48: not a useful figure.
- Pg 5-30, left column, Traffic Alert System: delete; TIS makes these obsolete.
- Pg 5-30, right column, Traffic Avoidance System: make clear what size aircraft use TCAS and TCAS II.
- Pg 5-34, left column, Ground Proximity Warning System (GPWS): update to EGPWS
- Pg 5-36, left column, Required Navigation Instrument System Inspection: this header title makes no sense, There is nothing in this chapter about navigation equipment.
- Pg 5-36, Figure 5-60, not a civilian HUD. Use a corporate aircraft HUD picture
- Pg 6-1: This is arguably the most important chapter in this book! Integrate the round dial and electronic display and emphasize common concepts, and minimize teaching to a specific product. Some electronic products have analog presentations for selected information. To have a figure with a mechanical display on the left and the same an electronic display on the right makes more sense. Details about the avionics should be in Avionics Handbook (8083-6).
- Pg 6-2, left column, Learning Methods: these are not 'learning methods'. They are methods for interpreting displayed information that pilots will use forever. Both have their place and should be better integrated.
- Pg 6-2, right column, Control Instruments: this is the same regardless of display system. Yet the information is different between part 1 and part 2
- Pg 6-2, right column, Performance Instruments: expand. this uses a term to define itself! this is a much deeper and important concept than shown.



- Pg 6-2, right column, Navigation Instruments: missing power instruments. they are part of concept
- Pg 6-2, right column, Procedural Steps in Using Control and Performacne, #1: add power instruments.
- Pg 6-5, right column, Altimeter: there needs to be a discussion of instrument interpretation. when the altimeter is changing what does that mean with respect to overall performance?
- Pg 6-6, right column, Airspeed Indicator: need better discussion of power and airspeed
- Pg 6-7, right column, Heading Indicator: the level of headers for this whole chapter need to be fixed
- Pg 6-8, left column, top para, last line: add slip indication.
- Pg 6-15, same general comments apply as to Chapter 6, section 1; Use different products, not just a G1000.
- Pg 6-19, right column, Navigation Instruments, this isn't technically accurate. Focus here on interpreting the course indicator. the details of the system and sensors should go somewhere else. The coverage in part 1 is more appropriate.
- Pg 6-20, Figure 6-27: this type of figure, with a PFD/MFD with lots of flags with text is not productive. It is cluttered with flags not relevant to the topic at hand. Keep the figures focused on supporting the concepts.
- Pg 6-21, Attitude Instrument Flying Primary and Supporting Method, 1st para: this paragraph is much better than its counterpart in part 1. Supports why part 1 and part 2 should be merged.
- Pg 6-23, Figure 6-32: good example of focused figure with mechanical and electronic representation. Only issue is there is actually no trend vector shown in figure.
- Pg 6-27, Figures 6-38 and 6-39: labels are incorrect.
- Pg 6-28, left column change "Practical Test Standards (PTS)" to "Practical Test Standards (PTS) and/or Airman Certification Standards (ACS)" (or depending on timing of new edition, replace PTS with ACS.
- Pg 7-1, integrate part 1 and part 2 similar to chapter 6. The information in part 1 applies equally to electronic displays. Need to be sure descriptions are inclusive of retrofit electronic panels often used for instrument training
- Pg 7-8, left column, 2nd para, 1st sentence: this should be in chapter 5 describing flight instruments.
- Pg 7-21, right column, 2nd para: practice climbing and descending turns as well as level turns.
- Pg 7-22, left column, 1st para and 1-5: include in describing dip errors in chapter 5
- Pg 7-22, left column, 2nd para, last sentence: include what happens with excessive bank angle.
- Pg 7-22, left column, 4th para (2nd from bottom): expand on the last sentence.



- Pg 7-26, right column, Unusual Attitudes and Recoveries: update to emphasize loss of control (LOC) and angle of attack.
- Pg 7-26, figure 7-39: this outside view is not nose-high. It is a level right turn.
- Pg 7-28, Figure 7-40: this view is a shallow nose down pitch.
- Pg 7-30, left column, last line (#5), "... adjusting the outbound leg..." there is no outbound leg defined in this exercise.
- Pg 7-30, Figure 7-41: confusing perspective.
- Pg 7-33, 2nd para, partial panel applies to both mechanical and electronic displays. move partial panel to chapter 11
- Pg 7-34, left column, 1st para, 3rd sentence ("For training purposes...") Not True! Precise instrument flight needs to account for this! Somewhere, need to cover that the pitch bars cannot be adjusted and how this effects interpreting the display information.
- Pg 7-34, right column, bottom para, 2nd sentence, remove "increase situational awareness" (makes it easier to see. But that doesn't mean increased SA. In fact, the horizon overlaid on the airspeed can cause confusion and reduce SA regarding airspeed.) Last sentence, change to read "Most attitude indicators on light aircraft span the entire width of the PFD screen."
- Pg 7-36, right column, VSI Tape, vsi tape is just one way to display vsi information. need to generalize
- Pg 7-43, right column, add new common error addressing chasing the airspeed tape on an electronic display to expand on discussion from pg 7-37, common errors associated with reading heading and altitude in an electronic display.
- Pg 7-43, right column, #1: choice of words. Chevron is not adjustable.
- Pg 7-44, left column change "Practical Test Standards (PTS)" to "Practical Test Standards (PTS) and/or Airman Certification Standards (ACS)" (or depending on timing of new edition, replace PTS with ACS.
- Pg 7-53, right column change "Practical Test Standards (PTS)" to "Practical Test Standards (PTS) and/or Airman Certification Standards (ACS)" (or depending on timing of new edition, replace PTS with ACS.
- Pg 7-58, left column, Autopilot Usage: is this the right place for autopilot? 1st sentence, "installed behind the MFD screen" -- this sounds system specific?
- Pg 7-58, left column, bottom para: need to address retrofit avionics installations aircraft
- Pg 9-1: In general, the chapter needs to be updated to delate LORAN and MLS, and add GBAS, and expand on RNP and WAAS. Present VOR as backup to GPS. There are numerous technical errors or outdated material on virtually every page of chapter. Separate the navigation display (e.g. CDI, HSI, RMI) from the sensor (e.g. VOR,GPS, LOC, GPS). Add Highway in the Sky display, The aircraft equipment probably fits better in Avionics Handbook. Focus here on the overall navigation system


and how to use it. update all descriptions based on marker beacon and middle marker to not refer to them .

- Pg 9-2: Basic Radio Principles: this is important. do not edit it out.
- Pg 9-2, left column, Ground Wave, 2nd para: example today is NDB. Older Omega and LORAN used ground waves but have been decommissioned.
- Pg 9-2, right column, para above "Space Wave" Sky waves are not used for navigation and their occur in the frequency range used by NDBs, especially at night, and can cause errors when using an NDB.
- Pg 9-2, right column, Space Wave, 1st para, change 2nd and 3rd sentences to read "Most navigation systems, except for NDBs, operate with signals propagating as space waves, including VOR, localizer, glideslope, DME and GPS. Frequencies above 100 MHz have nearly no ground or sky wave components. They are space waves, and (except for global positioning system (GPS)) the navigation...
- Pg 9-2, right column, Space Wave, 2nd para, 2nd sentence, change to "Space waves reflect off metallic objects and may be blocked if an object is between the transmitter and the receiver.
- Pg 9-3, left column, Disturbances to Radio Wave Reception: P static is just one of many things that disrupt radio wave reception. A general discussion here would be good. Change 1st sentence "Precipitation static (P static) distorts..."; 2nd sentence delete "and LORAN (long range navigation)" and replace "are" with "is".
- Pg 9-3, left column, Traditional Navigation Systems, change to "Ground-Based Navigation Systems"
- Pg 9-3, right column, NDB Components: update. Never seen an NDB with voice in lower 48. Don't mix up referring to NDB and ADB equipment within the same paragraph. Same para, last sentence, "two letters" three letters. Compass locators have two letters. Include classes of NDBs, similar to VOR. Include continuous listening of NDB, and what good signal sounds like since there is no flag
- Pg 9-3, right column, ADF Components, 1st sentence: obsolete. only one antenna which does both loop and sense.
- Pg 9-5, right column, Tracking: Using an RMI tracking to a waypoint is exactly the same as tracking an NDB. Teach tracking using an RMI independent of the sensor input.
- Pg 9-8, right column, bottom para: Update 1st sentence; 2nd sentence change to "When DME is colocated with..." These statements about distance information are only true if using DME equipment. VOR does not have distance information. Period.
- Pg 9-10, left column, 1st sentence: this is not shown in Figure 9-10.
- Pg 9-10, left column, 1st para, 7th sentence (starting with "Additionally, a VOR needle..."): Almost, not quite. This statement mixes up RMI and movable card ADF display. An RMI performs exactly the same for VOR as NDB signal.
- Pg 9-10, right column, 1st para, sort of. rewrite to accurately descibe classes and service volumes.

- Pg 9-10, right column, VOR Components, 2nd para, 1st sentence: true for old stations. Add doppler VORs.
- Pg 9-11, Fig 9-11: add pic of dopplar VOR.
- Pg 9-11, left column, 2nd sentence, change to "Most VORs can be used..."; last sentence is poorly worded.
- Pg 9-11, left column, 2nd para, update to work with stand along NAV units, Nav/COMS, GNS (such as Garmin 530) or PFD/MDS
- Pg 9-11, left column, bottom para and Fig 9-12: The Course deviation indicator can be used for VOR/LOC/GPS/INS. Present the display independent of VOR
- Pg 9-11, right column, 2nd para from bottom, last sentence: center the course needle with a FROM and read the radial. Use a figure where the signal is reliable.
- Pg 9-11, right column, bottom para: figure 9-12and 9-14 indicates neither TO or FROM. The signal is flagged and does not show any information. Figure 15 shows both a TO and a FROM; rewrite para it doesn't make sense.
- Pg 9-13, Figure 9-15, instrument bottom left corner: the TO/FROM is backwards on this display
- Pg 9-14, left column, 1st full sentence: not true. It deviates from side side because the aircraft is not exactly on course.
- Pg 9-14, left column, 1st para, last sentence, "because the resultant of the opposing reference and variable signals is small and constantly changing." true. in layman's terms, the radials are very close together close to the station
- Pg 9-14, left column, 2nd para: in call cases it is a 'CDI needle' or 'course needle'. the CDI refers to the entire device. Paragraph needs to be rewritten accurately.
- Pg 9-15, Figure 9-16, top right box, should say "Intercept the 205 Radial Inbound"; text below image with human profile: this comment refers to a moveable card ADF, not a CDI
- Pg 9-16, left column, VOR Accuracy, 3rd para: more errors not covered here. Scalloping, bending, Need to mention +10 deg full scale deflection, but this is not a requirement.
- Pg 9-16, left column, bottom para, 2nd sentence, change "not exceed" to "be"
- Pg 9-17, left column, top para: update to include this applies only if VORs are needed for navigation on the flight.
- Pg 9-17, left column, DME Components, 1st sentence: and stand alone DMEs; 4th sentence rewrite. ALL aircraft have separate VOR and DME receivers. Author is referring to a DME that is not autotuned through the VOR frequency selector "Some aircraft have VOR and DME receivers where each must be tuned..."
- Pg 9-17, right column, 1st sentence, these controls are specific of old panel mounted DMEs. Give general information principle of operation and avoid switchology.



- Pg 9-19, Fig 9-18, text below human profile image, text of this is wrong
- Pg 9-19, right column, last sentence, add range limitations, groundspeed errors
- Pg 9-20, Fig 9-19, top image, the other tracking didn't have approach charts. DME don't need them here either.
- Pg 9-22, left column, 2nd line, remove "LORAN"
- Pg 9-22, right column, VOR/DME RNAV: recommend minimal coverage of VOR/DME. It is obsolete. Should be mentioned at the end of RNAV, rather than extensive coverage at beginning of RNAV.
- Pg 9-23, left column, VOR/DME RNAV Components, remove "VOR/DME"; stay generic
- Pg 9-23, Fig 9-23, this looks like LORAN or GPS receiver, not VOR/DME. Update figure and caption
- Pg 9-25, Fig 9-26, update
- Pg 9-25, text below fig 9-26, update
- Pg 9-25, left column, #3, give specifications since actual number of satellites varies over time
- Pg 9-25, left column, Global Positioning System (GPS), update and delete detailed information that pilots don't need to know.
- Pg 9-25, left column, bottom sentence, update for current regulations.
- Pg 9-25, right column, bottom para, sentence starting "Presently, there are at least 31 Block...." And next sentence ("Recently, the Air Force...:") – remove both sentences – this isn't needed for pilots.
- Pg 9-26, left column, 2nd para, last sentence ("In its present form...") remove pilots don't need to know this.
- Pg 9-26, left column, Function of GPS subheading: Differentiate between basic principle of operation from WAAS
- Pg 9-26, right column, 3rd para, 1st sentence, change to "The IFR approved GPS receiver..."
- Pg 9-27, left column, GPS Substitution: Add WAAS and GBAS.
- Pg 9-27, GPS Substitution

This section makes figuring out when you can use GPS in lieu of ground-based navaids far too complicated. Fundamentally, you can use an IFR-approved GPS (non-WAAS or WAAS), as a substitute for *any ground-based navaid* and fly *any segment of a route or procedure* (including DPs, STARs, IAPs-including MAPs-*except for lateral guidance along the final approach segment of an approach that is based on a navaid such as a VOR, NDB, or localizer*. To make that point, in my presentation about using GPS under IFR, I include a color-coded illustration of the ILS or LOC RWY 13 at KHIO (Hillsboro, OR) that shows when you can use GPS and when you must ensure that your CDI is tuned to and receiving information from the localizer. As you can see, you can:

Fly the transition from DAFI to join the localizer.

Identify the fixes along the final approach course.



Resume navigation with the GPS at the MAP to fly to the MAHP associated with UBG, and then fly the hold.

You must use the localizer (green) for primary lateral guidance *only* when you are tracking the final approach segment.



It's probably wise to keep the detailed description of approved substitutions in the current edition of the *IFH*. It emphasizes specifically that you can substitute an IFR-approved GPS for DME fixes, DME arcs, step-down fixes along a final approach, NDBs, etc. And it notes that the primary restriction on substituting GPS for ground-based navaids is that you must be able to retrieve a procedure *or* navaid from the database. But the current presentation makes readers parse the entire list to try to figure out when substituting GPS is approved.

And a statement on p. 9-27 adds to the confusion:

...When using a facility as the active WP, the only acceptable facility is the DME facility that is charted as the one used to establish the DME fix. If this facility is not in the airborne database, it is not authorized for use.

Elsewhere on the same page, the IFH says:

To Fly a DME Arc:

1. Verify aircraft GPS system integrity monitoring is functioning properly and indicates satisfactory integrity.

2. Select from the airborne database the facility providing the DME arc as the active GPS WP. The only acceptable facility is the DME facility on which the arc is based. If this facility is not in your airborne database, you are not authorized to perform this operation.

These statements do not appear in AC 90-108, and based on questions I've received from pilots and CFIs, they imply that if, for example, you're flying an approach such as the <u>ILS or LOC/DME RWY 24 at</u> <u>KHQM</u>, you must use the HQM VOR as the active fix while flying the DME arc. These pilots argue that



you can't load the procedure and fly the arc—you must use HQM as the active waypoint until you are established on the final approach segment.

Of course, you can load the approach into, say, a GNS 530 or GTN 750, select one of the fixes (ZEDAT or PUGIC) that defines a point on the transition defined by the DME arc, and fly the magenta line. In other words, the DME arc is just another leg corresponding to a charted transition, and it's included as part of the procedure, like those that begin at ULESS and SOUPY.

It would be silly to try to fly the arc using HQM as the current waypoint while you're on the arc, and then load the approach as you pass LR-067 so that you can get distance information from fixes along the final approach segment.

Now, the section referenced above is preceded by a note:

NOTE: The following provides guidance that is not specific to any particular aircraft GPS system. For specific system guidance, refer to the POH/AFM, or supplement, or contact the system manufacturer.

That implies that if the handbook for the box in your airplane describes loading a conventional procedure that includes legs defined as DME arcs, you can load and fly the procedure as documented in the handbook. But the language in the note and the following text aren't as clear as they could be on this point. Emphasizing the general point as described above and providing examples would help greatly.

• Pg 9-27, Database currency

In the list under "GPS Substitution for ADF or DME," item 3 says: "The database must be current."

That *must* has sparked debate, because it contradicts AIM *Table 1-1-6: GPS Approval Required/Authorized Use*. Notes 2 and 3 in that table make allowances for working with an expired database.

Similar language appears in AC 90-108:

b. RNAV System Database Considerations.

(1) Pilots must ensure their onboard navigation data is current, appropriate for the region of intended operation, and includes the waypoints, NAVAIDs, and fixes for departure, arrival, and alternate airfields.

NOTE: The navigation data should be current for the duration of the flight. If the Aeronautical Information Regulation and Control (AIRAC) cycle will change during flight, operators and pilots should establish procedures to ensure the accuracy of navigation data, including suitability of navigation facilities used to define the routes and procedures for flight. Traditionally, this has been accomplished by verifying electronic data against paper products.

Of course, the AFM or supplements to it provided when new avionics are installed, holds precedence. Some handbooks for avionics have language that says databases *must* be current for IFR operations.

But the language currently in the *IFH* is causing confusion, and it should be clarified and aligned with guidance in other official sources.

• Pg 9-27, right column, To Determine Aircraft Position over a DME Fix, these different procedures can all be generalized into one or two procedures

- Pg 9-27, right column, To Fly a DME Arc, add "Using GPS Navigation" to the subheading
- Pg 9-28, right column, IFR Flight Using GPS, include RAIM or WAAS systems.
- Pg 9-29, left column, 2nd para, 1st sentence, change "conventional" to "ground"
- Pg 9-29, right column, top para: cover performance navigation requirements and RNP and how system adjusts depending on phase and segment of flight.
- Pg 9-30, left column, top para: this section is about the equipment, not how to fly the approach. That should be elsewhere (maybe more appropriate to FAA-H-8083-6).
- Pg 9-31, left column, Departure and Instrument Departure Procedures (DPs): update and move to Procedures.
- Pg 9-31, right column, 1st full para, 4th line, change "hard" to "metallic"
- Pg 9-31, right column, 2nd para from bottom (Selective Availability): leave out.
- Pg 9-32, left column, 2nd subheading DGBS update for GBAS
- Pg 9-33, right column, LAAS: update
- Pg xiv and 9-34 remove INS or mention this is specific to corporate and air transports.
- Pg 9-35, left column Instrument Approach Systems, Add LPV.
- Pg 9-35, left column, ILS, update for technical improvements, As into, explain history of markers and compass locator and how they are mostly gone, replaced by DME. Explain that this description is CAT i only. Have a separate sub header to explain back-course and how it differs from a front course. Include substituting waypoints in database for NDB, VOR intersections.
- Pg 9-35, right column, #3 at top of page: mostly decommissioned.
- Pg 9-35, right column, Ground Components: intersections off VORs is common.
- Pg 9-35, right column, bottom para: update explanation for lack of markers and that signal may is normally only usable in one direction.
- Page 9-35 A new section/paragraph should be added (in red letters, just before Instrument Approach Systems). The paragraph should be titled "IFR Operation with Minimal or Inoperative Navigation Systems." The section should emphasize a risk management approach to operation with minimal or inoperative navigation systems, using examples. For example, it might demonstrate to the pilot the hazards of navigating over a route with continuous low IFR conditions if the aircraft only has a single operating nav/com radio. On the other hand, for example, the presence of a portable nav/com radio, portable GPS, and or an ADF receiver could provide mitigation of this risk.
- Pg 9-37, left column, 1st para, 1st sentence, add to read ".... in high needle sensitivity compared to VOR. With this course..."
- Pg 9-37, left column, Glideslope, 1st para: poorly worded regarding FAF
- Pg 9-37, right column, Marker Beacons, update for lack of use today
- Pg 9-38, left column, ALS, this section covers more than "ALS" revise subheading accordingly.

- Pg 9-38, right column, 1st full para, This is for non-precision, not ILS covered here.
- Pg 9-38, right column, 2nd full para: include PAPIs.
- Pg 9-38, right column, bottom para, 2nd sentence, remove "Some receivers have separate function selector switches, but most" this is obsolete.
- Pg 9-39, right column, top para: not exactly explain differences.
- Pg 9-39, right column, 2nd para, remove "Though some GPS receivers are tuned separately" obsolete.
- Pg 9-40, left column, 3rd para, 1st sentence, change "sufficient voltage is received to actuate the needles" to "a reliable signal is being received from the localizer and glideslope transmitters respectively."
- Pg 9-40, left column, 4th para (starting The OM is identified...), 5th sentence (starting "Marker beacon receiver sensitivity..."): explain setting high/low sensitivity better. most don't understand this.
- Pg 9-40, left column, ILS function 1st para, change 2nd sentence to read "... it is useful for situation awareness to rotate the OBS..."
- Pg 9-40, left column, ILS Function 2nd para, 1st sentence, remove "aircraft"; also, need intro to reverse sensing with localizer.
- Pg 9-41, Figure 9-38 and caption: suggest showing both holding as procedure turn and old fashion PT.
- Pg 9-41, Figure 9-38, block B: comment here applies to HSI, but figure shows both HSI and CDI
- Pg 9-41, Figure 9-38, block A: for HSI, needle sensing is correct.
- Pg xiv and 9-43 remove MLS
- Pg 9-44, left column, Required Navigation Performance: expand on the first sentence and provide a better introduction. RNP is the description of the required capability of the aircraft's navigation system to fly in a particular airspace/procedure. RNP itself is not a navigation system.
- Pg 9-44, right column, Flight Management System: move FMS. This would be good as the FMS introduction in avionic handbook (FAA-H-8083-6).
- Pg 9-46, left column, Head-Up Display (HUD): this is a display system, not a navigation system. Group with other displays.
- Pg 9-46, left column, Radar Navigation (Ground-Based): change subheading to Navigation by Radar Vectors or Navigation via Surveillance Radar
- *Pg 10-1*: throughout chapter, update and freshen for current procedures.
- Page 10-2 A new section (in red letters) should be added (following the section "Sources of Flight Planning Information."). The new section should be titled "Risk Management During Flight Planning." The new section should emphasize that pilots should conduct a risk analysis during preflight planning. This should include identifying the risks using the standard PAVE checklist method, assessing the likelihood and severity of the identified risks using a risk assessment matrix or other technique, and mitigating moderate and high risks by taking action to reducing the likelihood and/or severity of each risk.



- Pg 10-3, figure 10-1 and associated text: update to ICAO flight plan form (required after October 2015).
- Page 10-7, En Route Procedures I recommend adding a new section entitled "Direct Routing" right before the paragraph "ATC Reports." The new paragraph should emphasize when it is appropriate and authorized to request and follow a direct route using GPS or another RNAV capability. It should be emphasized that in a non-radar environment, the GPS or RNAV system must be IFR approved. However, in a radar environment, the pilot may request a direct routing and use any means to accurately navigate. This could include a non-IFR approved GPS or RNAV system, providing the pilot realizes that ATC radar is now a primary navigation method and requires the pilot to monitor position and stay on the approved track.
- *Page 10-10, Holding Procedures* I recommend adding a paragraph describing how protected airspace is incorporated into a hold and emphasizing the need to stay within protected airspace when entering and staying in the hold.
- Page 10-21 A new section/paragraph should be added after the section "IAP Minimums." The
 new section should be titled "Personal Minimums." This section should discuss the concept of
 adding margins to the approach minimums as a means to mitigate identified risks. For example, if
 the pilot is fling a leg of several hours in turbulent IMC conditions with no autopilot, it might be
 appropriate to add a margin to the published minimums to accommodate potential fatigue.
- Pg 10-22, right column, remove "EFAS"
- Pg 10-24, left column, remove "EFAS"
- Page 10-29 A new paragraph in the right column following the discussion about the navigation log. This paragraph should discuss the need to conduct a risk analysis of the planned flight, as I recommended in comment 5. This new paragraph should refer back to this revised section.
- Pg 11-1: Needs a new outline of topics and reworking. This chapter should focus on how to manage different emergencies the decision making, the help available, general how-to techniques, how to minimize risk and have a safe outcome. Include both human factors of dealing with emergencies, and technical methods. Much of this is somewhat covered elsewhere. Too much G1000-based. Electronic cockpit system details should be more in Avionics Handbook (FAA-H-8083-6). P-static is included under unforecast weather which is not appropriate. A section on navigation-system failure, regardless of the exact cause, would be more appropriate. P-static being one cause of nav (and comm) failure. Section on p-static in earlier chapter should be combined with this info.
- Page 11-2 A new section/paragraph should be added after the "Introduction" section and titled (in red letters) "On-going Risk Management During the Flight." This section should emphasize the need to continue active risk management as the flight progresses. The pilot must continue to identify, assess, and mitigate new hazards and risks and immediately take action to reduce the likelihood and/or severity of emerging risks. Examples should be included for each of the four major categories represented by the PAVE checklist.



