have assigned tickets to the EN, and the ways that ENs may improve their performance under the program.

DATES: There will be two listening sessions—a Webinar and a National Teleconference Call in September 2010. On Monday, September 27, 2010, from 1 p.m. to 2:30 p.m., we will invite Employment Networks, advocates, and other interested TTW program partners to participate in a Webinar. On Tuesday, September 28, 2010, from 1 p.m. to 2:30 p.m., we will invite our beneficiaries, the public, and those who cannot make the first date to participate in the National Teleconference Call.

FOR FURTHER INFORMATION CONTACT: Bashiru Kamara, Office of Employment Support Programs, Social Security Administration, 6401 Security Boulevard, Baltimore, MD 21235–6401, 410–965–9128, for information about this notice. For information on eligibility or filing for benefits, call our national toll-free number, 1–800–772–1213 or TTY 1–800–325–0778, or visit our Internet site, Social Security Online, at *http://www.socialsecurity.gov.*

SUPPLEMENTARY INFORMATION: The purpose of the Webinar and National Teleconference Call is to provide a forum for us to hear the public's perspective on our planned means of monitoring and evaluating EN performance under the TTW program, including customer satisfaction with ENs. Since the publication of the revised TTW program regulations in July 2008, we have seen significant increases in the number of ENs who have Tickets assigned and are receiving payment for helping beneficiaries go to work. We have increased outreach efforts to disability beneficiaries in the TTW program. More beneficiaries are participating in the TTW program and successfully progressing in their employment goals.

On an annual basis, one of the Ticket Program Managers, MAXIMUS, is responsible for collecting from ENs administrative data on each EN's performance, using a format called the Annual Performance and Outcome Report (APOR). This report is currently the primary EN evaluation tool. To expand on this effort, we will be conducting annual customer satisfaction surveys regarding the performance of ENs. The mechanism we will use to report the combined results of the customer satisfaction surveys and the APOR data is called the EN Report Card. In 2008, we tested the EN Report Card in New York with two focus groups composed of disability beneficiaries and their representatives. We then piloted it in customer satisfaction surveys with the clients of two ENs last year. We will be rolling out the EN Report Card in California first and then nationally.

We will include the results of the EN Report Card on the Beneficiary Access and Support Services Web site that will be a feature of the new Program Manager contract. The Web site will also include a monitored user comments section where beneficiaries will be able to post comments about their experiences with ENs. We also will make the results of the Report Card available to the ENs.

We invite participation in the Webinar and National Teleconference Call from persons who have an interest in the rules we use to administer the TTW program, applicants and beneficiaries, members of the public, advocates, and organizations that represent parties interested in the TTW program.

This is not a request for written comments; comments will be accepted as part of the Webinar and National Teleconference Call. We will not respond directly to comments you send in response to this Notice. After we have considered all comments and suggestions made during the Webinar and National Teleconference Call, as well as what we have learned from our program experience administering the TTW program, we will determine whether and how we should adjust the EN Report Card.

Dated: September 3, 2010.

Michael J. Astrue,

Commissioner of Social Security.

[FR Doc. 2010–22611 Filed 9–9–10; 8:45 am]

BILLING CODE 4191–02–P

DEPARTMENT OF STATE

[Public Notice: 7159]

Determination Under Section 1010(a) of the Supplemental Appropriations Act, 2010 (Pub. L. 111–212)

Pursuant to section 1010(a) of the Supplemental Appropriations Act, 2010 (Pub. L. 111–212) and the authority vested in me by Delegation of Authority 245–1, I hereby determine that the Government of Mexico is continuing to:

(A) Improve the transparency and accountability of Federal police forces and to work with State and municipal authorities to improve the transparency and accountability of State and municipal police forces through mechanisms including police complaints commissions with authority and independence to receive complaints and carry out effective investigations;

(B) Conduct regular consultations with Mexican human rights organizations and other relevant Mexican civil society organizations on recommendations for the implementation of the Merida Initiative in accordance with Mexican and international law;

(C) Ensure that civilian prosecutors and judicial authorities are investigating and prosecuting, in accordance with Mexican and international law, members of the Federal police and military forces who have been credibly alleged to have violated internationally recognized human rights, and the Federal police and military forces are fully cooperating with the investigations; and

(D) Enforce the prohibition, in accordance with Mexican and international law, on the use of testimony obtained through torture or other ill-treatment.

This determination shall be reported to Congress and published in the **Federal Register**.

Dated: September 2, 2010.

James B. Steinberg,

Deputy Secretary of State.

[FR Doc. 2010–22647 Filed 9–9–10; 8:45 am]

BILLING CODE 4710–29–P

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

Aviation Rulemaking Advisory Committee Meeting on Transport Airplane and Engine Issues

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of public meeting.

SUMMARY: This notice announces a public meeting of the FAA's Aviation Rulemaking Advisory Committee (ARAC) to discuss transport airplane and engine (TAE) issues.

DATES: The meeting is scheduled for Wednesday, October 06, 2010, starting at 9 a.m. Eastern Daylight Time. Arrangements for oral presentations must be made by September 22, 2010.

ADDRESSES: The Boeing Company, 1200 Wilson Boulevard, Room 234, Arlington, Virginia 22209.

FOR FURTHER INFORMATION CONTACT: Ralen Gao, Office of Rulemaking, ARM–209, FAA, 800 Independence Avenue, SW., Washington, DC 20591, Telephone (202) 267–3168, FAX (202) 267–5075, or e-mail at *ralen.gao@faa.gov.*

SUPPLEMENTARY INFORMATION: Pursuant to Section 10(a)(2) of the Federal Advisory Committee Act (Pub. L. 92–

463; 5 U.S.C. app. 2), notice is given of an ARAC meeting to be held October 06, 2010.

The agenda for the meeting is as follows:

- Opening Remarks, Review Agenda and Minutes.
- FAA Report.
- ARAC Executive Committee Report.
- Transport Canada Report.
- Airworthiness Assurance Harmonization Working Group (HWG) Report.
- Avionics HWG Report.
- Materials Flammability Working Group Formation.
- Any Other Business.
- Action Items Review.