- Pg B-1, left column change "Practical Test Standards" to "Practical Test Standards and/or Airman Certification Standards" (or depending on timing of new edition, replace PTS with ACS.
- Pg B-3, right column change "Practical Test Standards (PTS)" to "Practical Test Standards (PTS) and/or Airman Certification Standards (ACS)" (or depending on timing of new edition, replace PTS with ACS. (2 occurrences this page)
- Pg G-6, remove "EFAS" and En route Flight Advisory Service terms.
- *Pg G*-19, remove Transcribed Weather Broadcast (TWEB) and TWEB terms.



Advanced Avionics Handbook (FAA-H-8083-6)

<u>General</u>

- Better outline chapters with more level of headers and shorter paragraphs to emphasize topics and sub topics.
- Layout chapters in three parts: 1) basic information application to VFR or IFR: 2) IFR features: 3) advanced high-end features
- "Chapter Summary" should be changed to "Chapter Conclusion" throughout book
- Include a more nuanced handling of Situation Awareness (SA). Saying something will 'enhance situation awareness' really is just a marketing phrase. Include the levels of SA and factors in automation that enhance and degrade SA. Include as relevant: vigilance, complacency, mode awareness, information overload, clutter, workload, attention tunneling, out-of-the-loop syndrome and misplaced salience.
- Include risk management beyond the 'common errors' and 'catch errors' in text.
- Include new technology. Minimize old technology. Add Enhanced vision systems, Synthetic vision systems, and Electronic Flight Bags.
- Use this handbook to provide more details on how equipment works, (e.g. magnetometer, ADC and AHRS) and on the main differences between GPS TSO-C129, -C145,and –C196 capabilities. Either make this in addition to IFH Chapter 5-22 to 5-34 or instead. But don't make it less, and don't repeat the same information.
- Combine the navigation chapter with the AFH Chapter 6,7 Section II

Specific Book Recommendations

- Pg 1-1, This chapter is all about FMS/autopilot and nothing about PFD/MFD, navigation, or information. An introduction needs to be a balanced introduction for the entire book.
- Pg 1-2, left column top paragraph is a run-on paragraph.
- Pg 1-3, left column, 1st para, remove reference to sidebars (there aren't any in the book)
- Pg 1-3, left column, 2nd para, In reading the introduction, it is not clear what this Learning series, Awareness series and Risk series is. Good idea, but poor execution. Having read the book, I now know what it is referring to.
- Pg 2-1, This could be combined with the Instrument Flying Handbook on attitude flying. The information here seems like just a teaser. For example, instead of just mentioning the trend indicator for rate of turn, explain how to read it.
- Pg 2-2, right column, top paragraph: This assumed level of knowledge of the reader seems disjointed. Here is assumes the reader is familiar with primary and supporting flight instruments which means an instrument rating with electromechanical gauges. Going forward, there should be no assumption of experience with electro-mechanical displays.
- Pg 2-2, right column, common errors: This is too short. There are other common errors worth mentioning.
- Pg 2-3, left column, 4th sentence: Isn't this more a negative transfer of learning from conventional gauges, rather than negative human factors?



- Pg 2-4, left column, 2nd para, Stormscope/Strikefinder: Change to update to current weather and traffic products
- Pg 2-4, left column, 3rd para: Add synthetic vision systems and enhanced vision systems
- Pg 2-4, left column, Other Flight Status Information, 1st para: (1) displaying data on MFD should be expanded on. (2) Not being distracted by all the data should be discussed
- Pg 2-4, right column, making entries in the PFD: The common error of too much head down time while making entries should be discussed and methods to mitigate discussed
- Pg 2-4, right column, Failures and the Primary Flight Display 1st para: This just isn't in depth or specific enough to be very useful.
- Pg 2-4, right column, bottom para: Many different ideas in this paragraph. Develop each idea
- Pg 2-6, Awareness: Using Standby Instruments, last sentence: this doesn't make sense. A vacuum failure in a TAA aircraft would disable the backup instruments, not the PFD. Is the author equating a PFD failure to a vacuum failure in an aircraft with electromechanical instruments?
- Pg 3-1: suggest start with basics for VFR Pilot, then cover IFR features for light aircraft (GPS Navigation System), and finally a section for high-end capability (INS, DME/DME, and FMS)
- Pg 3-1: Delete LORAN and Doppler. Make it clear INS, DME/DME, are on air transport aircraft, and GA will be using GPS, WAAS, VOR, and LOC/GS
- Pg 3-2, left column, top para: Break up paragraphs and use sub headers to emphasize key points
- Pg 3-2, left column, remove "and LORAN-C. Older RNAV units made use of VOR and DME information to compute positions within range of the navaids. Newer"
- Pg 3-2, left column, 4th sentence, I have yet to see a GA navigation system with DME equipment installed. What I do see are confused pilots who think they have DME, but its really GPS distance: Therefore, flight management system (FMS) is the best descriptor of the current navigation systems which integrate GPS, VHF VOR and localizer. GPS units which also integrating VOR (and DME, optionally) to allow point-to-point navigation outside established flight routes. You will learn to use the FMS data entry controls to program a flight route, review the planned route, track and make modifications to the planned route while en route, plan and execute a descent, and fly an approach procedure that is based solely on RNAV signals.
- Pg 3-2, left column, 4th sentence, highlighted section above: Poorly written where will the reader learn? This is a recurring issue throughout text.
- Pg 3-2, left column, Area Navigation (RNAV) Basics: concepts are still good, update for current generation of navigation systems. Include touch screen
- Pg 3-2, right column, top para, rewrite to read "In this way, RNAV overcomes a fundamental limitation of ground-based navaid point-to-point navigation techniques, which require navigating between electronic navigation transmitters on the ground."
- Pg 3-2, right column, 2nd para, rewrite 1st sentence to "An aircraft using VOR for navigation guidance is positioned at Point A as shown in the diagram at the top of *Figure 3-1*, and the pilot wishes to navigate directly to Point B."
- Pg 3-2, right column, 3rd para break to new paragraph where new idea starts: The national airspace system..."

- Pg 3-2, right column, last para, last sentence, change to "... a GPS navigation system also contains..."
- Pg 3-3, left column, change subheading to "Stand alone FMS/RNAV/Autopilot Interface: Display and Controls"
- Pg 3-3, left column, 1st sentence, remove "Every"; this is over-simplified; the system has one or more user interface(s) with display, etc. Much of the avionics these days is not accessible to the pilot.
- Pg 3-4, right column, bottom para, remove "usually called"
- Pg 3-6, left column, FMS/RNAV Approval for IFR Operations, section is way out of date. Remove 2nd para completely.
- Pg 3-6, left column, Navigation Database Currency: most of the stuff under this header does not deal with a current database. the info in this section on alternates, & NOTAMs could be moved under appropriate sections in instrument procedures handbook
- Pg 3-6, right column, GPS Signal Availability, 4th sentence, change "Many" to "All non-WAAS IFR" and after "units" add "certified under TSO-C129"
- Pg 3-6, right column, GPS Signal Availability, 5-6-7th sentences: Not the place for how WAAS works. Move/combine to where other navigation systems are explained
- Pg 3-7, left column, Alternate Airports, 4th sentence, The AIM has a good table on this that could be repeated here.
- Pg 3-7, Aircraft Equipment Suffixes, last sentence: remember who the reader is. Deferred items are not something a low time pilot knows about. But the concept is sound and should be included in text at the appropriate level
- Pg 3-7, left column, Suitability of an RNAV Unit for VFR flight, 1st sentence, replace "receiver is" with "system is"
- Pg 3-7, right column, top line: this issue of too much head-down time should be expanded on for all levels of flight, not just VFR
- Pg 3-7, right column, Programming the Flight Route, include systems that allow input of airways or point to point input.
- Pg 3-7, Figure 3-8, Clearance block, "12L3" is probably meant to be "121.3"
- Pg 3-8, left column, Entering En Route Waypoints, this section is confusing.
- Pg 3-9, left column, Risk: taking off without a flight plan: could the different risks be grouped together and discussed in more detail along with mitigation?
- Pg 3-9, right column, 2nd para, change parenthetical, "Remember the" to "There is an"
- Pg 3-9, right column, last sentence: this should include the 4 things to check, then expand on them.
- Pg 3-11, right column, 2nd para starting with "On the great circle route..." don't bring in examples of other locations. Stick to the example at hand.
- Pg 3-12, left column, 2nd para, 2nd sentence, change "instrument" to "indicator"
- Pg 3-12, left column, change subheading to "Common error: Displaying the data from the wrong navigation source"

- Pg 3-12, right column, sentence starting with "Some installations compound" and following sentence: This problem is in the older TSO-129, and then, only in KLN devices, so don't' spend time on it. This quirk is an example of knowing your equipment inside and out.
- Pg 3-12, right column, change sentence starting with "Typically, that is not a problem..." to read "That is not a problem if the pilot is ready to switch to the ILS. However, the error arises if the aircraft is still tracking GPS or upon missed approach, when the pilot selects another frequency to follow a VOR missed approach routing."
- Pg 3-20, left column, Elements of Descent Planning Calculations combine with Airplane Flying Handbook (FAA-H-8083-3) on how to fly descents (don't need it in both places).
- Pg 3-25, left column, Intercept and Track Course combine this section with Instrument Flying Handbook (don't need it in both places).
- Pg 3-28, Holding the level of subheadings need to be better established so it's obvious to the reader the hierarchy of these sections.
- Pg 3-30, GPS and RNAV (GPS) approaches combine with the Instrument Procedures Handbook (FAA-H-8083-16); doesn't need to be in both places.
- Pg 3-35, red headings on this page should be subheadings under "Approaches"
- Pg 3-35, left column, LNAV/VNAV, delete parenthetical (shift to using WAAS in same paragraph as discussing non-WAAS is confusing).
- Pg 3-35, right column, GPS or RNAV (GPS) Approach Waypoints is this a subheading of "LPV" subheading styles are confusing to hierarchy.
- Pg 3-36, left column, Terminal Mode, update. Be clear this is description is for non-precision, not LPV.Can combine with description of how GPS approach works. A diagram of changing course sensitivity would be helpful. An advanced section could go into RNP course sensitivity.
- Pg 3-36, right column, Vectored Approaches, 1st sentence, "conventional" is poor word choice clarify.
- Pg 3-38, left column, Course Reversals: up date for current systems. Consider how to give time to older units without too much text on them.
- Pg 3-42, left column, Ground-Based Radio Navigation (remove "Radio" no longer used in reference to ground-based navigation); 1st para under this heading, add (define) skills to end of last sentence.
- Pg 3-42, right column, top line, "Displaying" is not a pilot skill better word choice?
- Pg 3-44, this fits better as an introduction. It does not really summarize the material in the chapter
- Pg 4-2, left column, 1st sentence "you will learn..." -- where will you learn? In this chapter?
- Pg 4-2, right column, bottom para, starting with "Figure 4-1..." new idea, start new paragraph.
- Pg 4-4, right column, Flight Director subheading, [Figure 4-5] also include a picture with V bars.
- Pg 4-6, left column, bottom para, should include the GPSS allows AP to automatically change course when next leg becomes active
- Pg 4-7, right column, para starting You should note that, last sentence: unless ... It won't fly to fuel starvation if the pilot does his/her job!



- Pg 4-7, Maintain Altitude, include adjusting altitude hold as pressure changes along the route (below FL180)
- Pg 4-8, left column, para ahead of subheading "Climbs and Descents" add explanation how systems without auto trim are handled.
- Pg 4-8, right column, Catching Errors: Armed Modes Help Prevent Forgotten Mode Changes" this section is confusing.
- Pg 4-10, left column, Common Error: Failure to Arm the Altitude Mode; add other common errors with respect to auto pilots.
- Pg 4-11, left column, Power Management: this needs more emphasis as a serious risk for loss of control and a potential error
- Pg 4-11, right column, Essential Skills: all these 'essential skills' should have "Essential Skills for XXX" to aid learning
- Pg 4-14, left column, Deciding when to use the FD/Autopilot, 1st para: Include Autopilot/FD use requirements on RNP procedures
- Pg 4-15, left column, Positive Exchange of Controls, 1st para: this needs to be explicitly tied into the discussion of AP. Such as how does this exchange of control change when the aircraft if on AP?
- Pg 4-16, change "Chapter Summary" to "Chapter Conclusion"
- Pg 5-1, Add traffic information system to chapter; Add enhanced vision system to chapter; Add taxi charts; Discuss information overload
- Pg 5-6, left column, #1 at bottom of page: needs a more nuanced discussion of SA.
- Pg 5-6, right column, Early Systems: There is no history of other systems. What is the advantage of including this one?
- Pg 5-8, left column, TAWS A and TAWS: include equipment requirements such as radio altimeter
- Pg 5-10, Onboard Weather Radar Systems: explain both radar system in the last 10 years and the new systems coming out circa 2015
- Pg 5-10, Figure 5-12: this is the wrong type of aircraft for this picture. It needs to be a high performance aircraft.
- Pg 5-10, right column, Ground Weather Surveillance Radar: include information on aircraft systems that can receive this information.
- Pg 5-12, left column, Lightning, 1st sentence, change by adding "... this is indicative of lightning if lightning detection equipment is installed or available via datalink."
- Pg 5-12, left column, Lightning 2nd para: needs updating
- Pg 5-12, right column, top para, include the timeliness of lightning displays
- Pg 5-15, left column, Advanced Traffic Data Systems Based on ADS: update for current system status.



March 24, 2015

Robert L. Newell FAA Branch Manager, Airman Testing Standards Systems Training Annex Bldg. 26 FAA Mike Monroney Aeronautical Center 6500 S. MacArthur Blvd. Oklahoma City, OK 73169



Dear Mr. Newell,

On behalf of the Aviation Rulemaking Advisory Committee's (ARAC) Airman Certification System Working Group (ACSWG), we submit the following recommendations for the *Aircraft Weight and Balance Handbook* (FAA-H-8083-1A). We hope these recommendations will be useful to the FAA in future development efforts for new editions and prioritizing training guidance documents.

Recommendation

The previous committee (Airman Testing Standards and Training Working Group) offered this recommendation: Add any pertinent information in the Aircraft Weight and Balance Handbook (FAA-H-8083-1A) not already covered in the Pilot's Handbook of Aeronautical Knowledge (FAA-H-8083-25) and the Aviation Maintenance Technician General Handbook (FAA-H-8083-30) and eliminate the Weight and Balance Handbook altogether.

The ACSWG agrees with this recommendation – a separate handbook is not necessary on this subject. Aircraft weight and balance should be consolidated into other appropriate FAA reference documents and FAA-H-8083-1A canceled. In addition, we offer the following input:

- Absorb Chapter 6 into the *Helicopter Flying Handbook* (FAA-8083-21); most of the information is already covered here.
- Chapter 7: Large Aircraft would be most appropriate in the FAA-H-8083-30; it is not relevant to the typical FAA-H-8083-25 reader.
- Add new/more information on risk management of weight and balance and center of gravity concepts.

The ACSWG and its members welcome the opportunity to provide feedback on streamlining FAA publications affecting training and testing. Thank you for this opportunity and please let us know if we can provide anything further.

Sincerely,

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David Oord ACSWG Chair Vice President, Regulatory Affairs Aircraft Owners and Pilots Association

Jackie Spanitz ACSWG Subgroup Lead Curriculum Director Aviation Supplies & Academics, Inc.



Interim Recommendation Report of the ARAC Airman Certification System Working Group March 1, 2016 April 30, 2015

Robert L. Newell FAA Branch Manager, Airman Testing Standards Systems Training Annex Bldg. 26 FAA Mike Monroney Aeronautical Center 6500 S. MacArthur Blvd. Oklahoma City, OK 73169



Dear Mr. Newell,

On behalf of the Aviation Rulemaking Advisory Committee's (ARAC) Airman Certification System Working Group (ACSWG), we submit the following recommendations for the *Helicopter Flying Handbook* (FAA-H-8083-21A). We hope these recommendations will be useful to the FAA in future development efforts in preparation for releasing the new Change 1 file as well as for new editions and prioritizing training guidance documents.

The WG reviewed the 8083-21A file to include Change 1 via this file: <u>https://s3.amazonaws.com/FAA/Helicopter+Flying+Handbook+Change+1+(Draft).pdf</u>

The ACSWG and its members welcome the opportunity to provide feedback on streamlining FAA publications affecting training and testing. Thank you for this opportunity and please let us know if we can provide anything further.

Sincerely,

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David Oord ACSWG Chair Vice President, Regulatory Affairs Aircraft Owners and Pilots Association

Jackie Spanitz ACSWG Subgroup Lead Curriculum Director Aviation Supplies & Academics, Inc.

Incl: 150429 8083_21A Tracking Matrix.xlsx



Recommendation

Specific recommendations are detailed in the accompanying matrix document. In addition to those, this document includes the following recommendations:

Preliminary Discussion to Chapter 2 – many new helicopter students have a limited physics background. Therefore, I have found it useful to cover some very basic concepts before proceeding to more advanced ideas.

Gravity acting on the mass (the amount of matter) of an object creates a force called weight. The rotor blade below weighs 100 lbs. It is 20 feet long (span) and is 5 feet wide (chord). Accordingly, its surface area is 100 square feet.



20 feet

The blade is perfectly balanced on a pinpoint stand, as you can see from looking at it from the end (the "airfoil" view).



The goal is for the blade to defy gravity and stay exactly where it is when we remove the stand. If we do nothing before removing the stand, the blade will simply fall to the ground. Can we exert a force (a push or pull) opposite gravity that equals the 100 lb. weight of the blade? Yes, for example, electromagnetic force could be used. In helicopters, however, we use aerodynamic force (AF) to oppose weight and to maneuver.

Every object in the atmosphere is surrounded by a gas that exerts a static force of 2,116 lbs per square foot (a force times a unit area, called "pressure") at sea level. However, that pressure is exerted equally all over the blade (top and bottom) and therefore does not create any useful force on the blade. We need only create a difference of a single pound of static pressure differential per square foot of blade surface to have a force equal to the blade's weight (100lbs of upward pressure opposite 100lbs downward weight).



Total pressure consists of static pressure and, if the air is moving, dynamic pressure (a pressure in the direction of the air movement). As we will see below, if dynamic pressure is increased the static pressure will decrease. Due to the design of the airfoil, the velocity of the air passing over the upper surface will be greater than that of the lower surface, leading to higher dynamic pressure on the upper surface than on the lower surface. The higher dynamic pressure on the upper surface lowers the static pressure on the upper surface. The static pressure on the bottom will now be greater than the static pressure on the top. The blade will experience an upward force. With just the right amount of air passing over the blade the upward force will equal one pound per square foot. This upward force is equal to, and acts opposite the blade's weight of 100 lbs. So if we now remove the stand, the blade will defy gravity and remain in its position (ignoring rearward drag for the moment).

The force created by air moving over an object (or moving an object through the air) is called "aerodynamic force". Aero means air. Dynamic means moving or motion. Accordingly, by moving the air over an airfoil we can change the static pressures on the top and bottom thereby generating a useful force. An "aerodynamic force".

The portion of the aerodynamic force that is usually measured perpendicular to the air flowing around the airfoil is called lift and is used to oppose weight. Drag is the portion of AF that is measured as the resistance created by an object passing through the air (or having the air passed over it). Drag acts in a streamwise direction with the wind passing over the airfoil and retards forward movement.

On page 2-2, "Forces Acting on the Aircraft" are described as forward thrust from a prop or rotor, drag, weight and lift opposing weight. This is good for fixed-wing pilots getting an additional helicopter rating because it is the same as used for airplanes, but is somewhat incorrect and confusing when applied to helicopters. When discussing the entire rotor system (and not just an airfoil segment), most current texts simply define all the aerodynamic force that is perpendicular to the tip-path plane as "Thrust". This is because the rotor thrust is used for both propulsion and as a force opposite weight (lift), because lift is not produced separately by wings. As shown below, the main rotor total thrust is divided into thrust used for lift (T_{vertical}) and thrust used for propulsion (T_{horizontal}). This type of diagram is more correct and seems to make more sense to the students. Of course, when discussing individual airfoil sections, the standard Bernoulli analysis is used.



On page 2-3, in sections on "Bernoulli's Principle" and "Venturi Flow", the concepts of mass flow continuity and Bernoulli are conflated and confusing; perhaps they are best viewed



separately. The continuity of mass flow will cause the air to move faster through the venturi. Bernoulli (P_{total} = P_{dynamic} + P_{static}) states that the increase in velocity will increase the streamwise dynamic pressure. Since the total pressure in the tube must remain constant, the static pressure on the sides of the venturi will decrease. Figure 2-4 states only, "Pressure decreased" at the venturi, but it is the static pressure decrease we are interested in (and the dynamic pressure actually increases). This should be made clear by labeling it "Static pressure decrease."

Also, if the term "energy" is used, it should be defined the first time it is used. Specifically in this case the "energy" referred to are the dynamic pressure (the kinetic energy of the airmore velocity, more kinetic energy) and static air pressure (potential energy). These will change among themselves, but the total pressure energy remains constant inside the tube.

Perhaps a presentation using actual numbers would be helpful in getting from the abstract to the practical. The diagram below shows plates of one square foot in the dynamic flow and on the sides of the tube indicating static pressure, with corresponding pressure readings (these numbers are approximate and should be checked for accuracy). At point 2 it is easier to visualize the static pressure reduction on the top of the airfoil as compared to the bottom of the airfoil which is depicted as outside of the tube and therefore at ambient static pressure. This is good as a basic introduction to the concept, even though with actual blades it is not a simple as this because the bottom static pressure is influenced by blade design and blade angle, among other things. However, the basic idea is that it is the static pressure differential between the top and bottom multiplied by the surface area of the blade that generates the aerodynamic force.



Figure 2-9 on page 2-6 appears to be a fixed wing drag chart adapted for helicopter use by adding a profile drag line. It stops as if the aircraft has a stall speed. An actual typical



helicopter drag chart is shown below. Note that the chart goes to zero fuselage speed, but that there is high induced drag associated with the high blade pitch angles at a hover.

Figure 2-20 on page 2-11 "In ground effect" and Figure 2-21 "Out of ground effect" on page 2-12 are overly complicated - perhaps the below figures are less so. High induced velocities (measured at the rotor) and large vortices require a blade pitch angle of 18 degrees to achieve an effective angle of attack of 10 degrees.





The figure below shows reduced induced flow and lessening of vortices when in ground effect thereby allowing an effective angle of attack of 10 degrees at a pitch angle of only 14 degrees



On page 2-14 "Pendular Action", there is a difference in the amount of pendular action between a semirigid system and a fully articulated system. Because of the hard connection (offset) of the latter, the centrifugal force pulling out on the blades is transferred to the fuselage, and the fuselage tends to follow the rotor attitude. The semirigid system is a true pendulum, with thrust required to create a moment around the fuselage CG to allow for control of the fuselage. This comes into play later when mast bumping is discussed. The diagram below illustrates this and is from "The Helicopter" by John Fay, 3rd ed., 1979.





Interim Recommendation Report of the ARAC Airman Certification System Working Group March 1, 2016

On page 2-22, "Transverse Flow Effect" is correct, but the vibration associated with ETL is further explained by Mr. Ray Prouty in "Even More Helicopter Aerodynamics", Rotor & Wing, Phillips Business Information, Inc., 1993, p. 35:

Vibration

Another effect that can be traced to upwash is the vibration felt when starting into forward flight for hover. While going through the so-called "transition regime," the upwash over the front of the disc send the blade-tip vortices that are generated in this region up rather than down.... Further back, they fall under the influence of the downwash over the rear of the rotor, where they come down and pass through the rotor disc.

When the following blades strike these little whirlpools of air, they are subjected to large transient changes in local angle of attack. This in turn produces sudden changes in air loading, leading to "transition vibration."

Of course, the transition vibration is worse when decelerating from forward flight to hover. For a considerable period of this maneuver, the flow up through the rearward-tilted rotor disc cancels out the normal downwash of the rear of the disc, and many tip vortices stay around long enough to be struck by the following blades....

At speeds above the transition speed, the vibration is less. The upwash is lower and the rotor plane is tilted forward with respect to the flight path, so that vortices tend to go below the rotor.

The Prouty diagram below differs with Figures 2-37 and 2-38 in that it shows an upflow where the helicopter is moving through the forward limit of its hover pattern downwash, which he terms "ground roll-up" or "ground vortex". (See "Helicopter Aerodynamics", Rotor & Wing, Phillips Business Information, Inc., 1985, Figure 9-9, p. 52.) This is sometimes visible to the pilot when taking off from unprepared sites by papers and other light objects being moved up in front of the rotor and then being caught in the induced flow and traveling through the rotor system. Depending on the object, the blades may be damaged.





Figure 2-47 on page 2-26 is busy and complicated for new students. The figure below is less so. It is based upon a diagram by Professor H.H. Hurt, Jr. of the University of Southern California. It shows the blade regions with the horizontal lift as a blade propulsive force vs. drag for each region. Note that only in the "driving" (autorotative) region does the forward propulsive force (green) exceed that of drag (red).



In Chapter 7, page 7-2, "Autorotation Performance". The chapter lacks an autorotative curve. The chart should be added in Chapter 7 or Chapter 11 "Autorotation."



A review of the relationship between airspeed (or horizontal speed) and vertical speed in autorotation would be helpful. During autorotation gravity provides the source of energy powering the rotor by causing upflow up through the rotor during descent. This is the same as saying that potential energy is being traded for kinetic energy to turn the rotor as the aircraft descends.



The S-300 curve above shows the various combinations of horizontal and vertical speeds that will supply the required energy to keep the rotor turning at a constant 471 RPM. For example, an airspeed of 54 MPH with a corresponding vertical speed of 1,600 FPM will provide enough kinetic energy to maintain the rotor at a 471 RPM. The rotor does not care if the air is coming from the front or the bottom so long as the total is sufficient to maintain the RPM. Any point on the curve will maintain rotor speed. However, the pilot does care because if he or she, for example, glides at 30 knots the corresponding rate of descent will be over 2,200 FPM. Since there is little airspeed for a deceleration (or "flare") to reduce the rate of decent before touchdown, the collective pitch application (increasing blade pitch and giving a final temporary increase in lift before the blades slow down) may be insufficient to arrest the rate of descent.

Students who fully comprehend this relationship will understand why training autorotations are usually limited to airspeeds between the minimum rate of descent airspeed and the



maximum range airspeed (usually about 25% faster than the minimum rate of descent airspeed).

An example of the curve would be useful to ensure that the student understands the consequences of not maintaining the target airspeed when executing an autorotation. Simply put, they should know <u>why</u> airspeed is the most significant factor affecting the rate of descent.

It is possible to view an autorotation as a series of energy trades.

The potential energy gained by virtue of the aircraft's altitude is traded for dynamic pressure (kinetic energy of the air as the helicopter moves downward) to power the rotor.

Then the airspeed is traded in the deceleration to stop altitude loss and bring the rate of descent to zero. (In powered flight this is called a "zoom" or "cyclic climb" – trading airspeed for altitude. In autorotation, it should be a progressive deceleration so as to stop the descent, but not climb.) Although the primary purpose of the deceleration is to stop the rate of descent, it also slows the forward speed and increases RPM. Excessive flaring in order to achieve a "zero ground run autorotation" should be avoided. Following the flare the aircraft must be leveled for touchdown so as to avoid striking the tail rotor. An extreme nose high attitude makes the leveling process difficult, so in training there sometimes is a requirement for a specific amount of ground slide after touchdown in order to help preclude tail strikes.

In the final stage of the deceleration (but before leveling), a small collective pitch application ("initial pitch") is made to assist in slowing the aircraft's forward speed. Following the leveling process the remaining collective pitch travel is used to "cushion" the touchdown. This collective pitch pull at the bottom of the autorotation is also an energy trade. The rotor blades' kinetic energy is used to create a burst of lift to allow the aircraft to settle gently to the ground. In fact, this is the only time during flight operations that rotor angular velocity (RPM) is allowed to slow down and depart from the bottom of the green arc.

Third, with either a straight-in or 180° autorotation, the final portion is the same. At no lower than 100 feet the aircraft must conform with the following requirements:

Rotor RPM - in the green Airspeed – at target airspeed Trim ball – centered Engine running and available – if needed to terminate the practice autorotation and go around Landing area assured – alignment and distance Normal rate of autorotational descent for target airspeed

The autorotation should not be continued if all six of the requirements are not met at the 100 feet "gate".



High density altitudes present a particular problem for autorotation training, especially during the flare-and-touchdown phase, due to the decreased aerodynamic efficiency of the rotor blades. Some operators prohibit their aircraft from conducting "touchdown" autorotations if the density altitude is above a certain altitude. A "termination with power" (bringing engine power back to the rotor system as the aircraft is being leveled for touchdown) is not a touchdown maneuver, but also can be difficult to accomplish in high density altitude conditions. Accordingly, it seems that they should be subject to the same constraints as the full touchdown autorotatons.

High density altitude is not a problem for autorotative glides at altitude or what are known as "power recoveries" where the power is normally added prior to 300 feet AGL (while the aircraft is still gliding) and a go-around is completed.



July 2, 2015

Robert L. Newell FAA Branch Manager, Airman Testing Standards Systems Training Annex Bldg. 26 FAA Mike Monroney Aeronautical Center 6500 S. MacArthur Blvd. Oklahoma City, OK 73169

Dear Mr. Newell,

On behalf of the Aviation Rulemaking Advisory Committee's (ARAC) Airman Certification System Working Group (ACSWG), we submit the following recommendations for the **FAA Guidance Documents**. These recommendations support of 14 CFR Part 61 knowledge requirements (see Appendix 1) and continue from those made from the committees that preceded the ACSWG (see appendix 2).

We hope these recommendations will be useful to the FAA in establishing priorities and with future development efforts.

The ACSWG and its members welcome the opportunity to provide feedback on streamlining FAA publications affecting training and testing. Thank you for this opportunity and please let us know if we can provide anything further.

Sincerely,

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David Oord ACSWG Chair Vice President, Regulatory Affairs Aircraft Owners and Pilots Association

Jackie Spanitz ACSWG Subgroup Lead Curriculum Director Aviation Supplies & Academics, Inc.





Recommendation

The ARAC ACS WG offers the following vision and recommendations to AFS630 to support the transition from Practical Test Standards (PTS) to Airman Certification Standards (ACS). The recommendations focus on these primary objectives:

- Move from product management towards data management via content QMS processes and hyperlinks within the ACS.
- Align training and testing guidance content and organization to the ACS.

Conduct of Airman Knowledge Test Guides (Order 8080.6G)

• Short-term and Long-term: continue to maintain and revise as needed (about every 2 years).

Knowledge Test Guides (FAA-G-8082-XX)

- Short-term: Update annually each June to account for transition from PTS to ACS.
- Long-term: cancel each title as the corresponding ACS is released; i.e. Recreational and Private Pilot Knowledge Test Guide (FAA-G-8082-17l) will be canceled with the release of FAA-S-8081-ACS-PA. The ACS incorporates all the information currently in the Test Guides.

Learning Statements Reference Guide

- Short-term: Update pg 1 with information on the ACS and ACS codes, effective with release of initial ACS. Maintain LSC codes without further changes to transition applicants, instructors and examiners to the new ACS code system.
- Long-term: cancel 24-months after the final ACS is release, to support airman test reports effective for 24 months. The Learning Statement Codes will be phased out with the implementation of the Airman Certification System codes.

Knowledge Testing Authorization Requirements Matrix

- Short-term: Update pg 1 with information on the ACS and noting this matrix will be phased out with the implementation of the ACS. Maintain remaining test document without additional changes any future changes will be accounted for in ACS.
- Long-term: cancel once the final ACS is release. The ACS incorporates all the information currently in the matrix.

Computer Testing Supplements (CT-8080-XX)

- Short-Term: documents include outdated information, un-used figures, and require corrections (see Appendix 3). Release new editions by June 2016 as follows:
 - 1. Correct errors, cancel and/or remove figures not being used. Do not add figures until unused figures are first removed. See Corrections identified in Appendix 3.
 - 2. Do not add figures to the supplement until corresponding questions are developed and validated (figures can be displayed onscreen during validation process).
 - 3. Add "Parallel" questions to the public data for every figure being used on the test to ensure training and testing are correlated for a true validation process (i.e. questions cannot be accurately validated if they weren't first part of a training curriculum).
 - 4. Figures and associated questions are identified to the public when removed from testing to ensure training and testing remains correlated



• Long-Term: Once new FAA Knowledge Exam testing system is implemented, move all applicable figures to on-screen graphics and combine remaining figures into a single document referenced for all tests.

Handbooks (FAA-H-8083-XX)

The University Aviation Association (UAA) conducted a survey of its membership to determine which FAA handbooks were used where and by whom (See Appendix 4). The following recommendations are consistent with these survey results.

- Short-Term:
 - Update handbooks to support introduction of ACS:
 - Supporting Private, Commercial, ATP ACS: FAA-H-8083-25B, FAA-H-8083-3B, FAA-H-8083-2A (AFS630 currently processing ARAC ACS WG recommendations for these new editions)
 - Supporting Instrument ACS: FAA-H-8083-15C, FAA-H-8083-16A, FAA-H-8083-6A
 - Publish AFS630 handbook inventory with planned update schedule so documents are on a <u>regular</u> and <u>predictable</u> schedule, which is <u>communicated</u> to the training communities.
 - Follow defined QMS to solicit input from the stakeholder WG prior to establishing Statement of Work associated with a given revision and ensure quality control to help alleviate errors.
 - Collect input from reader (via email <u>afs630comments@faa.gov</u> or other portal) for each given title provide collected input to stakeholder WG when soliciting input.
 - Include an Executive Summary identifying changes for new editions (or Updates, Erratas, Changes) of a given title.
 - Provide at minimum PDFs (and ideally html) for each FAA title on the AFS630 website.
- Long-Term:
 - Add hyperlinks to ACS References to guide readers to the specific information. This will allow the information to remain in context, yet support the trend towards data and information management
 - Consolidate guidance documents to alleviate redundancy and potential conflicts of information (as varying between publications):
 - Skill-specific handbooks should remain stand-alone documents, organization and content aligned with the ACS, and reviewed every 2 years for possible updates and/or new editions:
 - Airplane Flying Handbook FAA-H-8083-3
 - Helicopter Flying Handbook FAA-H-8083-21; add Helicopter Air Ambulance and Part 133 External Load information.
 - Glider Flying Handbook FAA-H-8083-13
 - Balloon Flying Handbook FAA-H-8083-11
 - Powered Parachute Flying Handbook FAA-H-8083-29
 - Weight-Shift Control Handbook FAA-H-8083-5
 - Seaplane, Skiplane, and Float/Ski Equipped Helicopter Operations Handbook FAA-H-8083-23
 - Certificate-specific handbooks should remain stand-alone documents, organization and content aligned with the ACS, and reviewed every 2 years for possible updates and/or new editions:
 - Aviation Maintenance Technician General FAA-H-8083-30

- Aviation Maintenance Technician Powerplant FAA-H-8083-31
- Aviation Maintenance Technician Airframe FAA-H-8083-32
- Parachute Rigger Handbook FAA-H-8083-17
- Flight Navigator Handbook FAA-H-8083-18 [Note: only 1-3 applicants prepare this certificate annually allocate resources accordingly]
- Aviation Instructor's Handbook FAA-H-8083-9; incorporate applicable information from FAA-H-8083-4
- Knowledge-specific handbooks should continue to support the knowledge requirements as defined by 14 CFR Part 61 (see Appendix 1). The following handbooks should remain stand-alone documents, organization and content aligned with the ACS, and reviewed every 2 years for possible updates and/or new editions:
 - Pilot's Handbook of Aeronautical Knowledge FAA-H-8083-25
 - Instrument Flying Handbook FAA-H-8083-15
- Discontinue the following Handbooks moving information to other documents as noted:
 - Helicopter Instructor Handbook FAA-H-8083-4: move unique information to FAA-H-8083-21 and FAA-H-8083-9 as applicable.
 - Plane Sense FAA-H-8083-19: move unique information to FAA-H-8083-25 and FAA-H-8083-30 as applicable.
 - Instrument Procedures Handbook FAA-H-8083-16: move unique information to FAA-H-8083-15
 - Aircraft Weight and Balance Handbook FAA-H-8083-1: move unique information to FAA-H-8083-25 and FAA-H-8083-30 as applicable.
 - Risk Management Handbook FAA-H-8083-2: implement risk management techniques to existing skill, knowledge, and certificate-based documents so risk management is taught in context.
 - Student Pilot Guide FAA-H-8083-27: move unique information to FAA-H-8083-25 and ACS Appendices.
 - Advanced Avionics Handbook FAA-H-8083-6: move unique information into existing navigation chapters of FAA-H-8083-25 and FAA-H-8083-15.
- New Handbooks needed to support applicants, instructors, evaluators:
 - Airship Flying Handbook (alternately, add Section to Balloon Flying Handbook FAA-H-8083-11)
 - Gyroplane Flying Handbook (previously included as Section in Rotorcraft Flying Handbook – was left out with introduction of Helicopter Flying Handbook)
 - Aircraft Dispatcher Handbook



Appendix 1: 14 CFR Part 61 Knowledge Requirements

Certificate/Rating	Knowledge Requirements
Instrument Rating (14 CFR 61.65)	(1) Federal Aviation Regulations of this chapter that apply to flight operations under IFR;
	(2) Appropriate information that applies to flight operations under IFR in the "Aeronautical
	Information Manual;"
	(3) Air traffic control system and procedures for instrument flight operations:
	(4) IFR navigation and approaches by use of navigation systems:
	(5) Use of IER en route and instrument approach procedure charts:
	(5) becoment and use of aviation weather reports and forecasts and the elements of forecasting
	(o) Focularity and use on that information and norseanal observations of weather conditions:
	(7) Safe and officiant operation of aircraft under instrument flight rules and conditions:
	(7) Sale and endent operation of an craft under instrument right rules and conditions,
	(8) Recognition of critical weather situations and windshear avoidance;
	(9) Aeronautical decision making and judgment; and
	(10) Crew resource management, including crew communication and coordination.
Private Pilot (14 CFR 61.105)	(1) Applicable Federal Aviation Regulations of this chapter that relate to private pilot privileges,
	limitations, and flight operations;
	(2) Accident reporting requirements of the National Transportation Safety Board;
	(3) Use of the applicable portions of the "Aeronautical Information Manual" and FAA advisory
	circulars;
	(4) Use of aeronautical charts for VFR navigation using pilotage, dead reckoning, and navigation
	systems:
	(5) Radio communication procedures:
	(6) Becognition of critical weather situations from the ground and in flight windshear avoidance and
	the procurement and use of aeronautical weather reports and forecasts.
	(7) Sofe and officient operation of aircraft including collision avoidance, and recognition and
	(7) Sale and emicine operation of an end of micrary, including consister avoidance, and recognition and
	avoluance of wake to bulence,
	(8) Effects of density attitude on takeon and climb performance;
	(9) weight and balance computations;
	(10) Principles of aerodynamics, powerplants, and aircraft systems;
	(11) Stall awareness, spin entry, spins, and spin recovery techniques for the airplane and glider
	category ratings;
	(12) Aeronautical decision making and judgment; and
	(13) Preflight action that includes—
	(i) How to obtain information on runway lengths at airports of intended use, data on takeoff and
	landing distances, weather reports and forecasts, and fuel requirements; and
	(ii) How to plan for alternatives if the planned flight cannot be completed or delays are encountered.
Commercial Pilot (14 CFR 61.125)	(1) Applicable Federal Aviation Regulations of this chapter that relate to commercial pilot privileges,
	limitations, and flight operations;
	(2) Accident reporting requirements of the National Transportation Safety Board:
	(3) Basic aerodynamics and the principles of flight:
	(4) Meteorology to include recognition of critical weather situations, windshear recognition and
	avoidance and the use of aeronautical weather reports and forecasts:
	(5) Safe and efficient operation of aircraft.
	(5) Weight and balance computations:
	(a) Weight and balance computations,
	(7) Use of performance charts,
	(a) significance and effects of exceeding an trait performance inmuttons;
	(9) Use of aeronautical charts and a magnetic compass for pliotage and dead reckoning;
	(10) Use of air navigation facilities;
	(11) Aeronautical decision making and judgment;
	(12) Principles and functions of aircraft systems;
	(13) Maneuvers, procedures, and emergency operations appropriate to the aircraft;
	(14) Night and high-altitude operations;
	(15) Procedures for operating within the National Airspace System; and
	(16) Procedures for flight and ground training for lighter-than-air ratings.
ATP (14 CFR 61.155)	(1) Applicable Federal Aviation Regulations of this chapter that relate to airline transport pilot
	privileges, limitations, and flight operations;
	(2) Meteorology, including knowledge of and effects of fronts, frontal characteristics, cloud
	formations, icing, and upper-air data;
	(3) General system of weather and NOTAM collection. dissemination. interpretation. and use:
	(4) Interpretation and use of weather charts, maps, forecasts, sequence reports, abbreviations, and
	symbols
	(5) National Weather Service functions as they pertain to operations in the National Airspace Systems
	(3) wational weather service functions as they pertain to operations in the National Airspace System;
1	(o) while the and micropurst awareness, identification, and avoidance;



	(7) Principles of air navigation under instrument meteorological conditions in the National Airspace System:
	(8) Air traffic control procedures and pilot responsibilities as they relate to en route operations,
	terminal area and radar operations, and instrument departure and approach procedures:
	(9) Aircraft loading, weight and balance, use of charts, graphs, tables, formulas, and computations,
	and their effect on aircraft performance:
	(10) Aerodynamics relating to an aircraft's flight characteristics and performance in normal and
	abnormal flight regimes:
	(11) Human factors:
	(12) Aeronautical decision making and judgment:
	(13) Crew resource management to include crew communication and coordination: and
	(14) After July 31, 2014, for airplane category multiengine class rating or airplane type rating, the
	content of the airline transport pilot certification training program in §61.156.
CFI (14 CFR 61.185)	(i) The learning process;
	(ii) Elements of effective teaching;
	(iii) Student evaluation and testing;
	(iv) Course development;
	(v) Lesson planning; and
	(vi) Classroom training techniques.
	(2) The aeronautical knowledge areas for a recreational, private, and commercial pilot certificate
	applicable to the aircraft category for which flight instructor privileges are sought; and
	(3) The aeronautical knowledge areas for the instrument rating applicable to the category for which
	instrument flight instructor privileges are sought.
Sport Pilots (14 CFR 61.309)	(a) Applicable regulations of this chapter that relate to sport pilot privileges, limits, and flight
	operations.
	(b) Accident reporting requirements of the National Transportation Safety Board.
	(c) Use of the applicable portions of the aeronautical information manual and FAA advisory circulars.
	(d) Use of aeronautical charts for VFR navigation using pilotage, dead reckoning, and navigation
	systems, as appropriate.
	(e) Recognition of critical weather situations from the ground and in flight, windshear avoidance, and
	the procurement and use of aeronautical weather reports and forecasts.
	(f) Safe and efficient operation of aircraft, including collision avoidance, and recognition and
	avoidance of wake turbulence.
	(g) Effects of density altitude on takeoff and climb performance.
	(h) Weight and balance computations.
	(i) Principles of aerodynamics, powerplants, and aircraft systems.
	(j) Stall awareness, spin entry, spins, and spin recovery techniques, as applicable.
	(k) Aeronautical decision making and risk management.
	(I) Preflight actions that include—
	(1) How to get information on runway lengths at airports of intended use, data on takeoff and
	landing distances, weather reports and forecasts, and fuel requirements; and
	(2) How to plan for alternatives if the planned flight cannot be completed or if you encounter delays.



Appendix 2: History

The Airman Testing Standards and Training Aviation Rulemaking Committee (ARC) submitted a final report in April 2012. Among the 9 recommendations was included:

• The ARC recommends the FAA establish and continuously communicate a schedule for publishing standards, handbooks, and knowledge test questions by June 30, 2013.

Excerpt from the Final ARC Reports:

Stakeholder Role in the Development and Review of Key Handbooks Used for Airman Training

The inventory of handbooks is the baseline for guiding day-to-day training in the GA industry. The FAA currently reviews handbooks every 3 years per FAA Order 1320.1E. However, in-house FAA resources allocated to this task have consistently declined over the last 15 years, and corresponding costs have increased. This has resulted in large delays in the review and production process associated with handbook development, with handbooks now revised every 3 to 30 years, depending on the subject. This delayed development and unpredictable release schedule for new editions has a direct effect on training innovations, as FAA handbooks define the standards on which all curriculums are based. Private industries are reluctant to invest in training innovations because "pending" FAA standards may nullify the investment with unanticipated changes. Therefore, the aviation industry responds with new training innovations only after pending FAA documents are released.

Handbook review begins with establishing a set of requirements for the requested changes. As an example, the FAA recently decided to amend the Pilot's Handbook of Aeronautical Knowledge to include separate chapters related to loss-of-control and runway safety. The FAA then either undertakes the development of new text or contracts the development to the aviation industry. Following the development of new draft text, the updated handbook is coordinated per FAA Order 8900.1 by the Technical Information and Communications Programs Branch (AFS-140), which incorporates comments from key offices and collects senior-level endorsements, and the new handbook is published. The ARC believes the aviation industry must stay involved and, more importantly, be informed when changes to documents are released so these changes can be implemented in training curriculums. In the case of the runway safety and loss-of-control addition, industry only learned about this change through the ARC. Without a policy in place to notify the intended reader, it is difficult, if not impossible to ensure applicants, instructors, and training providers include the requirements or new topics as the FAA intended.

Additionally, to address the timeline for the FAA's internal review of the handbook, the ARC believes the FAA should review how each office conducts its internal handbook review, including its priority among other documents subject to internal coordination. Although FAA Order 1320.1E requires policy and procedures be reviewed every 3 years, many of the FAA handbooks are long overdue for revision. The industry segments with knowledge of current training practices and equipment in use can help with prioritization, along with other agencies such as NASA, the National Transportation Safety Board (NTSB), and other branches within the FAA.

The ARC evolved into the Airman Testing Standards and Training Working Group to the ARAC (ATST WG). One of the tasks assigned to this group included:

The ATST WG formulated recommendations to align and, where appropriate, consolidate FAA handbooks (FAA-H-8083-XX series) and computer testing supplements (FAA-CT-8080-XX series) with the ACS, as well as recommendations for updating these materials and coordinating, distributing, and communicating changes with/to stakeholders in a timely fashion.

The ATST WG Final Report was submitted September 2013 and included these recommendations specific to Guidance Documents:

The FAA's guidance material provides an essential link between the statutory certification requirements for airman certificates and ratings, the proficiency standards described in documents such as the ACS, and the knowledge test questions. For this reason, the FAA's tasking to the ATST WG included the request for a proposal to align and, as appropriate, streamline and consolidate existing FAA guidance material with the newly-developed ACS documents.

For the purposes of this endeavor, the ATST WG focused primarily on the range of guidance material developed and maintained by the FAA Flight Standards Service's Regulatory Support Division (AFS-600). These include the FAA-H-8083-XX series handbooks and the FAA-CT- 8080-XX series computer testing supplements. The Handbooks/CTS Recommended Changes Matrix included in Appendix G to this report summarizes the ATST WG's document-specific recommendations with respect to substantive changes, possible consolidation, and sequence for revision. The ATST WG recommends that the Test Guide (FAA-G) series and Learning Statement Reference Guide be discontinued with the adoption of the ACS, as the information in these publications is incorporated into the ACS approach.

Recognizing that the airman testing and training system uses a wide range of additional reference material, the ATST WG also developed a tracking document/matrix (see Appendix Q) to assist the FAA in updating the agency's internal guidance (e.g., Order 8900.1) and reference materials (e.g., Advisory Circulars) managed outside AFS-600. The PTS-to-ACS References Matrix lists those areas of FAA Order 8900.1, Flight Standards Information Management System, as well as other internal guidance documents where references to the PTS should be changed to ACS. The Reference Documents Tracking Matrix lists documents such as the Airport/Facility Directory and FAA Advisory Circulars that, in the opinion of the ATST WG, should be incorporated into the FAA-H series handbooks rather than retained as separate knowledge test reference material. (See Appendix H.)



To avoid the fragmentation and misalignment that bedevil the airman certification system today, the ATST WG believes it is essential for the FAA to develop a systemic, comprehensive change management mechanism that aligns both the guidance material housed in AFS-600 and the range of internal and external reference material with the terminology and content of the foundational ACS documents. The comprehensive QMS process recommended in Section 4 of this report is the recommended mechanism for the kind of robust change management system this task requires, and it should include a guidance management component that encompasses handbook changes and ensures alignment with the ACS, FAA reference documents, and regulatory changes.

The guidance management material component of the QMS process should provide a means to accomplish the following goals. **5.1 Updates**

To ensure the proper management of updates to FAA-H-8083-XX series handbooks and FAACT- 8080-XX series computer testing supplements, the FAA's integrated QMS process should document the means to:

• Obtain and incorporate input from a broad range of internal and external stakeholders to ensure that the FAA-H-8083-XX series handbooks, the FAA-CT-8080-XX series computer testing supplements, and reference materials provide information that aligns with the ACS and support the airman's acquisition of the ACS elements to be assessed via the knowledge test.

o To facilitate this work, the ATST WG recommends that the FAA consider making proposed handbook and computer testing supplement series changes electronically available up to 12 months in advance of a new edition, with a provision for stakeholders to upload suggestions and recommendations for adjudication.