Attendance is open to the public, but will be limited to the availability of meeting room space. Please confirm your attendance with the person listed in the **FOR FURTHER INFORMATION CONTACT** section no later than September 22, 2010. 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.

The FAA will arrange for teleconference service for individuals wishing to join in by teleconference if we receive notice by September 22, 2010. For persons participating by telephone, please contact Ralen Gao by email or phone for the teleconference call-in number and passcode. Anyone calling from outside the Arlington, VA, metropolitan area will be responsible for paying long-distance charges.

The public must make arrangements by September 22, 2010, to present oral statements at the meeting. Written statements may be presented to the ARAC at any time by providing 25 copies to the person listed in the **FOR FURTHER INFORMATION CONTACT** section or by providing copies at the meeting. Copies of the documents to be presented to ARAC may be made available by contacting the person listed in the **FOR FURTHER INFORMATION CONTACT** section.

If you need assistance or require a reasonable accommodation for the meeting or meeting documents, please contact the person listed in the **FOR FURTHER INFORMATION CONTACT** section. 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 September 3, 2010.

Dennis R. Pratte, II,

Acting Director, Office of Rulemaking.

[FR Doc. 2010–22631 Filed 9–9–10; 8:45 am]

BILLING CODE 4910–13–P

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

[Summary Notice No. PE–2010–40]

Petition for Exemption; Summary of Petition Received

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of petition for exemption received.

SUMMARY: This notice contains a summary of a petition seeking relief from specified requirements of 14 CFR. The purpose of this notice is to improve the public's awareness of, and participation in, this aspect of FAA's regulatory activities. Neither publication of this notice nor the inclusion or omission of information in the summary is intended to affect the legal status of the petition or its final disposition.

DATES: Comments on this petition must identify the petition docket number involved and must be received on or before September 30, 2010.

ADDRESSES: You may send comments identified by Docket Number FAA–2010–0765 using any of the following methods:

- *Government-wide rulemaking Web site:* Go to *http://www.regulations.gov* and follow the instructions for sending your comments electronically.
- *Mail:* Send comments to the Docket Management Facility; U.S. Department of Transportation, 1200 New Jersey Avenue, SE., West Building Ground Floor, Room W12–140, Washington, DC 20590.
- *Fax:* Fax comments to the Docket Management Facility at 202–493–2251.
- *Hand Delivery:* Bring comments to the Docket Management Facility in Room W12–140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

Privacy: We will post all comments we receive, without change, to *http://www.regulations.gov,* including any personal information you provide. Using the search function of our docket Web site, anyone can find and read the comments received into any of our dockets, including the name of the individual sending the comment (or signing the comment for an association, business, labor union, etc.). You may review DOT's complete Privacy Act Statement in the **Federal Register** published on April 11, 2000 (65 FR 19477–78).

Docket: To read background documents or comments received, go to *http://www.regulations.gov* at any time or to the Docket Management Facility in Room W12–140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

FOR FURTHER INFORMATION CONTACT: Mark Forseth, ANM–113, (425) 227–2796, Federal Aviation Administration, 1601 Lind Avenue, SW., Renton, WA 98057–3356, or Katherine Haley, (202) 493–5708, Office of Rulemaking (ARM–203), Federal Aviation Administration, 800 Independence Avenue, SW., Washington, DC 20591.

This notice is published pursuant to 14 CFR11.85.

Issued in Washington, DC, on September 7, 2010.

Pamela Hamilton-Powell,

Director, Office of Rulemaking.

Petition for Exemption

[Docket No.: FAA–2010–0765]

Petitioner: Airbus S.A.S.

Section of 14 CFR Affected: 14 CFR 26.33 (d),(e),(f) and (h).

Description of Relief Sought: Temporary exemption from compliance with timely issuance of service bulletins and instructions for continued airworthiness. These documents will be ready for release to airplane operators approximately one year after their part 26 compliance deadline.

[FR Doc. 2010–22595 Filed 9–9–10; 8:45 am]

BILLING CODE 4910–13–P

DEPARTMENT OF TRANSPORTATION

Federal Railroad Administration

Program for Capital Grants for Rail Line Relocation and Improvement Projects

AGENCY: Federal Railroad Administration (FRA), Department of Transportation (DOT).

ACTION: Notice of funding availability.

SUMMARY: Under this Notice, the FRA encourages eligible applicants to submit applications for grants to fund eligible rail line relocation and improvement projects. This Notice of Funds Availability (NOFA) does not apply to the 27 projects specifically enumerated in the Consolidated Appropriations Act, 2010 (Pub. L. 111–117 (December 16, 2009)) or the 23 projects specifically enumerated in the Omnibus Appropriations Act, 2009 (Pub. L. 111–8 (March 11, 2009)).

DATES: Applications for funding under this solicitation are due no later than 5 p.m. EDT, October 29, 2010 and must

Aviation Rulemaking Advisory Committee (ARAC)
Transport Airplane and Engine (TAE) Issues Area

Meeting Minutes

Date: October 6, 2010
Time: 8:00 AM
Location: Boeing, 1200 Wilson Blvd., Arlington, VA

Call to Order /Administrative Reporting

Ms. Suzanne Masterson read the public meeting announcement at 8:30 AM.

Mr. Craig Bolt discussed April 14, 2010 meeting action items.

Item	April 14, 2010 TAEIG Meeting Action Items	Status
1.	FAA (Suzanne Masterson) to send to TAEIG the FAA comment disposition on low speed awareness tasking.	Closed. (9/14/2010)
2.	AAWG to provide justification for extension of oversight activities to December 2010.	
3.	FAA to provide updated tasking for Low Speed Awareness to ARAC concurrent with Federal Register publication.	Closed
4.	Clark Badie to provide a current list of Avionics HWG members	Closed
5.	Boeing and Bombardier to provide comments to AHWG report for inclusion in transmittal letter.	Closed

FAA Report

Ms. Masterson presented the FAA Report. Please see Handout #1.

Mr. Doug Kihm asked why some rules stall in their review processes. Ms. Masterson replied that this is usually due to public comments raising controversial points, or to politics.