• Provide a systematic and controlled means of releasing mid-cycle information at defined regular intervals. This system should clearly distinguish between non-safety-related corrections (e.g., typos) and substantive updates or additions to existing material. For instance, the ATST WG recommends:

o A periodically scheduled release of errata to disseminate non-safety-related corrections.

o The use of the existing Information for Operators (InFO)/Safety Alert for Operators (SAFO) mechanisms to disseminate off-cycle safetyrelated corrections, additions, updates, or amendments.

• Provide a systematic and controlled means of incorporating and integrating new safetyrelated information into the handbook and computer testing supplement series documents at each regularly scheduled update. The current method of simply adding information as a new chapter, an appendix, or an addendum (vice integrating it into the appropriate part of the document) creates instability in the training environment, and it does not offer an educationally sound presentation to the applicant.

• Create and maintain a bibliography of advisory circulars (AC) and other reference documents not otherwise accounted for or cited in the handbook content.

• Create and maintain a single source "library" of figures (e.g., in the FAA-CT-8080-XX series computer testing supplements) referenced in the testing process to reduce redundancy and increase cost-savings.

5.2 Coordination

To ensure that both FAA policy divisions and external stakeholders have an opportunity to review and comment on proposed changes, the FAA's integrated QMS process should provide a systematic means of coordinating errata, updates, and other new information with the appropriate internal and external stakeholders.

5.3 Distribution

To facilitate efficient distribution of new and updated materials, the FAA's integrated QMS process should stipulate:

• Release of each FAA-H-8083-XX series handbook in both PDF and HTML form, with hyperlinked table of contents, figures, index tags, to enable distribution in eBook format.

• A publicly-accessible library of high-resolution images and illustrations, ideally organized by handbook and chapter, for public use in safety presentations, handouts, etc.

5.4 Communication

To ensure that stakeholders are informed of changes, updates, and new materials in a timely and predictable way, the FAA's integrated QMS process should provide for:

• Use of mechanisms such as SPANS, FAAST Blast, and other such tools to inform stakeholders when InFOs or SAFOs pertinent to the airman certification system are published, released, and/or effective. The FAA should also use these tools to inform stakeholders when current editions are canceled.

• A standardized set of data for each title, to include (a) date last updated; (b) current edition; (c) next edition expected; (d) InFO/SAFO updates; (e) how to submit feedback.

• Standardized periods of extension (vice "pending" notations) when handbook revisions are behind schedule. The term "pending" creates instability: Because it does not provide clear information on when stakeholders can expect updates, training providers suspend curricula and delay training changes pending release of new FAA guidance.

• Removal of obsolete terms, technologies, and associated sample questions from the public data. Retention of this material communicates incorrect information to applicants, training providers and other stakeholders, who waste time and effort to train / learn material that is no longer relevant to safe operation in today's NAS.

The ATST WG evolved into the ARAC Airman Certification System Working Group (ARAC ACS WG) – the committee in process today. This group was tasked with formalizing the recommendations previously made by the ARC and ATST WG with regards to the FAA Guidance Documents supporting the Airman Certification Standards.



Appendix 3: Computer Testing Supplement (CT-8080-XX) Corrections

Private/Recreational/Sport Pilot CT-8080-2F – Corrections Needed

- Legend 2-19, Figures 18, 19 suggest changing "2012" to "20XX" in all instances (so applicants aren't distracted by "outdated" references.
- Figures 21, 60 adjust sectional scaling to use full page consistent with other full-page sectional excerpt figures (so plotters can be used to be "close enough" for real-life practice correlated to testing and result in the correct answers). Applicants/instructors have also requested the ability to use a Compass (math tool) during the FAA Knowledge Exam (add this tool to list of acceptable test tools in AC 60-11 and Order 8080.6) so they can more easily use the scales provided on the Sectional image in the CT-8080 (if they aren't using a plotter).
- All Sectional excerpts add note to caption "Not to scale; not for navigation; use associated scale."
- Figure 7 (also used on cover) wrong bank indication; move the A tag to be right of the center tick to indicate a right turn (consistent with the rest of the instrument indications)
- Figure 12 METAR KLAX, remove the 2nd "SCT007"
- Figure 15 update TAF to current format (figure is showing old 24-hour format, needs to be updated to reflect current 30-hour format)
- Figure 17 update name of report, top left corner (of rotated image) change "FD" to "FB"
- Figure 18 (1) add A, B, C call-outs to work better with the questions; (2) South Texas and South Oklahoma have an extra symbol depicted which doesn't mean anything it's a barb going down with a left tick not associated with the rest of the symbol and both should be removed.
- Figure 19 use different (updated) chart that includes depictions for severe weather, echoes, and cell movement the one in the –F edition doesn't have these things depicted which means none of those test questions can be used.
- Figure 20 legend in middle of figure, 2nd line from bottom should be "100/070" (currently backwards)
- Figure 22 left of the "1" the excerpt needs to move to the right so "117.1" is fully legible (it's needed for some questions).
- Figure 29 return to depictions from previous (CT-8080-2E) edition where the number set at the OBS (top of the indicator) is in a larger font and the reciprocal to the OBS settling (at the bottom of the indicator) is in a smaller font.
- Figure 31 fixed cards don't use N, S, E W tags refer to the CT-8080-2E figures for correct versions (remove N, S, E W from the compass roses in all 8 images).
- Figure 36 All 3 tables, correct "RMP" to "RPM".
- Figure 41 scale in bottom left corner is off by about 10 degrees; i.e. 59 deg F = 5 deg C in the chart but should be 15 deg C.
- Figure 49 this new image comes from an A/FD but the associated test questions are about airport markings. This A/FD image doesn't include depictions for chevrons, displaced thresholds, etc. but the test questions are asking about these things. Suggest either replacing or revising this figure with reference to the –E version to include the necessary airport symbols. This would allow more flexibility for new test questions too addressing the need for more testing on surface (airport) movement.

Instrument CT-8080-3E + Addendeum A – Corrections Needed:

- Throughout the Testing Supplement, approach chart figures are in the old format which has not been used since about 2008. The new chart format which has been used since then is closer to the look of the Jeppesen charts. (The approach charts in Addendum A are in the new format.) Suggest removing all approach charts in the obsolete format and replacing with the new versions. If a new edition can't be created now, cancel figures no longer being used.
- Throughout the Testing Supplement, en route charts use obsolete symbols for mandatory reporting points at VORs or NDBs. This changed in 2011. The previous symbol was a solid triangle in the center of the navaid; the new symbol has the navaid symbol itself fully



shaded. Suggest updating all en route charts where a mandatory reporting point is shown at a navaid to the new format. If a new edition can't be created now, cancel figures no longer being used.

- Figure 8 out of date.
- Figure 18 out of date.
- Figure 36A: cancel or replace. Depicts old-fashioned RNAV plate, but the minimums for the approach that exist today are GLS, LNAV/VNAV and LNAV not straight-in and circling.
- Figure 49 "6100" in MSA circle (plan form view, bottom right quadrant) is not legible but this number is used in a test question. Remove question until this figure can be fixed.
- Figure 93 Class C and Class D airspace is depicted with the same upper ceiling. But Class C is generally the surface to 4,000 ft AGL and Class D is generally the surface to 2,500 feet AGL. Better to depict these airspaces at different altitudes so they don't look the same.

Commercial CT-8080-1C Corrections Needed:

- Figure 9 notes 1 and 2 need clarification on whether they must be applied in sequence.
- Figures 16, 20 remove ADF, RMI questions from test.
- Figures 21, 22, 23 remove time and angle to station questions from test.
- Figures 25, 26, 27, 28, 29, 30 update to current approach plate layout.
- Figure 35 bottom chart, bottom right figure "200" should be "400"

CFI CT-8080-5F Corrections Needed:

- Figure 19, bottom scale (on right side of page when holding book upright) "Bank angle (degrees)" should be "Angle of attack (degrees)"
- Add Addendum A Figures 57, 58

ATP CT-8080-7C Corrections Needed

There are a number of Computer Testing Supplement (CT-8080-7C + Addendums A, B, C) figures not being used on the ATP and Aircraft Dispatcher tests (ADX, ATP, ATA, ARA, ATH, ARH, ACP, FNX, ATM, ATS) yet are required by the ODAs to provide to all applicants. The current ATP supplement (Effective Dates: CT-8080-7C 2005 + Addendums A July 2011, B May 2012, and C April 2014) is 592 pages and includes 46 Legends (4 are used directly in questions) and 534 Figures (280 are used directly in questions). This results in increased cost for everyone involved with the test; the original CT-8080-7C was \$24.00; the current book to include Addendums A, B, and C is now \$36.00. Costs are expected to increase as the volume of issued ATP tests continue to decline. As such, it is important to take action now to try to contain any unnecessary inflation.

Based on proprietary (ASA) data, we have determined the following figures are **not being used**. The FAA should confirm these with the official form tests and validated questions: Legends 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42A; Figures 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 44, 45, 46, 47, 48, 49, 50, 51, 52, 54, 65, 76, 78, 81, 82, 83, 84, 85, 86, 87, 88, 90, 91, 92, 93, 95A, 113A, 113B, 113C, 132, 133, 161A, 163A, 166, 166A, 167A, 170, 170A, 173A, 178A, 189, 189A, 191A, 198, 209, 209A, 212A, 213, 213A, 219, 220, 221, 222, 229, 230, 232, 233, 234, 237, 238, 239, 240, 243, 244, 245, 246, 247, 248, 250, 254, 255, 255A, 255B, 256, 257, 257B, 258, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 275, 276, 277, 278, 280, 281, 282, 283, 284, 285, 286, 288, 289, 290, 291, 292, 294, 296, 300, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 319, 320, 322, 323, 324, 325, 326, 328, 333, 334, 335, 337, 338, 339, 341, 343, 344, 345, 346, 347, 349, 350, 351, 352, 355, 356, 357, 358, 359, 360, 361, 362, 364, 365, 366, 367, 368, 369, 370, 371, 372, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 396, 397, 400, 403, 404, 418, 419, 420, 423, 424, 425, 426, 427, 430, 431, 432, 433, 434, 435, 436, 437, 441, 442, 443, 444, 445, 446, 447, 448, 449, 453, 454, 455, 456, 458, 462, 463, 464, 467, 468, 473, 474, 476, 477, 478, 479, 480, 482, 483, 484, 485, 486, 487, 488

AMT CT-8080-4F Corrections Needed:

- Add Addendum A Figures
- General (Appendix 1) Figure 16, missing line near "9" see 4E
- Airframe (Appendix 3) Figure 20, top Gear warning visual "G" should be "R"; bottom Gear warning visual "G" should be "A".

IA CT-8080-8D Corrections Needed:

• Implement "pencil corrections" issued to ODAs.


September 9, 2015

Robert L. Newell FAA Branch Manager, Airman Testing Standards Systems Training Annex Bldg. 26 FAA Mike Monroney Aeronautical Center 6500 S. MacArthur Blvd. Oklahoma City, OK 73169



Dear Mr. Newell,

On behalf of the Aviation Rulemaking Advisory Committee's (ARAC) Airman Certification System Working Group (ACSWG), we submit the following recommendations for the new editions of the Commercial (CT-8080-1D) and Instructor (CT-8080-5G) Airman Knowledge Testing Supplement.

These recommendations are consistent with the recommendations made for the FAA Guidance Documents Vision submitted July 2, 2015.

We hope these recommendations will be useful to the FAA as you gear up to release these new editions to support airman testing and the release of the Airman Certification Standards.

The ACSWG and its members welcome the opportunity to provide feedback and thank you for this opportunity and please let us know if we can provide anything further.

Sincerely,

do

David Oord ACSWG Chair Vice President, Regulatory Affairs Aircraft Owners and Pilots Association

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Jackie Spanitz ACSWG Subgroup Lead Curriculum Director Aviation Supplies & Academics, Inc.



Recommendation

Computer Testing Supplements (CT-8080-XX)

- Short-Term: Release new editions effective June 2016 as follows:
 - 5. Correct errors, cancel and/or remove figures not being used. See Corrections identified below.
 - 6. Do not add figures to the supplement until corresponding questions are developed and validated (figures can be displayed onscreen during validation process).
 - 7. Add "Parallel" questions to the public data for every figure being used on the test to ensure training and testing are correlated for a true validation process (i.e. questions cannot be accurately validated if they weren't first part of a training curriculum).
 - 8. Figures and associated questions are identified to the public when removed from testing to ensure training and testing remains correlated
- Long-Term: Once new FAA Knowledge Exam testing system is implemented, move all applicable figures to on-screen graphics and combine remaining figures into a single document referenced for all tests.

Instructor Computer Testing Supplement (CT-8080-1D) Corrections

- Rework the cover to match fonts, and style of the Commercial cover, which would also have it tie in with the books done previously.
- Save the PDF so the text is black only. For printing CMYK text is not good.
- Add bleed to the cover.
- Change the cover image, sectional and airport directory images to high resolution.
- Pg 3, change "2015" to "2016".
- Pg 5, Preface add to bottom of list "FAA-CT-8080-5G supercedes FAA-CT-8080-5F, Computer Testing Supplement for Commercial Pilot, dated 2014." (to be consistent with Commercial supplement)
- Figure 4: bad break on 1st line; might look better:
 ... BKNO
 018-TOP...
 So the "018" is kept together
- Figure 5: this is old TAF format; 121720Z 121818 should be 1218/1318 per AC 00-45G page 7-31
- Figure 7: caption, change "FD" to "FB"
- Figures 10, 11, 12: Suggest replacing Weather Depiction Charts with today's tools (Ceiling & Visibility Chart or C&V and satellite vis/fog; rewriting associated questions to test applicants on determining ceiling, visibility and fog forecasts using data found at <u>www.aviationweather.gov</u>.
- Figure 14: showing top of the turbulence at a lower MSL than at the bottom (see AC00-45G pg 8-9 for correct depiction):





- Figure 14: update the prog charts (SIGWX) to reflect new 2-panel layout that went into effect September 2 2015: www.aviationweather.gov (these are ultimately being phased out, replaced by National Digital Forecast Display: http://digital.weather.gov. One of the many advantages of these new tools is "no more symbols to remember" – long-term, suggest removing this figure and/or replacing it with a NDFD and modifying questions to focus on "what information is needed to make the go/no go/continue decision – getting away from the "what is this symbol" and moving towards the decision-making associated with the weather; i.e. change questions and figures to focus on what information do you need, not what reports/forecasts symbols do you need to memorize). If short term the plan is to keep the charts, update to the current 2-panel layout.
- Figure 18, caption should be Stall Speed vs Load Factor; ***Load factor or "G" units scale should be on the right side of the chart.
- Figure 19, caption should be Angle of Attack vs Lift
- Figure 21: the CT-8080-5E has 4 wing examples; the -5F went up to 16 examples a 117' wing span is a B737-900 is this really necessary for this test/applicant? Suggest returning to the 5E (4 examples of typical training aircraft).
- Figure 26: caption, add "a" to read "... for a particular altitude."
- Figure 39: "Sea-level pressure altitude" remove hyphen in "sea-level" so it's just "Sea level"
- Figure 41: remove ADF indicators (fixed dial) ADF/NDB no longer included on FAA Knowledge Exams. Otherwise, modify caption to include "Not used on U.S. FAA Knowledge Exams."
- Figure 41 if you decide to keep this figure, remove N, S, E, W fixed cards don't show directionals like this.
- Figure 43: remove RMI indicators RMI no longer included on FAA Knowledge Exams.
 Otherwise, modify caption to include "Not used on U.S. FAA Knowledge Exams." Not necessary for today's or tomorrow's pilots.



- Figures 41 and 43 suggest replacing ADF and RMI figures with Figures 65 and 66 from CT-8080-2F – replacing the RMI and ADF/NDB questions with airport markings and signs questions (currently no airport markings/signs in CFI supplement).
- Figure 57, heading at top, change "Range of C. of G. behind Datum" to "Range of CG behind Datum"

Commercial Computer Testing Supplement (CT-8080-5G) Corrections

- Add bleed to the cover.
- Most of the sectionals are high resolution except for pages 56 and 57 (make these high resolution as well for best printing).
- Cover, replace ADF depicted in top right corner with VOR (i.e. "Radio Compass" instrument should be VOR) since NDB/ADB questions are no longer on FAA Knowledge Exams.
- Pg 3, change "2015" to "2016".
- Figure 1, Caption should be Drag vs Velocity or change Velocity on chart label to Speed
- Figure 3, Caption would be clearer if it read Degrees Angle of Attack; Title of figure should be Angle of Attack vs Lift
- Figure 3a, Label should be "Glide Distance" not "ground distance,"; Zero Wind, not zero wing
- Figure 4, Caption should be Stall Speed vs Load Factor; ***Load factor or "G" units scale should be on the right side of the chart.
- Figure 5, I'm not sure what question this graph is for, but there are much better V-G diagrams and the idea should be to emphasize Va in these charts as well. The title of the graph and axis names should match (Velocity vs Load Factor).
- Pg 6, Figure 7 is it necessary to keep the blank page? Maybe add to bottom of previous or following page to eliminate the unnecessary page.
- Figure 9, Caption should be Time, Fuel, Distance to Climb
- Figure 9 "Notes" sample question requires Note 2 be applied before Note 1 for the correct answer to result either re-arrange Notes so they appear in sequential order (by the method they should be applied) or rewrite question. Example question: (Refer to Figure 9.) Using a normal climb, how much fuel would be used from engine start to 10,000 feet pressure altitude? Aircraft weight 3,500 lb Airport pressure altitude 4,000 ft Temperature 21°C

To answer:

1. Locate the section for 3,500 pounds weight. Read across the 4,000-foot PA line to the entry under fuel used, 11 pounds.

2. Read across the 10,000-foot PA line to the entry under fuel used, 31 pounds.

3. Calculate the fuel required to climb:

31 - 11 = 20 lbs

4. Apply Note #2 before adding the fuel in Note 1. (A temperature of 21°C is +14°C, with respect to the standard atmosphere at 4,000 feet.)
20 x 1.14 = 22.8 lbs



5. Apply Note #1:

22.8 lbs + 12.0 lbs start and taxi = 34.8 lbs total.

- Figure 10, Caption should be Time, Fuel, Distance to Climb; should there be an airspeed in the header as there is in Figure 9?
- Figure 11, suggest adding a header consistent with Figure 12.
- Figure 13, caption should be Time, Fuel, Distance to Climb
- Figure 14, caption should be Time, Fuel, Distance to Climb
- Figures 16, 18, 19 remove ADF indicators ADF/NDB no longer included on FAA Knowledge Exams. Otherwise, modify caption to include "Not used on U.S. FAA Knowledge Exams."
 Figures 18, 19: Suggest a more modern name if it going to stay in the test bank. I assume this is Radio Magnetic Indicator (RMI) with ADF Incdicator? Or is this a fixed card ADF? Hard to tell.
- Figure 17, HSI at top of page, lowercase as follows:
 - Course Arrow, "Window" (window)
 - Rotating Compass Card, "System" and "Rotates" (system, rotates)
 - Heading Marker, "Knob" (knob)
- Figure 20 remove RMI indicators RMI no longer included on FAA Knowledge Exams. Otherwise, modify caption to include "Not used on U.S. FAA Knowledge Exams."
- Figures 21, 22, 23, 24 remove, time to station bearing change questions no longer applicable nor necessary for today's or tomorrow's pilots.
- Figure 32, Example and Table above graph, replace em or en dash with hyphen in "Lift-off" (2 times)
- Figure 37: All the other "loading graph" illustrations have grid lines contained within the area to be measured, with no need for "white boxes" underneath all the applied text callouts. In this one only, the grid lines extend way beyond the "x/y" area, which makes it necessary to put white boxes under all the text that's placed on the graph, giving this one a different and messy appearance compared to the others. A more realistic chart would be helpful. Top chart axis label should be Moment/1000 inch pounds (the way it is written is not a typical use in aviation) as in Figure 38.
- Figure 38, top graph, label on the left, remove 4 periods so it just reads "Load Weight in Pounds" (to match other graphs like this)
- Figure 41, label on left side of both graphs: The "H" with subscript "P" is not consistently displayed (between the left and right graph). Use one or the other, not both... Which is correct? Is it "H" with a subscripted capital "P", or is it supposed to be "H" with a lowercase "p"...? Also, is the black vertical label between the graphs supposed to go with right graph? If so, move closer to the right graph so it's not assumed to be a label for the left graph.
- Figure 45, label along right side of page (or bottom of graph) "obstacle" is missing change to read "Total takeoff distance to clear 50 ft-100 ft obstacle"
- Figure 45, label along right side of page (or bottom of graph) "obstacle" is missing change to read "Total takeoff distance to clear 50 ft-100 ft obstacle"
- Figure 47 deleted this was removed in previous (1C) edition remove page and renumber figures accordingly (or just remove the blank page not necessary).



September 28, 2015

Robert L. Newell FAA Branch Manager, Airman Testing Standards Systems Training Annex Bldg. 26 FAA Mike Monroney Aeronautical Center 6500 S. MacArthur Blvd. Oklahoma City, OK 73169



Dear Mr. Newell,

On behalf of the Aviation Rulemaking Advisory Committee's (ARAC) Airman Certification System Working Group (ACSWG), we submit the following recommendations for the new edition of the Private (CT-8080-2G) Airman Knowledge Testing Supplement.

Consistent with the recommendations made for the FAA Guidance Documents Vision submitted July 2, 2015, we request the FAA include a production schedule for all FAA Supplements (CT-8080s) as well as a projected timeline for the next revision (i.e. how long do you anticipate this CT-8080-2G edition to remain in effect). Doing so will allow the training community to plan for and update material to ensure training and testing remain correlated.

We hope these recommendations will be useful to the FAA as you gear up to release these new editions to support airman testing and the release of the Airman Certification Standards..

The ACSWG and its members welcome the opportunity to provide feedback and thank you for this opportunity and please let us know if we can provide anything further.

Sincerely,

David Oord ACSWG Chair Vice President, Regulatory Affairs Aircraft Owners and Pilots Association

Jackie Spanitz ACSWG Subgroup Lead Curriculum Director Aviation Supplies & Academics, Inc.



Recommendation

Computer Testing Supplements (CT-8080-XX)

- Short-Term: Release new editions effective June 2016 as follows:
 - 9. Correct errors, cancel and/or remove figures not being used. See Corrections identified below.
 - 10. Do not add figures to the supplement until corresponding questions are developed and validated (figures can be displayed onscreen during validation process).
 - 11. Add "Parallel" questions to the public data for every figure being used on the test to ensure training and testing are correlated for a true validation process (i.e. questions cannot be accurately validated if they weren't first part of a training curriculum).
 - 12. Figures and associated questions are identified to the public when removed from testing to ensure training and testing remains correlated
- Long-Term: Once new FAA Knowledge Exam testing system is implemented, move all applicable figures to on-screen graphics and combine remaining figures into a single document referenced for all tests.

Private Computer Testing Supplement (CT-8080-2G) Corrections

- General comment throughout: Be more consistent about the figure sizing, sometimes they are overly large for no necessary reason and there are some that run rotated on the page that could be smaller to fit right-reading without rotating the book. Where possible, put more than one on a page when they are small.
- Rework the cover to match fonts, and style of the Commercial (and -2F) cover, which would also have it tie in with the books done previously. The -2F style is better than the new -2G and 1D look.
- Save the PDF so the text is black only. For printing CMYK text is not good.
- Add bleed to the cover.
- Throughout the scanned images (sectionals and airport directory images) need to be high resolution. They were much better in 2F so it might be that the 2G PDF settings changed the image resolution, maybe just for the proof or on-screen viewing.
- Pg 3, change "2015" to "2016".
- Pg 5, Preface add to bottom of list "FAA-CT-8080-2G supercedes FAA-CT-8080-2F, Airman Knowledge Testing Supplement for Sport Pilot, Recreational Pilot, and Private Pilot dated 2013." (to be consistent with Commercial supplement)
- Figure 1. Lift Vector; It appears the chord line was removed. Chord line should be depicted as seen in -2F.
- Figure 15: this is old TAF format; KMEM 121720Z 121818 should be 1218/1318 (update KOKC too) per AC 00-45G page 7-31
- Figure 18: Suggest replacing Weather Depiction Chart with today's tools (Ceiling & Visibility Chart or C&V and satellite vis/fog; rewriting associated questions to test applicants on determining ceiling, visibility and fog forecasts using data found at <u>www.aviationweather.gov</u>.
- Pg 21, remove blank page (can note Figure 19 removed in Contents list and pages before or after this blank page).
- Figure 20: update the prog charts (SIGWX) to reflect new 2-panel layout (that excludes the surface forecast) that went into effect September 2015: <u>www.aviationweather.gov</u>:



Effective September 1, 2015, <u>www.AviationWeather.gov</u> users will see changes on the <u>Prog Charts page</u>. The current 4-panel Low Level SFC-240 chart will be replaced with a 2-panel chart. The new 2-panel chart will be the same as the top two panels in the current chart, depicting the freezing level and areas of IFR, MVFR, and moderate or greater turbulence. The bottom two panels of the chart will be removed. In lieu of these bottom two panels, an enhanced surface chart that includes fronts, pressure, precipitation type, precipitation intensity, and weather type, will be displayed. The green precipitation polygons will be replaced by shaded precipitation areas using the National Digital Forecast Database (NDFD) weather grid.

(these are ultimately being phased out, replaced by National Digital Forecast Display: <u>http://digital.weather.gov.</u> One of the many advantages of these new tools is "no more symbols to remember" – long-term, suggest removing this figure and/or replacing it with a NDFD and modifying questions to focus on "what information is needed to make the go/no go/continue decision – getting away from the "what is this symbol" and moving towards the decision-making associated with the weather; i.e. change questions and figures to focus on what information do you need, not what reports/forecasts symbols do you need to memorize). If short term the plan is to keep the charts, update to the current 2-panel layout.

• Figure 29. VOR; uses a single arrow showing the selected radial. Most receivers also have a smaller secondary arrow pointing at the reciprocal. Suggest adding another arrow on the reciprocal radial as seen in figure below.



- •
- Figure 30, 31: remove ADF indicators ADF/NDB no longer included on FAA Knowledge Exams. Otherwise, modify caption to include "Not used on U.S. FAA Knowledge Exams."
- Figure 49: test questions currently reference runways 32, 25, 14, 7 update test questions to reflect new image (Runways 35, 17, 30, 12). This new format is not a reflection of what pilots would likely come across; suggest reverting back to an actual airport diagram like in -2E to include the necessary airport symbols.
- Figure 49: Typo Itiernant Ramp (Rammp should be Ramp)
- Figure 52: update to ICAO flight plan form going into effect in 2016.



October 5, 2015

Robert L. Newell FAA Branch Manager, Airman Testing Standards Systems Training Annex Bldg. 26 FAA Mike Monroney Aeronautical Center 6500 S. MacArthur Blvd. Oklahoma City, OK 73169



Dear Mr. Newell,

On behalf of the Aviation Rulemaking Advisory Committee's (ARAC) Airman Certification System Working Group (ACSWG), we submit the following recommendations for the new edition of the Pilot's Handbook of Aeronautical Knowledge (FAA-H-8083-25B).

Please note this file replaces what we provided September 30, 2015 – with some additional recommendations.

Consistent with the recommendations made for the FAA Guidance Documents Vision submitted July 2, 2015, we request the FAA include a production schedule for all FAA Handbooks (FAA-H-8083 documents) as well as a projected timeline for the next revision (i.e. how long do you anticipate this FAA-H-8083-25B edition to remain in effect). Doing so will allow the training community to plan for and update material to ensure training and testing remain correlated, as well as provide feedback in a timely way to help with continued development of this title.

We hope these recommendations will be useful to the FAA as you gear up to release these new editions to support airman testing and the release of the Airman Certification Standards.

The ACSWG and its members welcome the opportunity to provide feedback and thank you for this opportunity and please let us know if we can provide anything further.

Sincerely,

do

David Oord ACSWG Chair Vice President, Regulatory Affairs Aircraft Owners and Pilots Association

Jackie Spanitz ACSWG Subgroup Lead Curriculum Director Aviation Supplies & Academics, Inc.



Interim Recommendation Report of the ARAC Airman Certification System Working Group March 1, 2016

Recommendations

Based on Draft Edition:

- Title Page, change "2015" to "2016" (projected release date is 02/2016)
- 1-9, left column, Aviation Safety Inspectors (ASI) "3,700 inspectors" this is the same number as the 8083-25A edition; is this still correct?
- 1-9, right column, 2nd line at top "The FAASTeam has replaced the Aviation Safety Program (ASP)," – update section as needed.
- 1-10, Figure 1-14, photoshop out "February 11, 2010" from AIM book cover.
- 1-19, left column, 2nd para, "Order forms are provided at the beginning of the manual..." update sentence this is no longer true; ordering is done via website.
- 1-10, Figure 1-15, change caption to read "A sample of handbooks available to the public. Most can be downloaded free of charge from the FAA website."
- 1-12, Figure 1-18, photoshop out "15 Dec 2011" or change "2011" to "20XX"; change caption to read "From left to right, a sectional VFR chart, IFR chart, and A/FD sample page."
- 1-12, right column, para starting "NOTAM information..." add NOTAM website url to end of para.
- 1-14, right column, 2nd para, last sentence, change <u>www.aopa.org/whatnew/notams.html</u> to <u>www.aopa.org</u> url as printed doesn't work.
- 1-15, left column top line and right column 2nd para, change "We" to "The FAA" (and adjust verb tense accordingly) I don't think FAA handbooks use 1st person writing.
- 1-15, right column, add new sentence at top ahead of "Size and weight are other..." to read "Unmanned aircraft systems (UAS) are another aircraft category. UAS come in a variety of shapes and sizes and serve diverse purposes. Regardless of size, the responsibility to fly safely applies equally to manned and unmanned aircraft operations. UAS operators can learn more about this rapidly growing aviation segment by visiting the FAA website." [could add new figure of a drone]
- 1-16, right column, Privileges, change 1st bullet to read "Operate as a Pilot in Command (PIC) of a light-sport aircraft or aircraft that meets light sport privileges."
- 1-17, left column, Limitations, 2nd bullet, change "you" to 3rd person "the pilot receives..."
- Vii and 1-18, add a new subheading after Airline Transport Pilot to read: Unmanned Aircraft Systems
 There is a wide variety of UAS models and missions. Many of these require specific FAA authorization including operator certifications. Visit the FAA website to learn more about this rapidly growing aviation segment to ensure UAS operations remain safe and legal. [could add new figure of a drone to follow existing figure 1-24.]
- 1-18, right column, last line update url as printed doesn't work.
- 1-20, left column, The Student Pilot, 1st para update whole section to account for Sport Pilots who don't need medical certificates.
- 1-22, Figure 1-26, remove dates (2011, 2011, 2006) from PTS covers or change all to "20XX"
- 1-22, left column, define acronym "DPE"



- 1-23, left column, 3rd bullet from top, 1st parenthetical, change to read "(Not required for glider, balloon, sport pilot, or light-sport aircraft operations); last parenthetical is out of place (driver's license...)
- 2-8, right column, 2nd para, 1st line, change to read "... maximum demonstrated crosswind..."
- 2-9, right column, 2nd bullet point from top, remove "An engine failure gives the nearby airports supreme importance." this lacks clarity.
- 2-9, right column, 3rd bullet point from top, doesn't make sense shorter than what? What are obstructed fields and why would a pilot want one?
- 2-9, right column, Airspace, add new bullet point to account for busy, complex airspace.
- 2-10, Figure 2-7, change caption to "A PAVE case study." (this is a case study not a checklist)
- 2-14, right column, The Pilot, 1st para, last line "(see page 2-6)" update this page reference, this is no longer correct.
- 3-2, add new subheading after "A Note About Light Sport Aircraft" to read: Unmanned Aircraft Systems
 There is a wide variety of UAS models and missions, with many differences in aerodynamics, operations, limitations, and capabilities. UAS require specific FAA authorization to operate in the National Airspace System (NAS). Visit the FAA website to learn more about this rapidly growing aviation segment to ensure UAS operations remain safe and legal.
 [could add new figure of a drone with caption "Visit <u>www.faa.gov</u> to learn more about UAS operations."]
- 4-8, left column, Press Distribution, 4th line AOA isn't defined until Chapter 5 do we need to clarify here or refer readers to Chapter 5 to learn more about this?
- Chapter 5 see marked-up PDFs and Comments for all recommended edits.
- 7-27, Fuel Grades and Figure 7-32: 80 octane is dead, for all practical purposes; pilots will be hard pressed to find any. Suggest removing it from the book.
- 13-4, remove "En Route Flight Advisory Service (EFAS)" subheading and paragraph this service has been cancelled.
- 13-15, WX Depiction charts: replace Weather Depiction Chart with today's tools (Ceiling & Visibility Chart or C&V and satellite vis/fog; rewriting associated questions to test applicants on determining ceiling, visibility and fog forecasts using data found at <u>www.aviationweather.gov</u>.
- 13-16, Significant Weather Prognostic Charts, update (SIGWX) to reflect new 2-panel layout that went into effect September 2015: www.aviationweather.gov (these are ultimately being phased out, replaced by National Digital Forecast Display: http://digital.weather.gov. One of the many advantages of these new tools is "no more symbols to remember" –suggest removing Figure 13-13, 13-14 and/or replacing it with a NDFD and modifying discussion to focus on "what information is needed to make the go/no go/continue decision.
- 15-13, Uncontrolled Airspace, Class G Airspace (or this could be added to Pg 15-10, Class G subheading): add "It is possible for some airports within Class G airspace to have a control tower (Lake City, FL, for example). Be sure to check the Airport/Facility Directory to be familiar with the airport and associated airspace prior to flight."
- 15-11, add new subheading below Parachute Jumps Unmanned Aircraft Systems



Most airports are a "no drone zone" unless operators have obtained special FAA authorization. Visit <u>www.faa.gov</u> to stay informed of the rapidly changing rules and procedures associated with UAS, particularly relative to airport operations.

- 16-2 and several places within the chapter: WAC charts are currently proposed to be discontinued remove from this edition of the book?
- 16-2, Flight Computers, 2nd sentence, change to "In reality, most pilots use a mechanical flight computer called an E6B or electronic flight calculator.
- 16-3, Figure 16-18, caption, change to "... mechanical flight computer (E6B) (B),..."
- 16-21, right column, 2nd para, change 1st sentence to read "Figure 16-27 shows a domestic flight plan form a pilot files with the FSS. The FAA is transitioning to the ICAO flight plan form; visit <u>www.faa.gov</u> for more information. When filing..."
- 16-21, Figure 16-27, change caption to "Domestic flight plan form."
- 16-22, change subheading "Radio Navigation" to "Ground-Based Navigation"
- Non-directional beacons/ADFs? Can we in good conscience ignore them?
- B-1, add ACS Airman Certification Standard
- B-5, remove EFAS
- B-9, add PD Pilot Deviation
- B-12, add V/PD Vehicle/pedestrian deviation
- B-12, change UAS to read "UAS uniform accounting system, unmanned aircraft systems
- C-2, C-3, C-4 is this a page pull-out? Pages are running off margin.
- G-11, remove EFAS and Enroute Flight Advisory Service.
- G-32, add new terms "UAS. See Unmanned aircraft system." and "Unmanned aircraft system (UAS). An aircraft that is operated without the possibility of direct human intervention from within or on the aircraft and associated elements (including communication links and components that control the unmanned aircraft) that are required for the pilot in command to operate safely and efficiently in the national airspace system."
- I-7, add Pilot Deviation (pg 14-28)
- I-9, add Unmanned Aircraft System (UAS)
- I-10, "Winds and temperature aloft (FD)" change FD to FB



January 29, 2016

Robert L. Newell FAA Branch Manager, Airman Testing Standards Systems Training Annex Bldg. 26 FAA Mike Monroney Aeronautical Center 6500 S. MacArthur Blvd. Oklahoma City, OK 73169



Dear Mr. Newell,

On behalf of the Aviation Rulemaking Advisory Committee's (ARAC) Airman Certification System Working Group (ACSWG), we submit the following recommendations resulting from the new Student Pilot Application Requirements announced in the January 12, 2016 Federal Register.

- AC 61-65 edit recommendations included in attached PDF.
- CFI Knowledge Exam test item bank a number of questions should be removed until AEB has opportunity to revise to reflect the rule change sample questions which are affected:
 - What is the duration of a Student Pilot Certificate
 - A student pilot whose pilot certificate is not endorsed by a flight instructor to make solo crosscountry flights is prohibited from flying solo beyond what distance from the point of departure?
 - An application for a student pilot certificate must be submitted in person to any of the following
 - o Prior to a first solo flight, the flight instructor is required to endorse the student's
 - o A student is required to have his/her pilot certificate endorsed by a flight instructor for each
- Student Pilot Guide (FAA-H-8083-27A)
 - Pg 15-16, questions 6, 7, 8, 9, 10, 11 modify answers
 - Pg 21, question 2 modify list (endorsement in logbook, not on certificate)
- FAA-H-8083-25B (new edition in development now)
 - Pg 1-20, 1-21 and Figure 1-25 distinction between medical certificate, student pilot certificate and
 - Pg 1-23, left column, 3rd bullet point from top solo endorsement in logbook, not on certificate

The ACSWG and its members welcome the opportunity to provide feedback and thank you for this opportunity and please let us know if we can provide anything further.

Sincerely,

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David Oord ACSWG Chair Vice President, Regulatory Affairs Aircraft Owners and Pilots Association

Jackie Spanitz ACSWG Subgroup Lead Curriculum Director Aviation Supplies & Academics, Inc.



January 29, 2016

Robert L. Newell FAA Branch Manager, Airman Testing Standards Systems Training Annex Bldg. 26 FAA Mike Monroney Aeronautical Center 6500 S. MacArthur Blvd. Oklahoma City, OK 73169



Dear Mr. Newell,

On behalf of the Aviation Rulemaking Advisory Committee's (ARAC) Airman Certification System Working Group (ACSWG), we submit the following per the request from the face-to-face meeting January 12-13, 2016.

As we stated in our March 2015 review of the 8083-15, 8083-16, and 8083-6: ... We believe future revisions of all three of these books should be done in collaboration with the AFS-630 office. Doing so will ensure consistent, coherent information without duplication between FAA publications. Currently, these publications provide information on some of the same topics, but with variations in terms, descriptions, and depth of coverage. A single document may be unwieldy and overwhelming for a pilot in training – and may be overlooked by VFR or advanced pilots needing the information but not actively training. However, consolidating key topics to avoid redundancy between publications would result in a single resource for a given topic, with consistent language and descriptions for a given technology and/or procedure – not only eliminating redundancy in FAA workload, but also consistency within the aviation training community.... Keep the books separate, but eliminate redundant information between them. It may be desirable to develop a "two-tier" approach to the instrument handbooks (FAA-H-8083-15 and FAA-H-8083-16). The basic text for training and certification for the instrument rating may be the Instrument Flying Handbook. The Instrument Procedures Handbook would be added as a reference text for the Airline Transport Pilot (ATP) certificate and aircraft type ratings. The Instrument Procedures Handbook could also be used as the reference text for certain NextGen pilot approvals such as RVSM and what is likely to be separate approvals for some automatic dependent surveillance broadcast (ADS-B) applications such as in-trail spacing. There is too much material required for all of these ratings and approvals to place them in a single handbook that would be manageable and convenient to use.

Here are the recommended mission statements for the two primary instrument flight guidance documents:

Instrument Flying Handbook (FAA-H-8083-15): This Handbook is designed for use by instrument flight instructors and pilots <u>preparing for instrument rating</u> tests. Instructors may find this handbook a valuable training aid as it includes basic reference material for knowledge testing and instrument flight training.

Instrument Procedures Handbook (FAA-H-8083-16): This Handbook is designed as a technical reference for all <u>pilots who</u> <u>operate under instrument flight rules (IFR)</u> in the National Airspace System (NAS). It expands upon information contained in the Instrument Flying Handbook (FAA-H-8083-15), and introduces advanced information for IFR operations. Instrument flight instructors, instrument pilots, and instrument students will also find this handbook a valuable resource since it is used as a reference for the Airline Transport Pilot Tests. It also provides detailed coverage of instrument charts and procedures including IFR takeoff, departure, en route, arrival, approach, and landing. Safety information covering relevant subjects such as runway incursion, land and hold short operations, controlled flight into terrain, and human factors issues also are included.

The ACSWG and its members welcome the opportunity to provide feedback and thank you for this opportunity and please let us know if we can provide anything further.

Sincerely,

David Oord, ACSWG Chair Vice President, Regulatory Affairs Aircraft Owners and Pilots Association

Jackie Spanitz, ACSWG Subgroup Lead Curriculum Director Aviation Supplies & Academics, Inc.



Interim Recommendation Report of the ARAC Airman Certification System Working Group March 1, 2016

Prototype/Implementation Subgroup

Implementation Recommendations February 9, 2016

OVERVIEW

The ACS Prototype Subgroup was charged with drafting recommendations for the ACS implementation process. Our recommendations represent broad industry knowledge and experience with airman certification guidance documents, with the added benefit of meaningful and valuable FAA participation.

We believe that moving to complete ACS acceptance is a critical step in improving the quality of pilot certificated by the FAA, not only in improved knowledge and skills, but also in the essential area of risk management. We also believe that moving to complete ACS acceptance is an intricate process with many moving parts. We support a phased release of the ACS concept with continuous data monitoring and quality assurance efforts on the part of FAA and industry to ensure the ACS concept is functional and efficient in accomplishing its stated purpose.

To support a Summer 2016 release of the Private and Instrument ACS documents, we propose the following steps be taken to ensure the appropriate internal and external stakeholders are prepared for the transition.

CORE IMPLEMENTATION CONSIDERATIONS

- 1. Communicate the reason/need for the change
- 2. Encourage a desire for supporting the change
- 3. Share knowledge about what is actually changing
- 4. Ensure all audiences have the ability to use the ACS
- 5. Account for reinforcement of the message in an ongoing way

EXTERNAL/PUBLIC STAKEHOLDER OUTREACH RECOMMENDATIONS

- 1. Applicants
 - 1.1. General/Universal Applicants
 - 1.1.1. FAAST Blast email
 - 1.1.1.1. ACS implementation timeline
 - 1.1.1.2. Link for more information
 - 1.1.2. Print articles in aviation publications
 - 1.1.2.1. Justify the need to switch to ACS
 - 1.1.2.2. Address FAQs and common concerns (check ride length, etc.)
 - 1.1.3. FAAST online course
 - 1.1.3.1. Identify content in the ACS and how to use it
 - 1.1.3.2. Explain differences from PTS (for those using Instrument ACS)
 - 1.1.4. AFS630 Subscription List
 - 1.1.4.1. Publish ACS with effective dates on AFS630 website
 - 1.1.4.2. Send email to AFS630 subscribers notifying new document, identifying which document(s) it replaces.



- 1.2. University/Collegiate Applicants
 - 1.2.1. UAA email blast to member schools
- 1.3. Part 141 Applicants
 - 1.3.1. FAA POI outreach to Chiefs (see Item 4.)
- 2. Instructors
 - 2.1. FIRC content
 - 2.1.1. Explain why transition to ACS is important
 - 2.1.2. Provide overview of ACS structure and organization
 - 2.1.3. Illustrate how the ACS improves upon the PTS
 - 2.1.4. Explain coding system and how it links to knowledge test reports
 - 2.1.5. Explain how the ACS is used during the practical test
 - 2.1.6. Provide sample lesson plans on how to incorporate risk management concepts
 - 2.1.7. Explain which certificates and ratings have an effective ACS and how to stay apprised of future ACS releases
 - 2.2. FAAST Online Course
 - 2.2.1. Narrate and record the Intro to the ACS PowerPoint presentation that highlights what the ACS is and how it works
 - 2.2.2. Create a short quiz to ensure individuals understand the components and function of the ACS
 - 2.3. DPE Outreach
 - 2.3.1. Phone, email, and meet instructors with whom relationship is established to advise them of the release of the ACS
 - 2.3.2. Offer web links and resources for learning about the ACS
 - 2.3.3. Offer assistance and answer questions for instructors preparing applicants for practical tests
- 2.3.4. Ensure applicants are familiar with the ACS prior to scheduling the practical test 3. FIRC Providers
 - 3.1. Approved Elective Topic
 - 3.1.1. Already approved in several FIRCs
 - 3.2. Required Course Content
 - 3.2.1. Once ACS is released with an effective date, will be mandatory as a component of course lesson "Regulatory, Policy and Publications Changes and Updates"
 - 3.3. Provider Outreach
 - 3.3.1. Letter from FAA to providers encouraging coverage of ACS ahead of effective/release date; will be component of "Regulatory, Policay and Publications Changes and Updates" once ACS is effective. (Allan Kash)
- 4. Part 141 Chief Instructors
 - 4.1. POI Outreach
 - 4.1.1. Phone, email, and meet chief flight instructors of assigned pilot schools to advise them of the release of the ACS
 - 4.1.2. Offer web links and resources for learning about the ACS
 - 4.1.3. Provide guidance and require revision to approved training course outlines
 - 4.1.4. Verify training provided to ground and flight instructors, designated check instructors, and assistant chief instructors
 - 4.1.5. Provide guidance and require revision to approved syllabi of annual training for chief instructors (for chief instructors completing required annual training using that method)
 - 4.2. FIRC content (for chiefs completing required annual training using that method)
 - 4.2.1. Explain why transition to ACS is important
 - 4.2.2. Provide overview of ACS structure and organization
 - 4.2.3. Illustrate how the ACS improves upon the PTS



- 4.2.4. Explain coding system and how it links to knowledge test reports
- 4.2.5. Explain how the ACS is used during a practical test
- 4.2.6. Provide sample lesson plans on how to incorporate risk management concepts
- 4.2.7. Explain which certificates and ratings have an effective ACS and how to stay apprised of future ACS releases
- 4.3. Initial Chief and Assistant Chief Instructor Training and Designation
 - 4.3.1. Develop standardized, online training course similar to FIRC module covering the ACS
 - 4.3.2. Incorporate items listed above for FIRC module
 - 4.3.3. POIs require completion prior to scheduling chief or assistant chief instructor practical test
 - 4.3.4. Test the applicant on the ACS during the chief or assistant chief instructor practical test
- 5. Designated Pilot Examiners
 - 5.1. Mandatory Online Learning Module
 - 5.1.1. Purpose of the ACS concept, including benefits to aviation safety
 - 5.1.2. Explain ACS development process (including prototyping)
 - 5.1.3. Compare and contrast the PTS and ACS
 - 5.1.4. Provide POA recommendations for ACS testing
 - 5.2. Initial and Recurrent DPE Training Curricula
 - 5.2.1. Incorporate basic ACS PowerPoint for ACS background
 - 5.2.2. Discuss POA creation for ACS testing
 - 5.3. Designee Branch Outreach
 - 5.3.1. Purpose of the ACS concept, including benefits to aviation safety
 - 5.3.2. Implementation timeline for the ACS
 - 5.3.3. Links for additional information
 - 5.4. FSDO DPE Program Managers
 - 5.4.1. Purpose of the ACS concept, including benefits to aviation safety
 - 5.4.2. Implementation timeline for the ACS
 - 5.4.3. Links for additional information
 - 5.4.4. Incorporate ACS content into annual FSDO outreach/training for DPEs
- 6. FAAST Representatives
 - 6.1. FPM Emails
 - 6.1.1. Purpose of the ACS concept, including benefits to aviation safety
 - 6.1.2. Implementation timeline for the ACS
 - 6.1.3. Links for additional information
 - 6.2. Safety Seminar Promotion
 - 6.2.1. Encourage all field reps to mention the ACS in upcoming seminars
- 7. Manufacturers
 - 7.1. No further outreach is specifically planned for this group beyond the content in Item 8.
- 8. Advocacy Organizations
 - 8.1. Organization Listing
 - 8.1.1. UAA University Aviation Association
 - 8.1.2. NATA National Air Transportation Association
 - 8.1.3. FSANA Flight School Association of North America
 - 8.1.4. SAFE Society of Aviation and Flight Educators
 - 8.1.5. NAFI National Association of Flight Instructors
 - 8.1.6. AOPA Aircraft Owners and Pilots Association
 - 8.1.7. GAMA General Aviation Manufacturers Association
 - 8.1.8. NBAA National Business Aircraft Association
 - 8.1.9. EAA Experimental Aircraft Association



- 8.2. Recommend that members of each group be designated to reach out to person in charge of communication with membership to email everyone the concise ACS message.
 - 8.2.1. Purpose of the ACS concept, including benefits to aviation safety
 - 8.2.2. Implementation timeline for the ACS
 - 8.2.3. Links for additional information

INTERNAL/FAA STAKEHOLDER OUTREACH RECOMMENDATIONS

Due to the unique and complex structure of the FAA organization, the Prototype/Implementation Subgroup will defer formal communication and outreach planning to the designated Change Management agent working with our group, Christopher Morris (AFS-630). His recommendations can be found in Appendix 1.