Regarding new taskings, Mr. Ray Holanda wanted to clarify his understanding that the rudder sensitivity and rudder reversal issues have been resolved. Ms. Masterson said that these issues have been resolved on a case-by-case basis, but the FAA is seeking to establish a specific standard to prevent these issues from occurring in the future. A tasking should be available as soon as possible. Mr. Bolt clarified further that ARM typically gives ARAC 15 days to comment on the tasking.

Mr. Holanda asked whether the materials flammability rulemaking arose from a particular incident. Ms. Masterson stated this rulemaking arose because there have been

some misunderstandings regarding standards, and also questions such as how to deal with composite materials, now that they are more commonly used in place of metallic materials. These questions means the regulation requires an update to reflect current technology and practices.

Mr. Bolt asked whether a rudder reversal retro-fit rule would lead to a new ARAC working group. The answer is that, yes, aa ARAC working group would be needed to provide recommendations on whether a retrofit rule would be cost-beneficial, and provide the desired degree of safety benefit. The working groups' recommendations would be used to make the determination whether to add retrofit or not to the rulemaking package.

Mr. Kihm asked whether the FAA will provide the Excel sheet of all outstanding rulemaking as it had in the past. Ms. Masterson replied that all the rulemakings that were on this list last year is still there this year. Also, there is a slew of rulemaking, mostly relating to Aviation Flight Standards, slated to be processed over this coming year and will take up much of the FAA's rulemaking resources. As a result, AIR's rulemaking output will be even less than prior years.

Mr. Bolt asked whether this upcoming slew of rules would affect the harmonization effort with EASA regulations. The answer is, it probably will.

EXCOM Report

Mr. Bolt presented this report. See Handout #2.

EXCOM held its most recent meeting on June 16, 2010, to discuss ARAC processes and structures.

Mr. Kihm asked whether EASA has participated in this effort. Mr. Bolt replied, EASA has named a point-of-contact, Julian Hall, but he could not attend the June meeting due to schedule conflict.

Mr. Bolt stated that this working group and topic has generated surprising energy and discussion.

Mr. Bolt then presented a report of EXCOM's findings so far, which Mr. Bolt had presented at the June 16, 2010 meeting. See Handout #3.

Mr. Joe Hawkins (FAA Consultant), tasked to streamline ARAC processes, had recommended that ARAC TAEIG be disbanded and converted to a Working Group, and that only EXCOM remain. Mr. Bolt stated that Mr. Mike Kaszycki and he had a long conversation with Mr. Hawkins, trying to make a case otherwise, that TAEIG has more functions than EXCOM could or should absorb. They are still awaiting the result of this conversation.

Mr. Kihm asked how quickly would these recommended processes be implemented. Mr. Bolt replied that implementation would not be immediate, as much of these recommendations would require an update of the ARAC Process Manual before any implementation could occur. However, the process of updating and internal coordination has already been initiated.

Transport Canada Report

Mr. Oliver Rusch presented this report. See Handout #4.

In response to questions, Mr. Rusch stated that Transport Canada (TCCA) will ensure that its website contains the most up-to-date status of all their rulemaking projects and advisory materials.

TCCA currently adopts the FAA's TSOs. In this upcoming agreement, TCCA and EASA intend to work on a list of rulemakings upon which the two agencies could combine their efforts.

Mr. Kihm asked whether the Aging Aircraft rule would greatly impact TCCA regulations and standards. Mr. Rusch stated that this rule is a minimal-impact rule, as most aircraft already comply with the FAA's Aging Aircraft standards, therefore the impact of this rule would most likely be limited to certain aircraft in Canada of European origin.

Airworthiness Assurance HWG Report

Mr. Mark Yaeger presented this report. See Handout #5.

Mr. Yaeger stated that so far, EASA's participation has been limited. Therefore, the AAWG would like to request more support in obtaining EASA participation for the harmonization effort.

The working group had collaborated closely with Rusty Jones from AFS and FAA General Counsel towards the clarification of certain required documentation items such as TCH Compliance Document /Repair Evaluation Guideline.

The working group concluded that it has completed its current official tasking, and is now on standing-by, available for new TAEIG taskings. The only remaining issue is harmonization with EASA regarding the Aging Aircraft rule.

Mr. Rao Varanasi announced his retirement from Boeing and from the AAWG starting November, 2010. Mr. Bolt thanked Mr. Varanasi for his effort over the years.

Mr. Bolt stated that he will send a letter to Pam Hamilton, Director of the FAA's Office of Rulemaking regarding Aging Aircraft harmonization. She will be attending an upcoming FAA/EASA meeting at Cologne, Germany, and that would be a good time to discuss the Aging Aircraft harmonization effort.

Avionics HWG
Mr. Clark Badie presented this report. See Handout #6.

Regarding AC/AMC 25-11A, Mr. Badie stated that the Working Group reviewed Boeing's comment, and a response Boeing would like to submit to the FAA. Also, Boeing's comment had already been incorporated into the draft document. Mr. Bolt stated he will undertake an action item to send a letter to the FAA to this effect. The Working Group recommends that it continue with guidance supporting cockpit display of traffic information. The general response is, please do so. See Handout #7a and 7b.

Regarding Low Airspeed Alerting, the Working Group had met and created a survey to solicit information. It was now seeking more information on a number of accidents/incidents where it is questionable whether low airspeed alerting would have made a difference to the outcome. It would also like to seek TCCA involvement as early as possible.

Mr. Edmond Boullay asked whether the Working Group has contacted ___.

Mr. Rusch agreed that he will forward this item to interested parties in the TCCA. The Working Group recommended Jim Martin as such a party, and that he should already have a draft of the recommendation.

The Working Group was tasked with working on Low Speed Alerting as well as AC 25-1322.

Mr. Badie confirmed that Boeing's representative to the Working Group had been accepted, and has been a great help.

Materials Flammability WG Formation
Mr. Jim Davis made this presentation.

Mr. Bolt showed the tasking notice for the formation of this Working Group in the *Federal Register*.

Mr. Davis will be the Chair. He is from AccuFleet, which provides service works to airports around the United States. A smaller portion of its business is involved in flammability testing. They have done most types of flammability testing for aircraft. He has been a member of Working Groups in this area for a long time, and was extremely interested in this particular Working Group.

Mr. Bolt stated this Working Group currently has 19 people, and is a good mix of operators, international groups such as Airbus and Dassault, and regulatory authorities such as TCCA and EASA. The FAA had provided more details on this tasking than what

was stated in the *Federal Register* notice. Mr. Bolt had been invited to review the notice as well as additional information on the topic. There was to be a meet-and-greet occasion coming up, as well as an official 2-day meeting scheduled for November, 2010. A mailing list already existed.

Mr. Bolt stated that a member from the Office of Rulemaking should be at the meeting to give the Group an overview of the processes for ARAC and recommendations.

Mr. Davis stated that he is interested in the EXCOM process improvement recommendations, and would like to adopt these recommendations. Mr. Bolt will provide Mr. Davis with an advanced copy of the EXCOM recommendations.

Mr. Holanda asked why is there a 9-month max term from when the tasking is published in the *Federal Register* to ARAC taking action. Ms. Masterson replied that this period could be shorter, depending on resources from all organizations involved, as well as the priority and complexity of the tasking. Mr. Bolt further stated that a limitation is necessary to setting deadlines for Working Groups to provide submissions and for industry to plan for upcoming regulations.

Flammability working group has 18-months timeline (from last August) to finish their task.

Mr. Kihm asked how does the FAA determine the comment period for NPRMs and ACs, and can industry extend this period. Ms. Gao and Ms. Masterson responded to the effect that FAA has a general pre-determined deadline for length of comment periods. This period could be extended if commenters submit a formal request, with sufficient justification to do so, e.g. complexity of the rule, or awaiting incoming data.

Mr. Kihm then asked about situations where comments to NPRM are incorporated into the final rule, apparently without much discussion or dissention, but then the FAA published issue papers that clarified the original intent which Mr. Kihm believes is different from what the final rule states. For example, ETOPS rule. He further stated that Boeing and Airbus would like to request that ARAC be tasked to help re-write ETOPS Advisory Circular, to ensure that the current draft is not adopted as the only means of compliance for this rule. Ms. Masterson agreed to pass Mr, Kihm's request to the FAA technical specialist for this project.

Action Item Review/Any Other Business

Item	October 6, 2010 Meeting Action Items	Status
1	Suzanne Masterson to provide list of FAA outstanding rulemakings.	
2	AAWG to send outstanding issues it would like to dialogue with EASA in the effort to harmonize the Aging Aircraft rule.	
3	Craig Bolt to send letter to Pam Hamilton regarding Aging Aircraft	Done

	harmonization effort between FAA/EASA.	
4	Craig Bolt to send letter regarding ASHWG response to Boeing's comment to AC/AMC 25-11A.	Done
5	Craig Bolt to provide updated HUD materials.	Done

Future TAEIG Meetings

A teleconference is scheduled in January, 2011, to discuss Low Airspeed Alerting.
The next meeting will be held on Wednesday, April 13, 2011, in Seattle, WA.
The meeting after that will be held on Wednesday, October 5, 2011, in Washington, DC, at Boeing.

Public Notification

The *Federal Register* published a notice of this meeting on September 05, 2010.

Approval

I certify the minutes are accurate.

Craig R. Bolt

Craig R. Bolt
Assistant Chair, ARAC

NAME	ORGANIZATION	EMAIL	TELEPHONE
Suzanne Masterson	FAA		
Craig Bolt	Pratt & Whitney		
Ralen Gao	FAA		
Keith Barnett	Bombardier		
Ethan Bradford	Lynden Air Cargo		
Rod Lalley	Airbus		
Ray Holanda	NADA/F		
Walter Desrosier	GAMA		
Tom Lynne	TWU		
Doug Kihm	Boeing		
Roger Knepper	Airbus		
Ed Wineman	Gulfstream		
Edmond Boullay	U.S.-Crest /GIFAS		
Mike McRae	FAA – TSS		
Steve Loukusa	Boeing		
Terry Tritz	Boeing		
C.W. Robers	Cessna		
Jim Davis	Accufleet		
Tom Peters	Embraer		
Rolf Grenier	Airbus		
Marcus Olivere			

October 2010
FAA Status Update

Transport Airplane and Engine Issues Group

Federal Aviation Administration

Presented to: TAEIG

By: Suzanne Masterson, Acting Manager, Safety Management Branch, Transport Standards Staff

Date: October 6, 2010

October 2010 TAEIG Meeting

Topics:

- **Rulemaking project status**
- **Non-rulemaking project status**

October 2010 TAEIG Meeting

Rulemaking Project Status *(since April 2010)*

- **Part 25/26 related Final Rules**
  - Maneuvering Speed Limitation Statement, Amdt. 25-130
    - Issued August 8, 2010

- **Part 25/26 Notices of Proposed Rulemaking**
  - Notice No. 10-10: Airplane and Engine Certification Requirements in Supercooled Large Drop, Mixed Phase, and Ice Crystal Icing Conditions, issued June 23, 2010
    - Comment period closed Sept 29, 2010

October 2010 TAEIG Meeting

Rulemaking Project Status *(since April 2010)*

- **Part 33/35 related Final Rules**
  - None

- **Part 33/35 Notices of Proposed Rule Making**
  - Notice 10-06: Rotor Overspeed Requirements (§ 33.27), issued April 26, 2010
    - Comment period closed July 26, 2010.