Authorized Instructor Subgroup

Aviation Instructor's Handbook (FAA-H-8083-9A) February 9, 2016

ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
1.	Throughout	Many of the photos and graphics should be updated. Any further useful review would have to take place after current comments are incorporated.	
2.	Throughout	From previous ARAC report: Place the "summary of instructor's actions" blurbs in shaded boxes or further separate them out of the other content. These summary sections are good references for applicants and existing CFIs. (FOI: Learning Process).	
3.	Throughout	From previous ARAC report: Add teaching techniques that can be used in the aircraft to address common student errors as identified in the Authorized Instructor ACS comparable to the information that is now found in FAA- H-8083-4. Including information in this 8083-9 will increase value and reduce workload for maintaining separate publications.	
4.	Throughout	From previous ARAC report: Incorporate information from Helicopter Instructor's Handbook (FAA- H-8083-4) and cancel this separate document; 2 books are not necessary.	

Item	Page Number /	Current Wording / Proposed Revision	Justification / Explanation
#	Section / Figure	0, 1	<i>,</i> ,
1.	P1-3¶4	"Consider Derek's dilemma" should reference the caption on p1-1	The casual reader may not read the blurb on p1-1 and consequently totally miss the reference
2	P1-3¶4 last	Poor example as it does not apply to	
Ζ.	sentence	pre-flight	
3.	P1-4¶2-Security	A CFI must be aware of his student's fear of certain flight regions and ease a student into those situations carefully.	



Item	Page Number /	Current Wording / Proposed Revision	Justification / Explanation
#	Section / Figure		
	P1-6¶3-Defense	Why not use stalls? It applies to a much	
4.	Mech	wider % of pilots' understanding	
		"For example" should use the same	
-	D1 702 Donial	example for all defense mechanisms:	
5.		Compensation, Projection,	
		Rationalization, etc.	
			The casual reader may not read
6	D1 2 0 4	"Consider Derek's dilemma" should	the blurb on p1-1 and
6.	P1-3¶4	reference the caption on p1-1	consequently totally miss the
			reference
-	P1-3¶4 last	Poor example as it does not apply to	
/.	sentence	pre-flight	
		A CFI must be aware of his student's	
8.	P1-4¶2-Security	fear of certain flight regions and ease a	
		student into those situations carefully.	
0	P1-6¶3-Defense	Why not use stalls? It applies to a much	
9.	Mech	wider % of pilots' understanding	
10.		"For example" should use the same	
	P1-7¶3-Denial	example for all defense mechanisms:	
		Compensation, Projection,	
		Rationalization, etc.	

ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
1.	Page 2-1	Delete: Practical Test Insert: Airmen Certification	Align with ACS wording
2.	Page 2-1	Delete: PTS Insert: ACS	Align with ACS wording
3.	Page 2-3	Delete: Early	Omit comments that make theories sound old and that are not pertinent to theory
4.	Page 2-3 Figure 2-2	Comment: Use an up to date picture that summarizes different theories	
5.	Page 2-3	Delete: Over the past century	Omit comments that make theories sound old and that are not pertinent to theory
6.	Page 2-3	Delete: increasingly large amount of	Reduce wordiness, and increase clarity
7.	Page 2-3	Delete: is a school of psychology that	Reduce wordiness, and increase clarity



· · ·			
ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
8.	Page 2-3	Delete: in a 1910 book designed for teachers.	Omit comments that make theories sound old and that are not pertinent to theory
9.	Page 2-3	Delete: than no reinforcement or punishment	Reduce wordiness, and increase clarity
10.	Page 2-3	Delete: Although the popular therapeutic system of behavior modification has emerged from this theory; Insert: Today,	Reduce wordiness, and increase clarity
11.	Page 2-4	Insert: This is the basis of the organizing a lesson methods discussed in Chapter 4.	Relate material to practical material later in book
12.	Page 2-4	Insert: later in this chapter	Relate material to practical material later in book
13.	Page 2-4	Delete: can be traced to the eighteenth century. This theory	Omit comments that make theories sound old and that are not pertinent to theory
14.	Page 2-4	Delete: In the mid-1900s,	Omit comments that make theories sound old and that are not pertinent to theory
15.	Page 2-4	Insert: later in this chapter	Relate material to practical material later in book
16.	Page 2-4	Insert: , and social learning.	The current edition does not include a discussion of social learning. This may need to wait until the complete rewrite of the AIH
17.	Page 2-4	Insert: Constructivism is the basis for several of the training delivery methods covered in Chapter 4.	Relate material to practical material later in book
18.	Page 2-5 Figure 2-4	Comment: Simplify this figure to just the star in the center with the 5 key words	Figure is too complicated
19.	Page 2-5	Delete: categories Insert: levels	Consistent word usage
20.	Page 2-6	Insert: create an SBT lesson, refer to Chapter 4, and for how to	Relate material to practical material later in book
21.	Page 2-7	Insert: an unfavorable	Grammar and clarity
22.	Page 2-7	Insert: adversely	clarity
23.	Page 2-7	Delete: unfavorably	grammar
24.	Page 2-7	Delete: s	Change text about learning stalls to learning 'stall recovery'



ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
25.	Page 2-7	Insert: recovery	Change text about learning stalls to learning 'stall recovery'
26.	Page 2-7	Delete: s	Change text about learning stalls to learning 'stall recovery'
27.	Page 2-7	Insert: recovery	Change text about learning stalls to learning 'stall recovery'
28.	Page 2-10	Insert: , or schematic,	clarify
29.	Page 2-11	Delete: : Insert: whether it is	Improve composition and make description an example rather than all inclusive
30.	Page 2-11	Delete: , Insert: or	Improve composition and make description an example rather than all inclusive
31.	Page 2-11	Insert: or on a	Improve composition and make description an example rather than all inclusive
32.	Page 2-12	Delete: The group effort to classify the levels of thinking behaviors thought to be important in the processes of learning mentioned earlier in the chapter led to Bloom's Taxonomy of	Reduce wordiness, and increase clarity
33.	Page 2-12	Delete: . Insert: is	Reword after delete wordiness
34.	Page 2-12	Delete: , Insert: .	Reword after delete wordiness
35.	Page 2-12	Insert: , or levels,	Reword after delete wordiness
36.	Page 2-14	Delete: thinking skills instructional	Reduce wordiness, and increase clarity
37.	Page 2-14	Insert: of the cognitive domain	clarity
38.	Page 2-14	Delete: or Insert: the	clarity
39.	Page 2-14	Insert: s	grammar
40.	Page 2-14	Comment on 'the graph': what graph? This sentence seems to refer to the table in Figure 2-9	
41.	Page 2-14	Delete: the graph Insert: Figure 2-9	Based on comment #40.
42.	Page 2-14	Insert: (Figure 2-9)	Based on comment #40.
43.	Page 2-15	Delete: PTS Insert: ACS	Align with ACS wording



ltem #	Page Number /	Current Wording / Proposed Revision	Justification / Explanation
44.	Page 2-15	Comment: the levels in the next paragraphs don't match the level of the physical domain just introduced. Need to clarify if this is a different model or if the psychomotor levels are being grouped with different, more practical terms.	
45.	Page 2-17	Insert: actually	Add emphasis
46.	Page 2-17	Delete: them Insert: an aircraft	clarity
47.	Page 2-17	Delete: c Insert: C	consistency
48.	Page 2-17	Delete: c Insert: C	consistency
49.	Page 2-18	Insert:)	Fit typo
50.	Page 2-19	Delete: transparencies Insert: presentations	Update wording
51.	Page 2-27	Insert: , two-seat	Improve composition
52.	Page 2-29	Delete: c Insert: C	consistency
1.	Page 2-29, Motivation	From previous ARAC report: Move Motivation covered in Chapter 2 to Chapter 1 where motivation is first discussed.	
2.	Page 2-31	Delete: PTS Insert: ACS	Align with ACS wording
3.	Page 2-31	Delete: PTS Insert: ACS	Align with ACS wording
4.	Page 2-31	Delete: PTS Insert: ACS	Align with ACS wording
5.	Page 2-31	Delete: PTS Insert: ACS	Align with ACS wording



ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
1.	p. 3-2, para. 1	3d sentence: replace "While" with "Although"	usage
2.	p. 3-2, para. 1	 Move last sentence to follow 3d sentence Add the following after the new 4th sentence (that was the last sentence before moving it): "Each instructor and learner may have a unique communication style, and bridging the gap between these styles is an important aspect of providing instruction." 	1. flow 2. emphasis of point
3.	p. 3-2, para. 5 (that begins "First, their ability")	 After "not possible" add "to achieve" Delete last sentence 	1. clarity 2. surplussage
4.	p. 3-2, para. 7 (that begins, "Third, communicators .")	Current: Communicators must constantly strive to have the most current and interesting information possible. In this way, the receiver's interest can be held. Out-of-date information causes the instructor to lose credibility in the eyes of the receiver. Use of monotonous or uninteresting information runs the risk of losing the receiver's attention. Revised: Communicators must constantly strive to convey the most current and interesting information available. Doing so holds the receiver's interest. Out-of-date information causes the instructor to lose credibility, and uninteresting information may cause the receiver's attention to be lost.	Streamline language



Item	Page Number /		
#	Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
5.	p. 3-3, first full para.	Delete "either"	surplussage
6.	p. 3-3, 2d full para.	Current: Most frequently, communicators select the channels of hearing and seeing. For motor skills, the sense of touch is added as the student practices the skill. Revised:	clarity
		Instructors commonly rely on the hearing and seeing channels of communication. However, using all channels may improve the learning process. For teaching motor skills, the sense of touch, or kinesthetic learning, is added as the student practices the skill.	
7.	p. 3-3, 3d full para.	Current: The feedback an instructor is getting from a student need to be constantly monitored in order to modify the symbols, as required, to optimize communication. Revised: An instructor should constantly monitor feedback from the learner in	clarity and make more usable
		order to identify misunderstandings and tailor the presentation of information to the receiver. Periodically asking the learner to explain her understanding of new information while it is being conveyed is one way to obtain such feedback. The instructor may then modify the symbols he or she uses, as	



ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
		appropriate, to optimize communication.	
8.	p. 3-4, 4th para. (that begins "Instructors in aviation")	Move entire 4th para. to the 7th para. after the 2d sentence ("What the student knows :)	logical flow of ideas
9.	p. 3-4, 7th para ("Third")	Move last sentence ("It is essential to understand") to the 8th para. ("The nature of language"), so that it becomes the first sentence of that para.	logical flow of ideas
10.	p. 3-5, Fig. 3-3	 Title is misspelled Current: "Cummunication Barriers" Revised: "Communication Barriers" Image is not very clear; the text below the hurdles is hard to read, it should be clearer 	1. oops 2. clarity
11.	p. 3-6, 2d para., through p. 3-7	Suggest not using the term "interference" and substituting it with something else, such as "External Factors"	The use of the term "interference" in this section is problematic because the term has a common usage in psychology with respect to learning that is different than the way it is used here. Note that the term "interference" in Fig. 3-3 would also have to be replaced
12.	p. 3-6, 2d para.	Current: Some barriers to effective communication can be controlled by the instructor. Interference, or the prevention of a process or activity from being carried out properly, is composed of factors outside the control of the instructor These factors include physiological, environmental, and psychological interference. To	See comment above; this is an example of how the discussion can be reworded without using the term "interference"



ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision communicate effectively, the instructor should consider the effects of these factors.	Justification / Explanation
		Revised: Some barriers to effective communication can be controlled by the instructor. Others are external factors outside of the instructor's control that prevent a process or activity from being carried out properly. These factors may include physiological, environmental, and psychological elements. To communicate effectively, the instructor should consider the effects of these factors and mitigate them where possible.	
13.	p. 3-6, 3d para., 1st sentence	Replace "problem" with "condition"	Less pejorative
14.	p. 3-7, 3d para., 3d sentence	Delete "the" in "during the training"	Flow of language
15.	p. 3-7, 8th para.	Replace reference to PTS with ACS	
16.			

ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
1.	P4-2 ¶6	Delete: Current: "The willingness to look for ways to match student learning styles to personal instructional style is another element of effective instruction. "	Recent research is calling into question the efficacy of "Learning Style Assessment" as ineffectual. If that is ineffectual, the instructor has no means of matching the learner's learning style (if, indeed, there is any).



ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
2.	P4-3¶1	Current: Networking with and observing other instructors to learn new strategies is also helpful Insert highlighted: Networking with and observing other instructors and seeking mentoring from an experienced instructor to learn new strategies is also helpful	Mentoring is another method of connecting with experience to pass on knowledge.
3.	P4-3¶2	Re: Human Behavior, the average age of aviation students is 34 years old	I think the age may be skewing younger. A current figure from FAA data should be secured
4.	P4-4¶2	Change: In addition, the Certificated Flight Instructor (CFI) To: In addition, the Authorized Instructor	Since this applies to Sport Pilot and LSA training, CFI isn't inclusive
5.	P4-4 ¶ 10	Delete: Normally	Strengthen the point of the paragraph
6.	P4-5¶ Fig 4-3	 Edit Figure 4-3 to read: Lesson 1 Obtain Weather Briefing Objective: To develop learner's skill in obtaining a weather briefing Elements: Observe wind and weather conditions from the Weather Channel, radio and/or visually Call Flight Service for a live weather briefing Obtain a weather briefing from an approved online source Discuss the ramifications of the weather conditions on VFR flight 	The text says: "generally contains a description of each lesson [Figure 4-3] but figure 4-3 includes 2 lessons – Flight Planning and Weather Briefing presented as a single lesson. I suggest this one, but any single lesson would work.



ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
		Equipment: Weather information form Sectional chart 	
		 Instructor's Action: Discuss lesson Demonstrate obtaining weather information from Flight Service Demonstrate obtaining weather information from an approved online resource Discuss briefing with learner Observe and review learner's briefing 	
		 Learner's Action: Obtain weather briefing from Flight Service Obtain weather briefing from approved Discus with instructor the ramifications of the weather for a VFR flight 	
		 Completion Standards: Demonstrates ability to obtain complete briefing from Flight Service and correlates this Information with observed weather conditions Demonstrates ability to evaluate and discuss the effects of weather and NOTAMs obtained with respect to the Go/No Go decision 	
7.	P4-6 ¶ 4 and 5	Multiple occurrences of "PTS". Replace PTS with ACS	Update reference name to ACS



ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
8.	P4-6 ¶ Fig. 4-5	Example covers of Practical Test Standards books	Replace images in Fig 4-5 with ACS volumes and Change the caption to Airman Certification Standards
9.	P4-7 ¶2 and 3	Multiple occurrences of "PTS".	Update reference name to ACS
10.	P4-7 ¶4	If Scenario Based Training (SBT) hasn't been bold headlined previously in the book, it should be at the beginning of this paragraph: Scenario Based Training (SBT)	If this recommendation is adopted, the parenthetical (SBT) in the 1 st para should drop the (SBT); "lead to the adoption of scenario-based training" Should be dropped
11.	P4-7 ¶4	Change: "flight maneuvers and not artificial maneuvers designed only for the test" To read: "flight maneuvers and not artificial maneuvers designed only for teaching that maneuver"	I think the AIH has it backwards – the training was developed then the "how do we test it was derived from that. For the most part we trained maneuvers, not the integration of that skill into practical flight applications.
12.	P4-7 ¶8	"Experienced CFIs have been" Replace CFIs with "Instructors	This handbook now applies to a broader range of instructor categories than Certificate Flight Instructors
13.	P4-9 ¶8	Change "For example, basic map reading is a perishable skill" To "For example, basic chart reading is a perishable skill"	Terminology in aviation is chart, not map.
14.	P4-9 ¶8	Change: "to be aware of there surrounding" To: "to be aware of their surrounding"	Wrong word. Right one is "their"
15.	P4-17 ¶4	Current: Mark's closest friends bought him a ticket for a playoff game at their alma	Since the scenario is developed in what appears to be Private Pilot training, perhaps we



ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
		mater and they paid him to rent an airplane	shouldn't include a major FAR violation that is not part of the
		Replace with:	discussion.
		Mark and his college fraternity brothers bought tickets for a playoff game at their alma mater. Mark volunteered to fly all of them to the game in an airplane he rented.	
16.	P4-18 ¶4	Delete: "Predictions are that more and more learning will take place via e- learning"	By now, I think everyone is well aware that pretty much "e Anything" is well established.
17.	CONTINUE TO NEXT PAGE Item 19		
18.	CONTINUE TO NEXT PAGE Item 19	I skipped to next page so it would all fit one page.	
19.	P4-18 ¶5 (1 st para top right of page)	Change: "Fixed-base operators (FBOs) who offer instrument training may use personal computer-based aviation training devices (PCATDs) or flight training devices (FTDs) for a portion of the instrument time a pilot needs for the instrument rating" " With: "Flight Schools of all types may offer training using a variety of computer-based desk top Basic Aviation Training Devices (BATDs), stand-alone, personal computer based advanced aviation training devices (AATDs) and even more advance Flight Training Devices (FTDs) for a portion of the time a pilot needs for various certificates and ratings"	To broaden from FBOs to all kinds of flight schools; to use current names of these devices (AFS-800 might want to weigh in on how this is stated); and to expand the training from "instrument" to flight training as they can be used for some primary training as well. Consider my comment a place- holder for the need to use current language) Ref: AC 61.136A
20.	P 4-29	Test Preparation Material: rewrite to reflect purpose of commercially- available test preparation materials. Existing content is derogatory to	



ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
Item #	Page Number / Section / Figure	Current Wording / Proposed Revision commercial publishers without acknowledging the deficits of the FAA Knowledge Exam (training and testing was not correlated, so applicants needed to prepare for the test to be successful; i.e. training to be a successful pilot did not ensure they would be successful on the FAA Knowledge Exam). This section should be completely rewritten to reflect the FAA goals for the FAA Knowledge Exam (ensure airman knowledge as defined by the ACS) and purpose of commercially available test	Justification / Explanation
		preparation material (to familiarize applicants with the scope and breadth of the test as it correlates to their training experience).	

ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
#	Section / Figure	"student" / "pilot in training" or "learning pilot" or "learner"	The pilot-in-training audience often involves mid-career, highly successful individuals for whom the title "student" might seem demeaning. Kochan Responds to this recommendation: Chapter 5 - If we change the term from student (which I do not find demeaning as I will always be a student of aviation), then will we issue "Learner's Certificates" instead of Student Pilot Certificates? Whatever term the FAA chooses to use should be consistent. Too bad
			successful individuals for whom the title 'student' might seem demeaning" as offered in the



ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
			comments. "Learner" might be an option as it is the norm in academia today. But, that term might be offensive to some, too
2.	Throughout	Pedagogical terms such as "rubric" and "criterion"	Non-common use pedagogical terms are not particularly helpful to a flight instructor applicant who is not writing a master's thesis or doctoral dissertation in education theory. They only provide irrelevant fodder for knowledge test writers.
3.	5-2 Assessment Terminology, 2 nd & 3 rd pp	Use of "Traditional" and "Authentic" for broad categories of assessment / "Knowledge" and "Skill"	"Authentic" implies that the other (Traditional) is not authentic. "Knowledge" assessment will cover rote and understanding and "Skill" assessment will cover application and correlation.
4.	5-2 Assessment Terminology, 2 nd pp, last sentence	Consequently, the traditional assessment is more likely to be used to judge, or evaluate, the student's progress at the rote and understanding levels of learning. / Consequently, the knowledge assessment will more often be used to assess, the learner's progress at the rote and understanding levels of learning, but when carefully crafted scenario questions are employed, they can assess higher levels of learning.	Replace "Traditional" with "Knowledge" and "Authentic" with "Skill". Encourage use of scenarios in FAA Knowledge tests to go beyond the rote and understanding levels on knowledge tests. Currently many of the FAA knowledge test questions require analysis of information, calculation, and application of principles.
5.	5-2 Assessment Terminology, 4 th pp	"rubric" / "assessment guide"	First thought is that an example needs to be included when the term "rubric" is introduced. Second thought is to eliminate "rubric" and replace it with something everyone



ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
			understands without having to Google it.
6.	5-5 Characteristics of a Good Written Assessment, Discrimination	Discrimination is the degree to which a test distinguishes the difference between students. In classroom evaluation, a test must measure small differences in achievement in relation to the objectives of the course. A test constructed to identify the difference in the achievement of students has three features: • A wide range of scores • All levels of difficulty • Items that distinguish between students with differing levels of achievement of the course objectives/ / Discrimination is the degree to which a test distinguishes the difference between students which may be appropriate for assessment of academic achievement. However, minimum standards are far more important in assessments leading to pilot certification. If necessary for classroom evaluation of academic achievement, a test must measure small differences in achievement in relation to the objectives of the course. • A wide range of scores • All levels of difficulty • Items that distinguish between students with differing levels of achievement of the course objectives	Small differences between students is not important in pilot certification. Measurement of each individual learner against the specified certification standards is absolute.
7.	5-5, Authentic Assessment, last sentence	HOTS / remove	Use of pedagogical acronyms like HOTS implies that it's important for a flight instructor to memorize and is fodder for knowledge test writers. The concept is important but



ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
			knowing the irrelevant acronym
			is not.
			Make consistent with existing
0	5-5, Collaborative	Collaborative Assessment / Learner	term of Learner Centered
٥.	Assessment title	Centered Assessment	Grading.

ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
1.	6-5, How to Use a Training Syllabus, 6 th pp under this heading, sentences 1 & 2.	The flight training syllabus should include special emphasis item that have been determined to be cause factors in aircraft accidents or incidents. For example, the instructor should emphasize collision and wake turbulence avoidance procedures throughout a student's flight training / The flight training syllabus should include Risk Management instruction unique to each stage, phase, or training element to help the learner identify the risks involved and employ strategies to mitigate them. Throughout out the learner's training scenarios should include increasingly more subtle risks so that the learner becomes more skilled in identifying them and able to develop effective mitigation strategies.	"Special Emphasis" relates to the PTS Special Emphasis section that will be eliminated and those items incorporated into the tasks as appropriate in the ACS (Airmen Certification Standards). Risk Management should be addressed here.
2.	6-9, Scenario- Based Training (SBT), 1 st pp, 2 nd and 3 rd sentences	The goal of SBT is to challenge the student or transitioning pilot with a variety of flight scenarios to improve decision-making skills. These scenarios require the pilot to manage the resources available in the flight deck, exercise sound judgment, and make timely decisions. / The goal of SBT is to challenge the student or transitioning pilot with a variety of flight scenarios to	Risk management terminology to replace judgment .



ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
		improve risk management skills. These scenarios require the pilot to manage the resources available in the flight deck for risk identification, development of mitigation strategies and employment with sound timely decisions.	
3.	6-9, Scenario- Based Training (SBT), 3 rd pp, 1 st sentence	"the recent emphasis on SBT" / "the current emphasis on SBT"	No longer "recent".
4.	6-9, Scenario- Based Training (SBT), 3 rd & 4 th pp,	"advanced avionics"	Is this the nom du jour?