October 2010 TAEIG Meeting

Rulemaking Project Status *(since April 2010)*

Final Rules (FR)

- **FRs in OMB/OST:**
  - 1 part 25 project
- **FRs in Headquarters (HQ) for coordination:**
  - 1 part 25 project
  - 1 part 121 project related to part 25
- **FRs in directorate coordination:**
  - None
- **FRs in development:**
  - 1 part 25 project

October 2010 TAEIG Meeting

Rulemaking Project Status *(since April 2010)*

Notices of Proposed Rulemaking

- **NPRMs open for comment**
  - None
- **NPRMs in OST/OMB:**
  - None
- **NPRMs in HQ for coordination:**
  - 3 part 25 projects
- **NPRMs in Directorate for coordination:**
  - 1 part 25 project

October 2010 TAEIG Meeting

Rulemaking Project Status *(since April 2010)*

New Tasking

- **Low Speed Awareness**
  - Tasking re-published May 18, 2010
  - The working group anticipates finishing Phase I in December, 2010
- **Materials Flammability**
  - Tasking published August 27, 2010
  - New working group members and co-chairs selected
- **Rudder pedal sensitivity and rudder reversals**
  - Scheduled for November Rulemaking Management Council (RMC) to approve draft
  - ARAC comment period will follow RMC approval

October 2010 TAEIG Meeting

Non-Rulemaking Project Status *(since April 2010)*

- **Part 25 Final Advisory Circulars (AC) issued:**
  - AC 25.785-1B, Flight Attendant Seat and Torso Restraint System Installations
    - Issued May 11, 2010
  - AC 25-27A, Development of Transport Category Airplane Electrical Wiring Interconnection Systems Instructions For Continued Airworthiness Using An Enhanced Zonal Analysis Procedure
    - Issued May 4, 2010

October 2010 TAEIG Meeting

Non-Rulemaking Project Status *(since April 2010)*

- **Part 25 Draft ACs issued:**
  - AC 25-XX, Compliance of Transport Category Airplanes with Certification Requirements for Flight in Icing Conditions.
    - Public comment closed: September 30, 2010
  - AC 25-25X, Performance and Handling Characteristics in Icing Conditions.
    - Public comment closed: October 4, 2010
  - AC 25.629-1X Aeroelastic Stability Substantiation of Transport Category Airplanes.
    - Public comment closed: September 29, 2010
  - AC 25.1329-1B Change 1, Approval of Flight Guidance Systems.
    - Public comment closed: September 29, 2010

October 2010 TAEIG Meeting

Non-Rulemaking Project Status (*since April 2010*)

- **Part 25/26 Final Policy issued:**
  - Approval of Electrical Wiring Interconnection System (EWIS) Instructions for Continued Airworthiness (ICA) … Joint AIR-140/ANM-100 policy
    - Issued April 6, 2010
- **Part 25 Draft Policy issued:**
  - Lithium Batteries permanently installed on airplanes
    - Public comment closes October 28, 2010
  - Policy Statement on Certification of Structural Elements in Systems
    - Public comment closed July 26, 2010

October 2010 TAEIG Meeting

Non-Rulemaking Project Status *(since April 2010)*

- **Part 33 Final Advisory Circulars (AC) issued:**
  - AC 33-9, Developing Data for Major Repairs of Turbine Engine Parts AC:
    - Issued April 30, 2010
  - Ratings and Operating Limitations for Turbine Engines (Sections 33.7 and 33.8):
    - Issued June 28, 2010
  - AC 33.64-1, Guidance for Pressurized Engine Static Parts:
    - Issued September 13, 2010

October 2010 TAEIG Meeting

Non-Rulemaking Project Status *(since April 2010)*

- **Part 33 Draft ACs:**
  - AC 20-147A, Turbojet, Turboprop, Turboshaft, and Turbofan Engine Induction System Icing and Ice Ingestion
    - Public comment closes: November 1, 2010
  - AC 20-24C, Approval of Propulsion Fuels and Lubricating Oils
    - Public comment closes: October 29, 2010.
  - Guidance Material for 14 CFR § 35.23, Propeller Control Systems;
    - Public comment closed: June 16, 2010
  - AC 35.37-1B, Propeller Fatigue Limits and Evaluation;
    - Public comment closed: June 11, 2010
  - AC 20-66B, Propeller Vibration and Fatigue;
    - Public comment closed: June 11, 2010

October 2010 TAEIG Meeting

Non-Rulemaking Project Status (*since April 2010)*

- **Part 33 Final Policy issued**
  - Guidance for Rain and Hail Ingestion Testing for Turbine Engines, § 33.78.
    - Issued 4/2/10.
- **Part 33 Draft Policy**
  - Engine Reliability in Extended Operations (ETOPS) – Continued Operational Safety (COS) Assessment (part 39)
    - Comments due 10/6/10

Process Improvement Working Group (PIWG)

Update to EXCOM

June 16, 2010

Introduction

- The working group was tasked on October 19, 2009 to provide advice and recommendations to the FAA about the current ARAC process.

- The team conducts a telcon every two weeks.

- A meeting was held at the FAA office in Renton, WA from April 15-17,2010
  - Discuss the results of the survey
  - Review previous studies
  - Begin brainstorming recommendations

Team Membership

- Dan Zuspan – Co-chair – Boeing and EXCOM (Occupant Safety)
- Craig Bolt – Co-chair – Pratt & Whitney and EXCOM (TAEIG)
- Ty Prettyman – Former EXCOM (Training and Qualifications)
- Katie Haley – FAA Office of Rulemaking
- Mike Kaszycki – FAA TAD and TAEIG
- Bill Edmunds – ALPA and EXCOM (Air Carrier Operations)
- Doug Anderson – FAA Legal (ANM-7)
- Walter Desrosier – GAMA and EXCOM (Aircraft Certification Procedures)

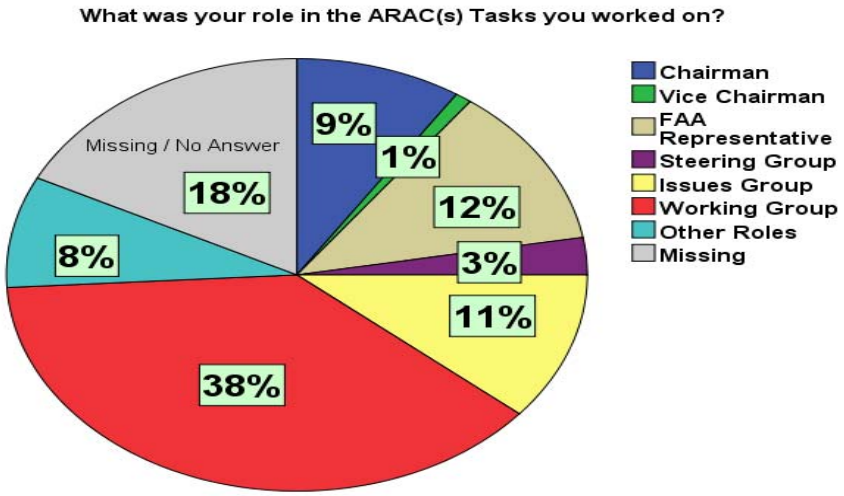
Information Gathering

- Developed a survey with the help from Mehdi Ghods, a Boeing survey analyst.