1.			Generally, I think Chapter 1 is
			well written
2	D7_1	The 3 boxes should not overlap as	
۷.	r / - 1	some important information is lost	
2	P7-1 Special	Stall and Spin awareness is ALWAYS	Remove "(if appropriate)
3.	Emphasis Areas	appropriate	Remove (il appropriate)
	P7-1		
	Responsibilities of	Demanding Adequate should be	This is a high or standard
4.	All Aviation	Demanding Appropriate	This is a higher standard
	Instructors		
			Transferring knowledge better
	P7-2¶1-Av Instr	The job of an av instructor is to teach	suggests that the instructor is
5.		should be "The job of an av instructor	responsible for understanding
	кеѕр	is to transfer knowledge"	what knowledge the student
			acquires.
	D7 2014 Holping	Last ¶: "uneasiness on the part of the	Unfortunately, instructors
6.	P7-2¶4-Heiping	student" should be "on the part of the	frequently do not know the
	Students Learn	student and the instructor."	objective of the lesson.
		"No two students are alike, and a	
7.	P7-2¶5-Providing	particular method of instruction	
	Adequate	cannot be equally effective for all	It can but usually will not be.
	Instruction	students" should read "No two	
		students are alike, and a particular	


		method of instruction may not be equally effective for all students"	
8.	P7-2¶5-Providing Adequate Instruction	Last line of column: "is prepared" to "should be prepared"	
9.	P7-2¶5-Providing Adequate Instruction	is prepared to change his or her methods of instruction as the student advances through successive stages of training. Change to "should be prepared to change his or her methods of instruction to meet that student's particular learning style as well as when that student progresses through successive stages of training.	Should be defines what an instructor should be ready to accomplish and frequently is not what an instructor "is". An instructor must change his teaching styles to adapt to the student's learning style, not the other way around.
10	P7-2¶last one on page	"an instructor can meet this responsibility through a careful analysis of and continuing interest in students" should read "As discussed in chapters 1 and 2, an instructor can meet this responsibility by becoming familiar and conversant in the fundamentals of instructing and through a careful analysis of and continuing interest in students"	To include FOI
11	P7-3¶1 st one on page	"Most new instructors tend to adopt the teaching methods used by their own instructors." Change to "Most new instructors tend to adopt the teaching methods used by their own instructors or the methods by which they themselves best learn."	Stating what research has suggested.
12	P7-3¶2 – Standards of Performance	"An aviation instructor is responsible for training an applicant to acceptable standards" change to "An aviation instructor is responsible for training an applicant to established standards"	Better choice of words
13	P7-3¶2 – Standards of Performance	REMOVE: When teaching a particular procedure, an instructor might be tempted to point out the consequences of doing it differently, perhaps telling the student that failure to perform the procedure as taught will court disaster. The instructor may believe this "consequence approach" is necessary to ensure the student	Why emphasize the negative just prior to a paragraph "Emphasizing the Positive"?



		commits the procedure to memory, but the stated reasons for performing the procedure a certain way must contribute to the learning situation to be effective.	
14	P7-3¶6 – Emphasizing the Positive	"Consider how the following scenarios conducted during the first lesson might influence and impress a new student pilot who has limited or no aviation experience:" change to "Consider how the following negative scenarios conducted during the first lesson might adversely influence and turn off a new student pilot who has limited or no aviation experience:"	More clearly defines improper procedures.
15	P7-4¶3 – Emphasizing the Positive	"In essence, a student's failure to perform is viewed as an instructor's inability to transfer the information. Otherwise, the instructor fails to consider himself or herself as part of a broken learning chain. Emphasize the positive because positive instruction results in positive learning." change to "In essence, a student's failure to perform can be viewed as an instructor's inability to transfer the required information. In not doing so , the instructor fails to consider himself or herself as part of a broken learning chain. Emphasize the positive because positive instruction results in positive learning."	More clearly defines an instructor's responsibilities and consequences for not satisfying those
16	P7-5¶4 – Flight Instructor Responsibilities	"Flight instructors must provide the most comprehensive ground and flight instruction possible." change to "Flight instructors must provide the most comprehensive ground and flight instruction to meet established standards."	Most comprehensive possible would result in never getting to a checkride.
17	P7-5¶4 – line 4	"encouraging" change to "and encourage"	
18	P7-5¶2 – Flight Instructor Responsibilities	"Flight instructors have the responsibility of producing the safest pilots possible with the overall focus on education and learning. It is also	Better flow; clearer meaning



		important to convey an understanding	
		of why pilots are trained to standards	
		and how they are set." change to	
		"Flight instructors have the added	
		responsibility of producing the safest	
		safe pilots possible with the overall	
		focus on safety, education and	
		learning. It is also important to convey	
		provide an understanding of why	
		pilots are trained to standards and	
		how they these standards are set."	
		REMOVE: Instructors should not	
		introduce the minimum acceptable	
		standards for passing the check ride	
		when introducing lesson tasks. The	
	P7-5¶3 – Flight	minimum standards to pass the check	
19.	Instructor	ride should be introduced during the	PTS is on the way out
	Responsibilities	"3 hours of preparation" for the check	
		ride. Keep the PTS in the proper	
		perspective, with emphasis on the	
		Practical Test Standard (PTS) increasing	
		later in the training	
		"These negative sensations can usually	
		be overcome by understanding the	
		nature of their causes. Remember, a	
		sick student does not learn well "	
	P7-5¶6 —	change to "These negative sensations	
20	Physiological	can usually be overcome by	Who is to say a sick student
20	Obstacles for Flight	understanding the nature of their	does not learn well?
	Students	causes Remember a sick student does	
		not loarn well is preoccupied and may	
		not have the mental or physical	
		capacity to learn."	
		"The instructor determines when a	
		student is ready for his or her first solo	
		flight " change to "The decision to	
21	P7-5¶8 – Ensuring	determine when a student is ready for	The decision to solo should be
21	Student Skill Set	his or her first solo flight should be a	a joint decision
		ioint decision between student and	
		instructor "	
	P7-5¶9– Ensuring		
22	Student Skill Set	Will this remain in ACS. I think not	
22	Last ¶ on nage		
	P7-6 – Safety	REMOVE: new from "the new FAA	
23	Practices and	Safety Team	It's not new anymore.
1			1



	Accident		
	Prevention		
24	Р7-6 -	ADD: the Society of Aviation and Flight	It's pow
24	Professionalism	Educators (SAFE)	it snew.
		ADD a comma: When preparing a	
		student or applicant for the private	
		pilot certification or higher grade	
25	P7-8 – knowledge	rating (i.e., commercial or instrument),	
25	Test	a test is required to ensure the student	
		has adequate aeronautical knowledge	
		in those subject areas listed in 14 CFR	
		part 61.	
	P7-10-		I don't boliovo this is trucy I
26	Government – 1 st	As mentioned earlier in the chapter,	r don't believe this is true, i
	line on page		
27	P7- 11 – 1 st full	"Most of these publications" change to	Timos, they are a changing
27	paragraph	"Many of these publications"	Times, they are a changing
		REMOVE first two paragraphs and	
		ADD: Access to the Internet via	
		personal computers, tablets, and	
28	P7-11 – Electronic	smartphones has opened up a vast	Times, they are a changing,
	Sources	storehouse of information for the	FAST!
		aviation instructor at the FAA website,	
		www.FAA.gov and many, many other	
		websites and apps.	

Chapter 8

ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
17.	8-2	"and by participation in pilot and flight instructor clinics, including the FAASTeam/SAFE quarterly series of Flight Instructor Open Forums.	This ongoing series of quarterly presentations is not promoted well enough. All instructors should be encouraged to participate.
18.	8-3	"conduct stabilized approaches, maintain desired airspeed on final, emphasize the importance of an aim point on final, i.e. "on spot, on speed,	I am amazed at the amount of pilots that I fly with that have no understanding of the importance of an aim point on final
19.	8-3	"The minimum standards to pass the checkride should not be introduced until the 3 hours of preparation for the checkride." Delete this sentence.	This sentence intimates that minimum standards are acceptable. In my book they are not! We should always



ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
			strive for the highest standard possible, and encourage all pilots-in- training to do so as well!
20.	8-4	Rough air, heat, and unexpected abrupt maneuvers tend to increase the chances of airsickness.	High cockpit temperatures can be a major contributor to airsickness. (Ask me how I know)
21.	8-4	The deficiencies listed below are apparent to others before the individual notices any physical signs of fatigue. CFIs need to be cognizant of these symptoms in themselves as well as in their clients.	An element of risk management for the CFI is the ability to recognize and mitigate those physiological symptoms that could lead to a degradation of the CFIs situational awareness. Much of this section is describing the conditions a CFI needs to be aware of in their clients. It is just as important that they recognize them in themselves.
22.	8-5	The first noticeable effect of dehydration, for some, is fatigue, for others it is irritability, which in turn makes top physical and mental performance difficult, if not impossible.	For me, personally, the first sign of dehydration is irritability with my client. This irritability will make me a less effective instructor. There will be times in a CFIs daily schedule when maintaining proper hydration will be difficult. It is important for CFIs to understand the importance of proper hydration for themselves as well as for their clients. This is another part of situational awareness related to risk management for the CFI
23.	8-6	StudentsClients need to know not only what they will learn, but also how they will learn it—that is, how the lesson will proceed and how they will be evaluated, as well as WHY they are learning it.	If the client doesn't understand the "why" of whay they are being taught their knowledge might never rise above the rote level.



ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
		Learning the "why" of a skill leads more quickly to a correlative level of knowledge.	
24.	8-6	Student Performance and Instructor Supervision Phases (insert the following paragraph between paragraphs 2 and 3 of this section. Risk management for the instructor during the demonstration/performance phases of flight training is critical. The instructor has to be prepared to intervene, as necessary, in order to maintain safety of flight, however early or premature intervention will not allow the pilot-in- training to learn to recover from an upset on their own. Instructors must maintain awareness of the dynamic state of the aircraft and not allow the PIT to exceed any published structural or operational limits as well as airspeeds, altitudes and attitudes that are inappropriate and hazardous.	AI.FOI.G.S4g,h
25.	8-7	"and describe any other pertinent factors that may apply. The instructor should describe the many proprioceptive inputs they are receiving and how they use these to make corrections to control inputs. These inputs include sight (not only what they are looking at, but what they are seeing), sound (the changes in engine sound, airflow over the cockpit, aural stall warnings, etc.) and feel through hands, feet and torso.	If an instructor can describe the proprioceptive and meta-cognitive inputs they are receiving it will give the pilot-in-training a much deeper understanding of all the inputs they can use to successfully conduct a maneuver. So often and instructor might say "I'm looking out the window" but they fail to say what they are looking at, nor how they interpret what they see to correlate with their control input.
26.	8-7	• Use outside visual references and monitor the flight instruments: "First I'm clearing the area, looking for traffic. Now as I roll into the turn I am looking at the relationship between the propeller and	This at least gives an example of a thorough description of the inputs that a pilot might use to fly a constant altitude turn.



ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
		the horizon. As the bank steepens I am having to add back pressure to the yoke to maintain that relationship. Now I'm looking at the altimeter to confirm that I am maintaining my altitude, and the airspeed indicator to confirm that I am maintaining my airspeed. If my airspeed is decaying I will add a little bit of power, using my hearing to adjust the power while still looking out the window to ensure the pitch attitude is still correct"	
27.	8-8	 When the desired angle of bank is reached, neutralize the ailerons. and trim as appropriate. Lead the roll-out by approximately one-half the number of degrees of the angle of bank. Use coordinated aileron and rudder control pressures. Simultaneously begin releasing the back pressure so aileron, rudder, and elevator pressures are neutralized when the aircraft reaches the wings-level position. 	If the second paragraph is to be accurate "trim as appropriate needs to be deleted from the prior paragraph. If we had "trimmed as appropriate" there would be no back pressure to release. Furthermore, who would trim for bank angles less than 45° or more?
28.	8-8	Upon reaching a wings-level attitude, reduce power and trim <mark>to remove control</mark> pressures. if necessary.	There is not always a need to trim in a turn. The statement, as written makes the assumption that one has trimmed.
29.	8-9	Flight instructors should always guard the controls and be prepared to take control of the aircraft, however if the instructor continuously follows through on the controls, the pilot-in-training will never truly know if they were doing the flying. Thus, guarding the controls should not be interpreted as "always having the instructors hands and feet on the controls."	Too many inexperienced instructors do not have the confidence to allow their clients to fly the airplane unassisted.
30.	8-9	Flight instructors should not exceed their own ability to perceive a problem, decide upon a course of action, and physically react within their ability to fly the aircraft. They must ensure that the	Al.FOI.G.S4g,h



ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
		aircraft remains within any published structural or operational limits	
31.	8-9	Nonessential activities include such activities as eating, reading a newspaper, or chatting, or texting.	There has been at least one documented case of a fatal accident that occurred while the instructor was texting.
32.	8-9	It is important the flight instructor not only teach the concept of a sterile cockpit, but also model such behavior during flight instruction. The instructor must determine that fine line between conversation that is essential to teaching and flight safety, and conversation that is distractive.	Self-explanatory
33.	8-10	 Ask the student to compute true airspeed with a flight computer. 	I suggest deleting this example as so many modern cockpits provide this information in the instrument display
34.	8-10	The early establishment of proper habits of instrument cross-check, instrument interpretation, and aircraft control, correlated with the view out the window, is highly useful to the student.	To re-enforce the concept of integration
35.	8-11	The use of integrated flight instruction provides the student with the ability to control an aircraft in flight for limited periods if outside references are lost. Conversely, if the pilot-in-training is able to correlate instrument indications with outside visual references they will be able to safely fly the airplane if/when any instruments fail.	Self-explanatory
36.	8-14 (alternatively this could be inserted after paragraph 5 of 8-15)	Insert the following between paragraph 5 and 6: Risk management requires the pilot to identify hazards related to a flight maneuver, assess the risk, and then develop and use mitigation strategies to manage the risk. Because it is not possible to anticipate and list every possible risk, risk management also requires the skill to identify and manage	This to address those areas of Risk Management as defined in the AI ACS.



ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
		a previously unknown risk by correlating evidence of non-specific or undefined hazards, assessing the risk, and applying appropriate mitigation strategies.	
		 Risk Management requirements for the Instructor are greater than those defined for a particular airman certificate or rating. The CFI must have: Instructional knowledge of hazards and risk management strategies associated with a particular task Instructional skill to transfer that knowledge to a pilot-in-training (PIT) in both ground and flight lessons. Ability to recognize, assess and mitigate the risk inherent in giving flight instruction to a PIT who is manipulating the controls. This skill requires the instructor to correctly decide when intervention is required to ensure the safe outcome of the 	
		In addition to needing to be able to teach all the elements of ADM to pilots-in- training, instructors also need to be cognizant of the many areas of risk that they and their clients are exposed to during the course of flight instruction, along with mitigation strategies to combat those areas of threat. These include, but are not limited to: • Maintaining active collision avoidance while simultaneously providing instruction • Maintaining a "sterile cockpit" at appropriate times. • Ensuring a positive exchange of flight controls.	



ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
		 Maintaining awareness of the actions, cognitive state, and physiological state of the pilot in training. Complacency regarding oversight of the pilot in training Failure to monitor coordination of flight controls by the pilot in training. Allowing instructional responsibilities to distract from situational awareness responsibilities. Failure to intervene in a timely fashion to maintain safety of flight Allowing instructional responsibilities to distract from situational awareness responsibilities. Failure to intervene in a timely fashion to maintain safety of flight Allowing instructional responsibilities. Recognizing and mitigating pilot in training anxiety. Failure to correct pilot in training "hazardous attitudes." 	
37.	8-15	To determine if there is a change in the winds aloft forecast and to check recent pilot reports, she contacts Flight Watch. AFSS (a flight service station).	Flight Watch has been discontinued
38.	8-15	To determine the severity of the problem, she calculates a new groundspeed and reassesses fuel requirements. In addition, she determines through flight service if the TAFs and FAs have changed, as an unforecast change in winds aloft might indicate a change in the entire forecast and might require a revised alternate.	One of the first indications of an unreliable forecast is winds and temps aloft that are not what were forecast.
39.	8-19	instructors must be familiar with the components of each aircraft in which they instruct to ensure students understand the operation of the equipment. In addition it behooves the	It is a responsibility of the CFI to stay abreast of, and current with as many of the numerous "apps" that are



ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
		instructor to be familiar with any and all handheld equipment the client might use so as to be able to instruct the client in the most efficient use of the equipment as well as any potential shortcomings that the equipment might present.	proliferating the "tablet" environment.
40.	8-19	Other valuable flight deck resources include current aeronautical charts and publications, such as the Airport/Facility Directory (A/FD) Even if accessed through a tablet "app". It is also important for the instructor to stress the importance of current databases in all installed navigational equipment.	It is not uncommon for me to have an applicant show up for a practical test with an installed GPS that has a database that might be more than one year out of currency.
41.	8-19	AFSS can provide updates on weather, answer questions about airport conditions. and may offer direction <mark>finding assistance.</mark>	DF steers are almost as archaic as radio ranges.
42.	8-19	by encouraging them to take advantage of services, such as flight following <mark>and</mark> Flight Watch .	Flight Watch is joining the list of dinosaurs
43.	8-20	Effective workload management ensures that essential operations are accomplished by planning, prioritizing, and sequencing tasks to avoid work overload. A pilot always needs to be able to answer the questions: Where am I? What do I have to do next? How will I achieve it?	Just offering a simple way of explaining a complex concept.
44.	8-20	As workload increases, attention cannot be devoted to several tasks at one time, and the pilot may begin to <mark>focu</mark> s fixate on one item	Makes the statement a little stronger

Chapter 9

Item	Page Number /	Current Wording / Proposed Revision	Justification / Explanation
#	Section / Figure		
1	n = 0.2 para 7	Current:	Reflects reorganization of
1.	p. 9-2, para. 7		material (incorporation of



ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
		The principles of risk management and the tools for teaching risk management in the flight training environment are addressed in Chapter 8, Techniques of Flight Instruction. Revised: The principles of risk management and the tools for teaching risk management in the flight training environment are also discussed.	elements from Ch. 8 into Ch. 9)
2.	p. 9-3, 5th full para. ("Risk management is .")	 Replace "simple" with "systematic" Replace "which" with "that" 	Usage
3.	p. 9-3, 6th full para ("A hazard is defined"	In second sentence, change "risks" to "hazards" Add new last sentence: An example of a hazard is line of thunderstorms.	Add concrete examples to flesh out text.
4.	p. 9-3, 7th full para. ("The assessment step . ")	Add: For example, flying through or in the vicinity of thunderstorms is known to present a heightened risk of severe adverse consequences such as loss of control or an in flight break up.	Add concrete examples to flesh out text.
5.	p. 9-3, 9th full para. ("Effective control measures ")	Add: For example, if preflight planning reveals thunderstorms forecast along the proposed route of flight, the pilot could revise the route to give the weather system a wide berth, or decide to stay on the ground until the hazard has passed.	Add concrete examples to flesh out text.



ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
 # Section / Figure p. 9-4, after 6. fourth bullet of third full para. 		Add the following new, non-bulleted paragraph: These general principles apply to a variety of activities. In aviation, each person involved in the operation of a flight has a duty to apply risk management principles to their activities. Providing flight instruction involves specialized risk management considerations. A flight instructor must effectively teach risk management principles and their practical application. In addition, in order to ensure safe outcomes, a flight instructor must also proactively apply risk management principles while simultaneously providing instruction.	Begin to focus the material on practical application to flight instruction.
p. 9-4, before the 7. heading "Level of Risk"		Add new heading: "Identifying Hazards"	Will add new text below to this heading to address this important topic. Parallels the order in which the material is introduced above.
8.	p. 9-4, below the new heading "Identifying Hazards"	Add the following text from the RM Handbook (FAA-H 8083-2): On page 1-2, the first paragraph and 4 numbered examples below the heading "Recognizing the Hazard"	This discussion fills a gap in the presentation of the material in the AI Handbook.
9. p. 9-4, below the text added above		Move the following discussion in the AI Handbook to this point: From page 9-6 through 9-8, all text in the discussion of the PAVE Checklist, including the subheading that starts the section. Also, revise the first sentence of the moved text so that it reads:	"PAVE" should logically be discussed here.



ltem	Page Number /	Current Wording / Proposed Revision	Justification / Explanation
#	Section / Figure		,
		"The PAVE checklist is a useful tool for identifying hazards."	
10.p. 9-4, below the text added aboveMove the following discussion in the AI Handbook to this point:10.p. 9-4, below the text added aboveOn page 9-9, the discussion under "Hazard List for Aviation Technicians" plus that heading. Then, demote the heading to		Logical organization of material.	
11.	p. 9-4, the Delete this heading and replace it with 11. heading "Level of Risk" "Assessing Risk." Delete the subheading		Logical organization of material.
12.	p. 9-5, immediately before the heading "Mitigating Risk"	 Add the discussion in the last paragraph on page 4-3 of the RM Handbook ("Although the matrix") plus the accompanying figure (figure 4-2 in the RM Handbook). After the insert in "1" above, add: Every flight has hazards and some level of risk associated with it. Figure is an example of a Flight Risk Assessment Tool (FRAT) intended to help a pilot identify potential hazards and assess risks presented by a proposed flight. The FAA Safety Team has developed an example FRAT for general aviation pilots and has additional information about the use of such tools on its website. 	 Provides an example of a practical risk assessment matrix that could be used in the real world. Directs reader to the use of a FRAT, which corresponds to the example in the figure added.
13.	p. 9-5, immediately prior to the heading "IMSAFE Checklist"	Move the following discussion in the AI Handbook to this point: On page 9-9, the discussion under "Pilot Self-Assessment" plus that heading. Then,	Logical organization of material.



- 14				
	ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
			demote the foregoing heading to make it a subheading.	
p. 9-5, after the 14. heading "IMSAFE Checklist"		p. 9-5, after the heading "IMSAFE Checklist"	Add the following text as the first sentence of the paragraph: The fitness of a pilot to complete a flight presents a potential hazard that must be assessed and addressed before and during each flight.	Helps transition and emphasizes the point.
	15.	p. 9-8, immediately before the heading "Three-P Model for Pilots"	Move the following discussion in the AI Handbook to this point: The entire discussion of Aeronautical Decision Making from page 8-14 through page 8- 21.	ADM is more logically presented in Chapter 9 than in Chapter 8. After a discussion of risk management principles, a discussion of ADM here sets up the discussion of the 3P model, which is presented in the text as a model for applying ADM to accomplish risk management. This reorganization also reflects the pairing of ADM and RM in the authorized instructor ACS.
	16.	pp. 9-16 and 9-17	Replace "PTS" with "ACS"	
p. 9-16, 1st full 17. para. ("Advance avionics")		p. 9-16, 1st full para. ("Advanced avionics")	 In the first sentence, replace "offers" with "offer" Add to the end: The FAA Advanced Avionics Handbook (FAA-H-8083-6) contains information about advanced avionics systems that an instructor can use for his or her own study and as an instructional resource. When using such a resource with a learner, the instructor should emphasize that technical information in a general publication should not 	The AA Handbook can be a useful resource



ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
		supplant information provided by the manufacturers of specific avionics systems.	
18.	p. 9-16, heading "Teaching Decision-Making Skills"	Revise heading to read: "Teaching Risk Management and Decision-Making Skills"	
19.	p. 9-16, after first para. under the heading "Teaching Risk Management and Decision-Making Skills"	Add: Flight instructors must understand the importance of teaching risk management in flight training. Once a pilot leaves an instructor's supervision, the pilot will be responsible for making risk management decisions on their own. Therefore, it is essential that instructors provide training that prepares each learner to independently identify hazards, assess risk, and make sound decisions. Learners should be given opportunities to make decisions on their own. For example, if the preflight weather forecast is marginal, instead of cancelling a flight outright the instructor can ask the learner to evaluate whether the flight should be made. During training flights, instructors should look for opportunities to question learners about potential hazards and prompt them to apply decision making concepts.	
20.	 p. 9-16, the para. below the para. added above ("It is important to understand that . ") 	Revise first sentence to read: "Learning system safety in flight operations typically takes place in three phases."	
21.	p. 9-17, after 5th full para. ("Since the scenarios .")	Add:	Like other suggestions with respect to Chapter 9, this change is intended to make



ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
		When using scenarios in flight training, an instructor should leave sufficient time for a thorough debriefing after a flight takes place. It is also valuable for an instructor to develop scenarios that can be discussed with a learner on the ground. Instructors may develop a library of scenarios based on personal experience, NTSB accident reports, and other sources. Examples of discussion scenarios are contained in Appendix	the AI Handbook more practical. To facilitate this change, add to an Appendix in the AI Handbook the contents of Appendix B to the RM Handbook, which contains examples of risk management discussion scenarios.
22.	p. 9-17, the paragraph immediately prior to the heading "Assessing SRM Skills" ("Teaching decision-making . ")	Replace PTS with ACS In the last sentence, replace "a component of the PTS' with "a component of pilot evaluation."	
23.	p. 9-17, immediately prior to the heading "Assessing SRM Skills" ("Teaching decision-making . ")	Add the following: The Airman Certification Standards being introduced by the FAA on a rolling basis are intended to form the foundation of an integrated and systematic approach to airman certification that emphasizes safety risk management in all aspects of flight operations. Pilots seeking a certificate or rating under the ACS will be evaluated, in part, on their risk management skills.	Emphasize importance of RM in the ACS
24.	p. 9-18, immediately prior to the heading "Chapter Summary"	Insert new heading, "Risk Management in Flight Instruction" and text on Attachment A	Add source material to support instructional risk management concepts incorporated into the AI ACS



ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
25.	Throughout	Chapter 9 should be completely rewritten (and reviewed) as it already looks like an addendum and a mishmash of models. It should also be moved to be Chapter 1. Then, the concept of Risk Management is covered and can be considered while the student ("flight instructor to be") is learning about human behavior and all of the other topics in the publication.	Let's move Risk Management to the prime location in the document!

Attachment A for Chapter 9

RISK MANAGEMENT IN FLIGHT INSTRUCTION

Risk management is a critical component of aviation safety. The flight instructor is involved with risk management on multiple levels. These levels include managing the risks of a particular phase of flight and also teaching risk management, both in the classroom and in the cockpit. In addition, flight instructors encounter risks while providing in-flight instruction that are not experienced by pilots during personal flight training or other operations. Therefore, instructors must at all times proactively manage the risks inherent in providing in-flight instruction.

Managing in-flight instructional risk involves the ability to recognize hazards and assess and mitigate risk while giving instruction to a pilot-in-training who is manipulating the controls. This skill requires the instructor to correctly decide when intervention is required to ensure a safe outcome. Some in-flight instructional risks are common to almost all phases of flight, while others are confined to specific maneuvers. Examples of hazards commonly associated with providing flight instruction include, but are not limited to:

- Maintain active collision avoidance while simultaneously providing instruction.
- Maintain a sterile cockpit at appropriate times.
- Ensure a positive exchange of flight controls.
- Maintain awareness of the actions, cognitive state, and physiological state of the pilot-in-training.
- Maintain vigilance regarding oversight of the pilot-in-training.
- Monitor coordination of flight controls by the pilot-in-training.
- Intervene in a timely fashion.
- Maintain overall situational awareness while executing instructional responsibilities.
- Recognize and mitigate pilot-in-training anxiety.
- Correct pilot-in-training hazardous attitudes.