- Analyzed the following past reports for common lessons learned and best practices:
  - Re-engineering report (1997)
  - GAO study (July 2001)
  - Fast track (November 1999)
  - GSA/Gallup Poll (March 2005)
  - R3 report (April 2009)

The Survey

- On January 13, 2010 a survey was sent to a test group of 14.
  - 7 participants completed it.
- On February 14, 2010, the final survey was released to 304 participants.
  - 101 started the survey and 84 completed it.
- Mehdi Ghods briefed the team about his analyses on April 16, 2010
  - Survey was deemed to be valid and statistically significant



Organization of Results

The team developed five areas based on the ARAC process:

1. FAA tasking the ARAC.
2. ARAC team formation and effectiveness.
3. ARAC addressing the tasks.
4. FAA consider and address ARAC recommendations.
5. ARAC opportunity to address FAA response to ARAC recommendations

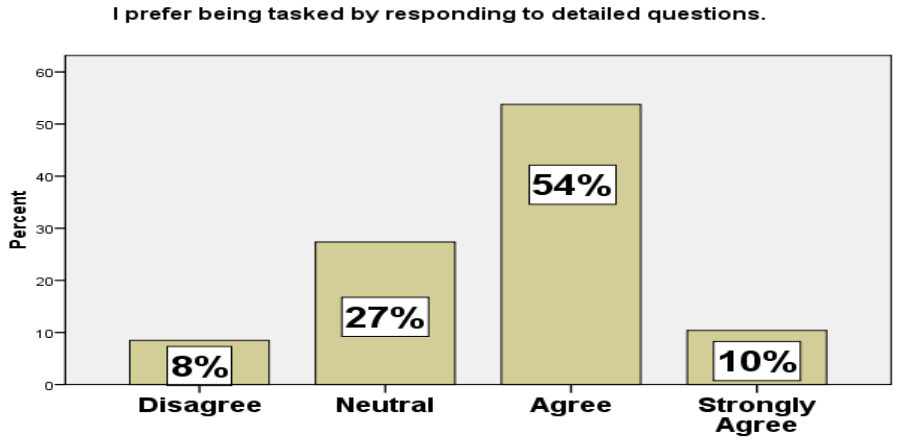
1. FAA Tasking ARAC

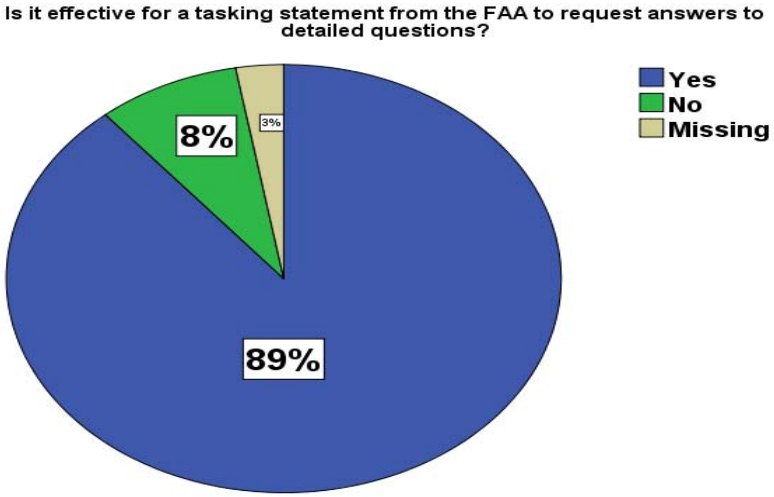
- **Consistent with recent taskings, the template should be updated to include:**
  - Detailed background information.
  - A clear problem statement
  - A list of detailed questions
  - If rulemaking is the objective -specifically ask “What should the regulatory text be?”
  - Address any known issues, new technology, etc.
  - It should clarify that consensus is desirable but not mandatory
    - 71% said it was important to reach consensus.
    - It was noted more complex tasks typically don’t have consensus
  - FAA commitment to the tasking
  - Include harmonization or rulemaking cooperation in the tasking, when applicable.

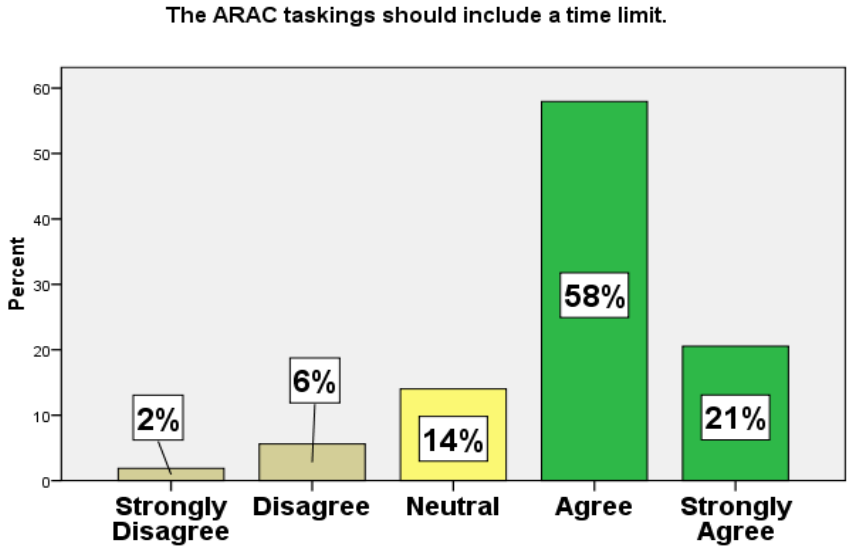
1. FAA Tasking ARAC (con't)

- 89% found it effective for a tasking statement to request answers to detailed questions and include proposed regulatory text if applicable
- 64% said they preferred developing a technical report in response to detailed questions instead of a draft NPRM document with full regulatory language.
- 79% want a time limit included.
  - It should be established when the working group is formed based on the complexity of the tasking
- 73% want an ARAC opportunity to respond to draft regulatory text
  - Providing ARAC with draft regulatory text prior to NPRM may create issues with ex parte requirements
- 67% want an ARAC opportunity to recommend responses to public comments received on the NPRM

1. FAA Tasking ARAC (con't)



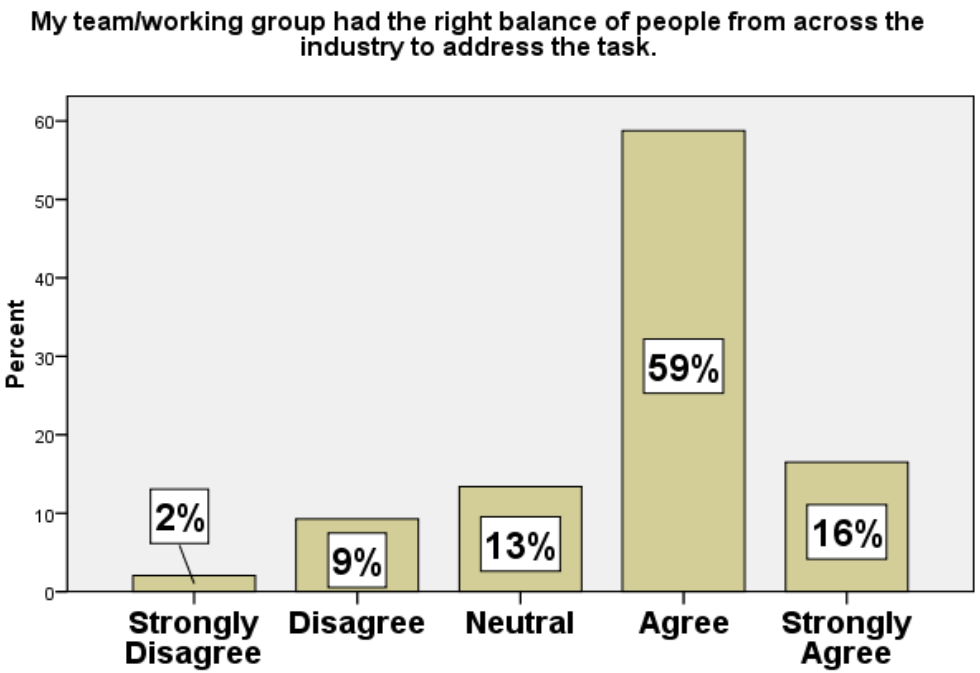


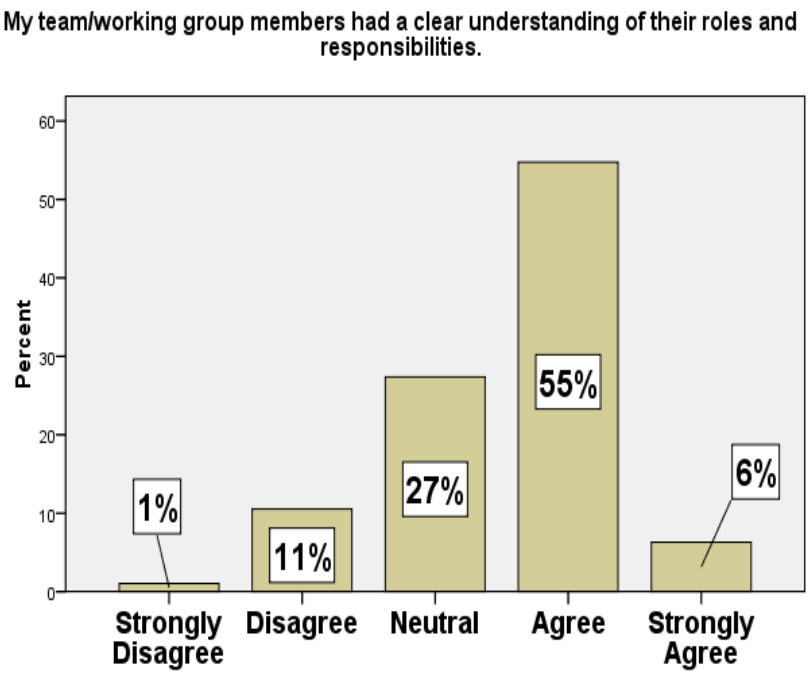


2. ARAC Team Formation and Effectiveness

- Tasking statement and Committee Manual should include the ability to work well in a team setting and should include the roles and responsibilities.
  - 73% experienced good teamwork skills.
  - Only 61% understood their roles and responsibilities.
- A capable leader is a critical factor to an effective team.
  - This includes the skill to manage to the work plan and keep the team on task.
  - 74% felt their team leader was effective.
- Good project management skills are important to the team success.
- The structure and size should be a manageable. (around 10)
  - Task teams should be utilized for additional support and expertise
- The working group should have a good balance of individuals representing all key stakeholders (industry and regulatory authorities).
  - 76% felt their work group had a good balance

2. ARAC Team Formation and Effectiveness





3. ARAC Addressing the Tasks

- At the first meeting, the working group should:
  1) Review tasking to assure understanding;
  2) Identify additional questions, clarifications, and/or background material that is needed;
  3) Establish a work plan consistent with the tasking schedule, including recommendations for changes to tasking schedule.

- ARM should provide training on both the ARAC and the rulemaking process.
  - 50% did not know of the Committee Manual.
  - 50% of those aware of the manual did not find the Committee Manual useful.
  - Note: Team recommendations will likely require revisions to the Committee Manual

- The first meeting should include discussion about how to involve FAA staff resources appropriate to the intent of the task and the work plan should include a milestone for it.