• Maintain continuous awareness of the dynamic state of the aircraft so as to be able to immediately intervene if necessary.

It is important to understand that above list is not intended to be exclusive. Instructional risk management requires continuous assessment and decision making. Student pilots can be expected to make perceptual and judgment errors. This is true of students at all levels of experience. For example, while running through engine start procedures, a flight instructor candidate sitting in the right seat may fail to clear the area to the left of the aircraft. Flight instructors must remain vigilant at all times and be prepared to take timely and sufficient action to correct student performance that, in the instructor's judgment, is leading to unacceptable risk.

The Airman Certification Standards will require flight instructor candidates to demonstrate knowledge and skill with respect to common in-flight instructional risks and, on the practical test, demonstrate effective instructional risk management from the beginning of preflight procedures through the conclusion of post flight procedures.

Appendices

ltem #	Page Number / Section / Figure	Current Wording / Proposed Revision	Justification / Explanation
1.	Appendix A, B, C, D	Incorporate the Appendices into the body of the publication or provide links to the source documents (such as AC 61-65F).	



Aircraft Systems Information Security / Protection (ASISP) Working Group

ARAC Update David Floyd, Boeing, Co-Chair Jens Hennig, GAMA, Co-Chair Steven Paasch, FAA March 23, 2013

Aircraft Systems Information Security Protection (ASISP)





Aircraft Systems Information Security Protection (ASISP)





Federal Aviation Administration

ASISP WG Task

- Currently, ASISP is Managed through Use of Special Conditions based on FAA PS-AIR-21.16-02, Establishment of Special Conditions for Cyber-Security
- The general task of the ASISP WG is to recommend in a report whether ASISP-related rulemaking, policy, and/or guidance on best practices are needed and, if so, where in the current regulatory framework these would be placed. In doing so, the WG will:
 - Provide rationale for its recommendations;
 - Identify
 - which categories of airplanes and rotorcraft such rulemaking, policy and/or guidance should address, and
 - which airworthiness standards such policy and/or guidance should reference;

ASISP Task (ctd.)

- Ascertain whether security-related industry standards from ARINC, FIPS, International Standards Organization (ISO), NIST, RTCA, SAE ARP 4754a and/or SAE ARP 4761 would be appropriate for use in ASISP-related policy and/or guidance; and
- Consider international harmonization needs.

Schedule

- ARAC Approved Terms of Reference December 18, 2014
- Federal Register Notice February 3, 2015
 - Membership by March 5th
- Meetings
 - June 23-25, 2015, Seattle, WA
 - September 29-October 1, 2015, Washington, DC
 - November 17-19, 2015, Seattle, WA
 - January 20-22, 2016, Philadelphia, PA
 - March 22-24, 2016, Seattle, WA We are currently meeting!
 - June 14-16, 2015, Washington, DC
 - July 19-21, 2016, Seattle, WA
- Report Due: 14 Months from Start (August 2016)

Membership

David Floyd, Boeing (Co-Chair)	Jens Hennig, GAMA (Co-Chair)
Steven C. Paasch, FAA (Representative)	Katie Haley, FAA (ARM) (Detailed AFS-50)

Company	Name	Company	Name
Airbus	Romuald Salgues	GE	Mark Gulik, Dave Pierce (O)
American Airlines	Maurice Ingle	GoGo Air	Karl Franz
Astronautics	Bernie Newman	Gulfstream	Wendy Sullivan
AFA	Dinkar Mokadam (O) Chris Witkowski (O)	Honeywell	Dan Johnson, Ben Morrow
ASTM	Christine DeJong (O)	Panasonic	Steven Bates
Bell Helicopter	Randall Johnson	Rockwell Collins	Patrick Morrissey
Boeing	Eric Lieberman (O)	RTCA	Karan Hofmann (O)
Dassault	Philippe Marquis	Sagem	Frederic Caro, Lionel Robin
DOD	Steve Hofmann (O)	SAE	Bruce Mahone (O)
DHS	Monica Maher (O)	TCCA	Marc Lord (A)
EASA	Cyrille Rosay (A)	Textron	Kevin Meier
Fed Ex	Brian Brown	Thales	Cyrille Marchand, Cedric Le May (O)
Embraer	Claudio H. de Castro, Ricardo Hachiya (O)	United Airlines	Phil Hardy
Free Flight	John DeBusk	USCG	Jeffery Dorwart (O)
GAMA	Jonathan Archer (O)	FAA	AIR, AFS, ATO Representatives (A)
Garmin	Mitch Trope, Alan Blood (O)	ANAC (NEW)	Rodrigo Magalhaes (A)

Technical Areas Under Review

- Development of Amendment to Part 25, Subpart F and Adopted to Parts 23, 27, 29, and 33
 - See Next Slide for Current Draft
- Development of Areas Warranting Guidance for Rule
- Review of FAA Policy Statement for Special Conditions
- Technical Topics including:
 - PEDs
 - COTS
 - FLS
 - Databases
 - Supply Chain Management
- Continued Operational Safety and Data Sharing

Next Steps

- Confirm Applicability to All Regulatory Parts – 23, 27, 29 and 33
- Development of Guidance Material based on Draft Regulatory Text with Consideration of Safety Continuum
- Continued Work on Other Technical Areas
- Finalize Report by August 2016

Questions?

Aviation Rulemaking Advisory Committee

Air Traffic Controller Basic Qualification Training Working Group (ATCWG)

Presented to: Aviation Rulemaking Advisory Committee By: Sid McGuirk, ATCWG Chair Date: March 23, 2016



Agenda

- Where We Are Today
 - Chair Selection
 - ATCWG Guidance Document
 - FAA Subject Matter Experts
 - Working Group Selections
- ARAC Extension Request



Chair Selection

• FAA Administrator approved AJI's recommendation for the ATCWG Chair on January 12, 2016. The endorsed recommendation was submitted to the Office of Rulemaking for final approval; the Designated Federal Officer approved the recommendation on February 5, 2016 and the ARAC Chair approved on February 10, 2016.



ATCWG Guidance Document

- Guidance Document was developed by an internal group of FAA stakeholders in 2015.
- The Guidance Document will be used to inform the ATCWG of agency needs.



FAA Subject Matter Experts to the ATCWG

• A core group of FAA subject matter experts have been identified to provide guidance to the ATCWG.



Working Group Selections

- AJI and the ATCWG Chair met on March 8th-9th to select the remaining Working Group members.
- Submitted Working Group member selections to the Office of Rulemaking for final approval.
- Notified those who responded to the Tasking Notice of their selection or non-selection.
- Planning for the first Working Group meeting to occur May 2016. The ATCWG Work Plan will be developed at the first meeting and will consist of two interim reports and the final recommendation report. The first interim report will contain recommendations for phase 1 (training), while the second interim report will combine both phase 1 (training) and phase 2 (hiring) recommendations.



ARAC Extension Request

- The first interim report is due to the ARAC Committee at its June 2016 meeting for their acceptance no later than July 15, 2016.
- Currently behind schedule for the first ATCWG meeting due to initial vetting of volunteers taking longer than expected.
- A May 2016 meeting will only give the Working Group 1 month to complete the first interim report.
- Request an extension until the December 2016 ARAC Committee meeting to complete the phase 1 interim report.


Transport Airplane and Engine (TAE) Report

March 23, 2016

Outline

- Summary
- Working Groups Updates
 - Engine Endurance Testing
 - Airworthiness Assurance
 - Flight Test Harmonization
 - Metallic and Composite
 - Crashworthiness and Ditching

TAE WORKING GROUPS

Status Summary

Status	Working Group	Comments
G	Engine Harmonization :	150 Hour Engine Endurance Testing (14 CFR 33.87) Due date: 2 Q. 2017 On Target
Y	Airworthiness Assurance	Implementation of WFD rule. Diminishing scope. Supporting Metallic and Composite Working Group. Need FAA Guidance/Direction
Y	Flight Test Harmonization	Transport Airplane Performance and Handling Characteristics - Phase 2 Due Date: April 2017 Many complex and controversial topics - Working Group is developing a proposal to repriotrize tasking items.
G	Metallic and Composite	Work Plan Accepted 11/4/2015 Report date: January 2017
G	Material Flammability	Cost impact assessment due to the changes proposed in phase 1. Report Approved by ARAC and submitted to FAA on Jan 6, 2016
G	Crash Worthiness and Ditching	Work plan due: March 2016 Due date: 6/2017

Engine Harmonization WG

Tasking:

- Engine Endurance Testing Current 14 CFR 33.87 rule is outdated relative to modern high bypass ratio, high pressure ratio engines
- New test is required which will meet the intent of an accelerated endurance run on a type design engine configuration

Chair: Peter Thompson, GE Aviation

Due Date: Second quarter 2017; Report due to TAE Dec. 2016

- Bi-weekly telecoms and quarterly face to face meeting.
- Proposed test is being finalized
- Schedule is tight

Airworthiness Assurance WG

Tasking:

- Supporting continued tasking related to WFD rule implementation.
 Providing recommendations to ARAC Metallic and Composites WG with respect to rotorburst requirements and introducing Structural Damage Capability (SDC) into Part 25 requirements
- **Chairs:** Steve Chisholm, The Boeing Company; Mark Yerger, FedEx (new Chair discussion at next meeting)

Due Date: January 2017; due date for Metallic and Composite WG tasking.

- Rotorburst currently considering one of three options
 - Harmonize with EASA (remove 25.571(e) requirement)
 - Clarify FAA guidance to allow averaging of 1 in 20 requirement in 25.571(e)
 - Clarify FAA guidance to require 1 in 20 requirement for each rotor stage in 25.571(e)
- SDC currently considering one of three approaches
 - Revise 2003 GSHWG recommended revision to 25.571
 - Create a design-based requirement (25.6xx)
 - Rely on existing regulations, revise guidance to encourage SDC practices
- AAWG face-to-face scheduled for March 14/15; interim recommendations will be made to Metallic and Composite WG on March 17/18

Flight Test Harmonization WG

Tasking:

- Transport Airplane Performance and Handling Characteristics Phase 2
- Group to develop standards for fly-by-wire, takeoff and landing performance, and handling characteristics
- **Chairs:** Christine Thibaudat, Airbus, & Brian Lee, The Boeing Company (Brian is replacing Bob Park)
- Due Date: April 2017; report to be summited to TAE in January, 2017

- Per TAE request, working group has assessed the remaining work statement and reprioritized the scope
- A total of 12 areas were included in the tasking (next slide)
- The top 10 areas will be completed by the due date
- WG plans to propose to shift the two remaining 2 lower priority items to Phase 3
- In an upcoming meeting (March 2016) the working group will finalize its recommendation to the TAE

New Proposal to be Presented to TAE in June 22

Topic No.	Topics Phase II	Proposed Phase 3
	Due Date April 2017	May require a new tasking
1	Envelope Protection	
6	Longitudinal / Lateral Stability	
2	Adaptation for Flight in Icing	
12	Steep Approach Landing	
13	Out of Trim	
7	Side Stick Controls	
10	Runway Excursion Hazard Classification	
9	Wet Runway Stopping Performance	
11	Stall Speed in Ground Effect	
14	Tailwind / Crosswind	
16	Handling Qualities Compliance Finding	→
15	Pilot Induced Oscillation/	→

Metallic and Composite WG

Tasking:

• Recommendations regarding DTA and fatigue requirements

Chair: Mike Gruber, The Boeing Company

Due Date: January 2017

- WG reviewing and evaluating details of the tasking
- Defined sub-teams a total of 12; each addressing a specific item
- Next meeting March 16-18, Everett, Washington
- During the March meeting, WG members will assess their progress towards completion of the tasking based on the sub-teams' reports to determine whether changes to the schedule are required

Crashworthiness and Ditching WG

Tasking:

- Recommendations regarding incorporation of airframe level crashworthiness and ditching standards into Part 25.
- **Chair:** Kevin Davis, The Boeing Company
- **Due Date:** June 2017; work plan due to TAE by the end of March, 2016

- Productive kickoff meeting on Dec. 8-9, 2015, excellent participation
- Detailed discussions concerning the tasking
- Established sub-teams to develop a schedule in support of the work plan
- Next meeting scheduled for April 5-7, 2016, in Melbourne, Florida

Next TAE Meeting

Date:

June 22, 2016

Location:

Aerospace Industries Association 1000 Wilson Blvd., Suite 1700 Arlington, VA 22209

Rotorcraft Bird Strike Background & Tasking



Federal Aviation Administration



Presented By: FAA Rotorcraft Directorate Gary Roach Date: March 23, 2016

History

- The Rotorcraft Directorate proposed a bird strike working group to the ARAC on Dec. 17, 2015.
- The ARAC requested:
 - A rate of incidents to assess the risk.
 - Review of other FAA bird strike activities.
 - Greater specificity and clarity in the tasking.



Actions since last ARAC

- Additional academic studies cited.
- Rate information included.
 - Bird strike per flight hour for U.S. fleet
 - Count of bird strikes from major operators
- Updates from other FAA Bird strike activities.
- Tasking revised Same scope, more clarity.



Academic studies

- Added to "Background" section.
- Studies highlight the uniqueness of helicopter bird strikes compared to fixed wing.



Rotorcraft bird strike rate

- Rate increased 49% from 2010-2014
 - Increased from 3.99 to 5.95 (per 100,000 flight hours)
 - In raw numbers, strikes increased from 136 to 193
- Reports from major rotorcraft operators
 - Offshore Gulf of Mexico operator
 - Helicopter air ambulance operator
 - Both reported an average of 1 strike per week over the past 10 years (over 500 total strikes for each operator)



Current bird strike activities

- Found no duplication of effort regarding bird strike protection activities.
- Their efforts are not transferable to the uniqueness of rotorcraft issues.



Task revisions

- Separated Part 27 from Part 29 for clarity
- Specified those tasks that apply to:
 - Newly type certificated (i.e. newly designed)
 - Newly manufactured
 - Existing fleet
- Revised task pertaining to non-traditional technology.
 - Clarified that the task was intended for <u>EXISTING</u> technology (no new research)
 - Includes consideration of flight manual limitations



Special Cargo Working Group (SCWG) Briefing for the Aviation Rulemaking Advisory Group (ARAC)

Presented by George Paul National Air Carrier Association (NACA) March 23, 2016

Timeline and Summary of Issues

- NACA formed the Special Cargo Working Group (SCWG) in June 2013, in response to the National Airlines crash at Bagram AFB, Afghanistan.
- The SCWG specifically addressed the certification of loadmasters handling special cargo and has worked for over two years to develop a detailed recommendation which was submitted to the FAA in August 2015 and again in November 2015.
- On December 17, 2015, FAA requested ARAC approve a two-year tasking for certification of loadmasters handling special cargo loads.
- NACA expressed concern with the need for the tasking, as recorded in the ARAC minutes.
- NACA, CAA, A4A, and the SCWG consider this tasking unnecessary and agree it would not be the best utilization of FAA and industry resources.

Special Cargo Working Group (SCWG)

- On April 29, 2013, a National Air Cargo Boeing 747 aircraft crashed during takeoff at Bagram Air Base, Afghanistan. The initial cause was believed to be a shift in the military vehicles the aircraft was carrying.
- At the June 2013 Commercial Aviation Safety Team (CAST) meeting, Ms. Peggy Gilligan, FAA Associate Administrator for Aviation Safety, expressed concern that the rate of fatal accidents in cargo aircraft was much higher than in passenger aircraft.
- Ms. Gilligan requested a team address cargo accidents and George Paul, NACA, agreed to form a working group to review the Bagram accident specifically and special cargo loading best practices generally.

Members of the SCWG

Subject-Matter Experts:

- FAA Flight Standards Service (AFS)
- FAA Aircraft Certification Service (AIR)
- National Transportation Safety Board (NTSB)
- Department of Defense (DOD)
- Boeing
- NACA, A4A, CAA, and IATA
- Majority of all Part 121 cargo airlines
- Cargolux (foreign cargo airline)
- Telair (cargo loading system manufacturer)

Special Cargo Working Group (SCWG) (cont'd)

- The SCWG has worked to address various issues related to air cargo operations since its first meeting in June 2013:
 - The SCWG discovered inconsistencies in the interpretation among air carriers of Boeing weight and balance manuals (WBM).
 - The SCWG focused on identifying Best Practices and worked with Boeing to provide clarification of WBM of B-747s.

Special Cargo Working Group (SCWG) (cont'd)

- The SCWG assisted the FAA with developing:
 - Airworthiness Directive (2014-NM-168-AD) to address safety issues identified with the carriage of intermodal containers on B-747 Aircraft Equipped with Main Deck Side Cargo Door. (Issued July 13, 2015)
 - Information for Operators (InFO) 13012 (FAAapproved Boeing 747 Sample Weight and Balance Manual (WBM)). (Issued November 21, 2013)
 - InFO 15010 (Approved Weight and Balance Manual (WBM) Supplements for Certain Boeing Aircraft (B-747, B-767, B-777)). (Issued August 31, 2015)

Special Cargo Working Group (SCWG) (con't)

- Safety Information for Operators (SAFO) 13005 (Title 14 of the Code of Federal Regulations (14 CFR) Part 121Air Carriers Transporting Heavy Vehicle Special Cargo Loads). (Issued May 17, 2013)
- SAFO 13008 (Part 121 Air Carriers Performing Special Cargo Loads Operations for uploading). (Issued August 20, 2013)
- The SCWG submitted extensive comments on draft Advisory Circular (AC) **120-85A** (Air Cargo Operations). (Issued June 25, 2015)
- The SCWG has met in person or via teleconference several times per year since 2013 and plans to continue assisting and working with the FAA in the future.

NTSB Recommendation

NTSB recommendation A-15-014 (Issued July 29, 2015)

TO THE FEDERAL AVIATION ADMINISTRATION: Create a certification for personnel responsible for the loading, restraint, and documentation of **special cargo loads** on transport-category airplanes, and ensure that the certification includes procedures; training; and duty hour limitations and rest requirements consistent with other safety-sensitive, certificated positions. (Emphasis added.)

Certification of Loadmasters Handling Special Cargo – SCWG Recommendation Presented to FAA in August and November 2015

NTSB Recommendations: A-15-014. Certification of personnel handling special cargo loads

Certification—FAA will determine how the certification will happen. NTSB wants it to be FAA certification, not air carrier certification. Special loads may include moving things on passenger aircraft. How do you train/certify for that?

The person who signs off on the special load would be required to be certified under this recommendation. This may include the Captain and/or First Officer. Air carriers expressed concern about the amount of time and cost if certification is like an A&P or pilot's license.

One air carrier suggested and the other members of the special cargo working group concurred that the certification should occur locally. The loadmaster certification would be specific to each air carrier's loadmaster program and type of aircraft; certification would be issued by the FAA local office but surrendered to the air carrier when the loadmaster's employment ends. This would serve two purposes:

- 1) Validate the loadmaster candidate, and
- 2) Continually validate the air carrier's weight and balance program.

If the FAA concurs with the NTSB recommendation to certify loadmasters, we recommend the process outlined above be used to provide that certification.

The Load Master Certification Working Group Tasking

<u>The Task</u>

The Load Master Certification Working Group will provide advice and recommendations to the ARAC on whether safety would be enhanced if this position were certificated with clear standards mandating an understanding of TC/STC limitations and industry wide consistent training.

1. Review the NTSB Safety Recommendation A-15-014

 $\underline{http://www.ntsb.gov/safety/safety-recs/_layouts/ntsb.recsearch/Recommendation.aspx?Rec=A-15-014 \\ \underline{014} \\ \end{array}$

The SCWG concurs for special cargo loads only. The certificate should be used only at the airline of current employment and not at another airline. Certification should be accomplished using one of the following methods:

- 1) Use the existing regulation for a repairman certificate which is 14 CFR § 65.101 (see attached). The FAA would have to determine if a person handling special cargo on an aircraft could be considered a repairman.
- 2) Use the original flight attendant certification process (see attached) but keep the restriction limiting its applicability to a specific airline.

The Load Master Certification Working Group Tasking (cont'd)

- 2. Review AC 120-85A "Air Cargo Operations" sections 2.7, 2.8, 2.12.3, 2.13.4.6, http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgAdvisoryCircular.nsf/0/AB744503E0642A96862 57E7B0073B8E8?OpenDocument
- The SCWG already reviewed the AC and provided comments to the FAA Cargo Focus Team and Mr. Tim Shaver. These comments were submitted in July 2015 and again, several months later. These comments are also in the attached meeting notes from the July 2015 SCWG meeting.
- 2) The Special Cargo Working Group will continue its review of the AC and submit comments when the next revision comes out. The attached meeting notes contain the specific recommendations made at the July 2015 meeting.
- 3. Determine if safety would be enhanced by certificating personnel responsible for the loading, restraint, and documentation of special cargo loads on transport-category airplanes, (the Special Cargo Working Group determined this would enhance safety, which is what led to the recommendation) and ensure that the certification includes procedures; training; and duty hour limitations; and rest requirements consistent with other safety-sensitive, certificated positions.

Dr. Michelle Bryant, FAA Office of Aerospace Medicine (AAM-510), Civil Aerospace Medical Institute (CAMI), has studied duty hours. The SCWG provided assistance with the development of this study and some of the member airlines hosted Dr. Bryant. The study is complete and being circulated through the FAA.

The Load Master Certification Working Group Tasking (cont'd)

- If so, determine if current regulations could apply such as utilizing the Repairman certification process or some other process already in place.
 The SCWG recommended the FAA use one of the following methods:
 - Use the existing regulation for a repairman certificate which is 14 CFR § 65.101 (see attached). The FAA would have to determine if a person handling special cargo on an aircraft could be considered a repairman.
 - 2) Use the original flight attendant certification process (see attached) but keep the restriction limiting its applicability to a specific airline.

The Load Master Certification Working Group Tasking (cont'd)

5. Determine the effect on impacted parties.

The SCWG can do this, if necessary.

6. Develop a report containing recommendations on the findings and results of the tasks explained above. The SCWG can do this, if necessary.

a. The recommendation report should document both majority and dissenting positions on the findings and the rationale for each position.

b. Any disagreements should be documented, including the rationale for each position and the reasons for the disagreement.

7. The working group may be reinstated to assist the ARAC by responding to FAA's questions or concerns after the recommendation has been submitted.

FAA Inspector Training Curriculum

- Although the FAA Inspector Training Curriculum is not part of the Load Master Certification Working Group tasking, the SCWG has offered to review the training curriculum and provide feedback to the FAA.
- The SCWG offered to send members to the initial training class and suggested it be a joint industry/FAA class. This would allow the two groups to work out any confusion and increase consistency in the field.
- AFS-300 was very receptive to the offer.

Conclusion

- The SCWG, NACA, CAA, and A4A believe forming a new working group under this tasking would duplicate work that has been done on an ongoing basis since June 2013.
- This is not necessary and would be a waste of resources.
- The ARAC should recognize the work of the SCWG and provide guidance for future tasks as needed.
- The SCWG will submit a more formal recommendation on this issue once the FAA reaches a decision regarding the option of pursuing either the flight attendant or the repairman certificate process.

Recommendation

The SCWG recommends the FAA resubmit its Load Master Certification Working Group (LMCWG) tasking request to ARAC and modify the scope of the request. Under the proposed modification, the LMCWG will:

- Ensure the tasking is limited in scope to personnel responsible for the loading, restraint and documentation of special cargo loads.
- Review all work the SCWG has completed. The SCWG will provide records of its previous meetings and calls and be available to the LMCWG as subject-matter experts.
- Review NTSB Safety Recommendation A-15-014, including the recommendation that the certificate should be used only at the airline of current employment and not at another airline.
- Review the SCWG recommendation on certification:
 - Certification should be accomplished using one of the following methods as determined by FAA AGC:

1) Use the existing regulation for a repairman certificate which is 14 CFR § 65.101 (see attached). The FAA must determine if a person handling special cargo on an aircraft could be considered a repairman.

2) Use the original flight attendant certification process retaining the restriction limiting its applicability to a specific airline.

Recommendation (cont'd)

- Review AC 120-85A "Air Cargo Operations." The SCWG will provide to the LMCWG the recommendations it has already submitted to the FAA.
- After review of work of the SCWG, determine if certificating personnel responsible for the loading, restraint, and documentation of special cargo loads on transport-category airplanes would enhance safety; and determine whether the certification should includes procedures, training, and duty-hour limitations and rest requirements consistent with other safety-sensitive, certificated positions. (Note: Doctor Bryant should supply this LMCWG with her completed study of fatigue).