- Tasks with harmonization implications should invite participation from foreign authorities – EASA, TCCA and ANAC.

3. ARAC Addressing the Tasks (con't)

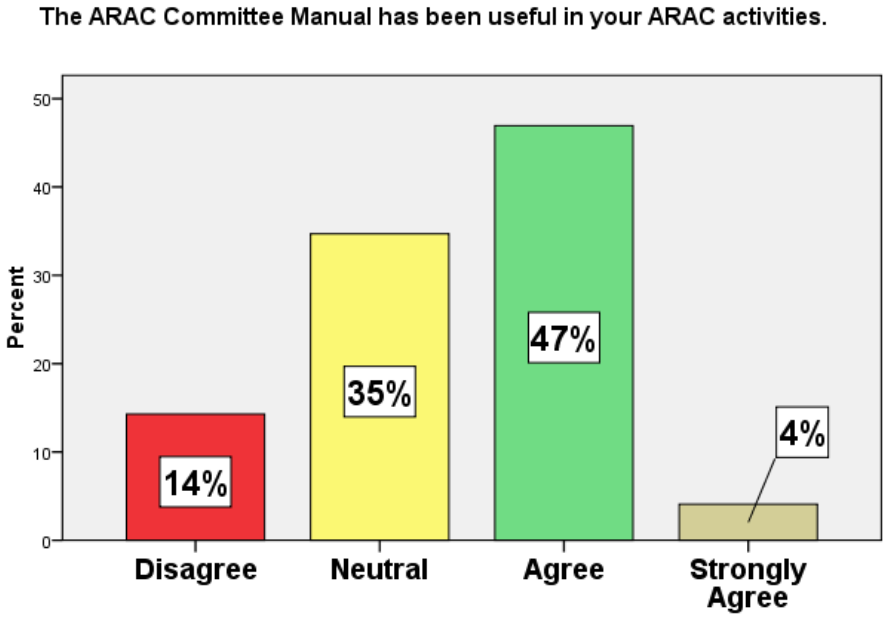
The Recommendation Paper:

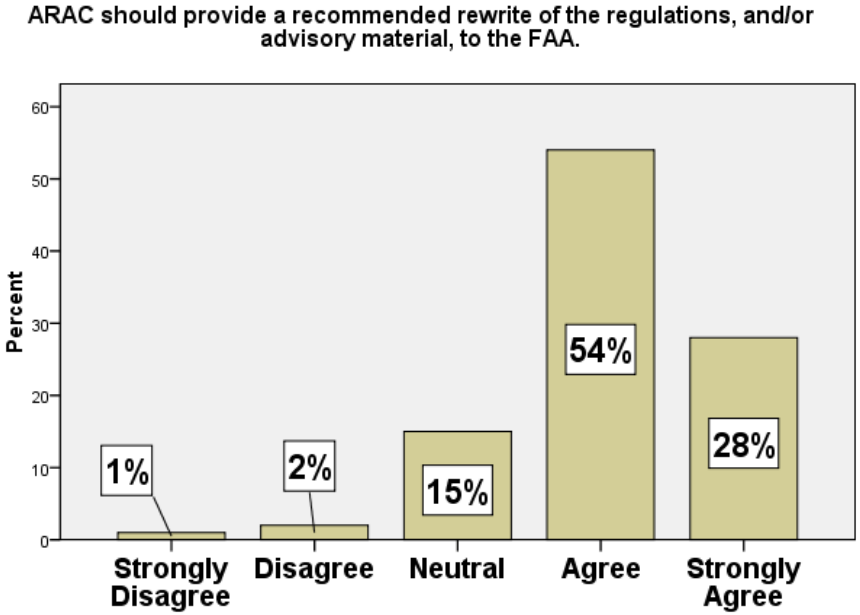
- 92% said the ARAC response should be in written form.

- Develop a standard report template.
  - Include a section for both consensus and dissenting positions.
    - 84% said the disagreements should be documented in the recommendation.
    - Industry and/or FAA concerns should be documented and addressed
    - All regulatory agency staff guidance should be considered in the Working Group Report

  - If requested, there should be a section for proposed regulatory text and/or advisory materials. (82% agreed with this)

3. ARAC Addressing the Tasks (con't)





4. FAA Consider and Address ARAC Recommendations

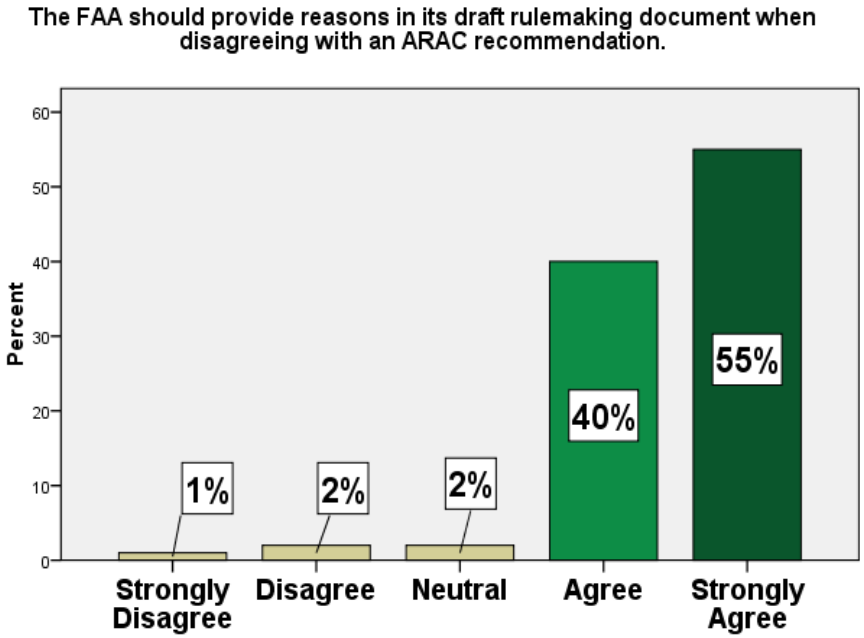
- NPRM Preamble should address consistencies and differences from ARAC WG recommendation.

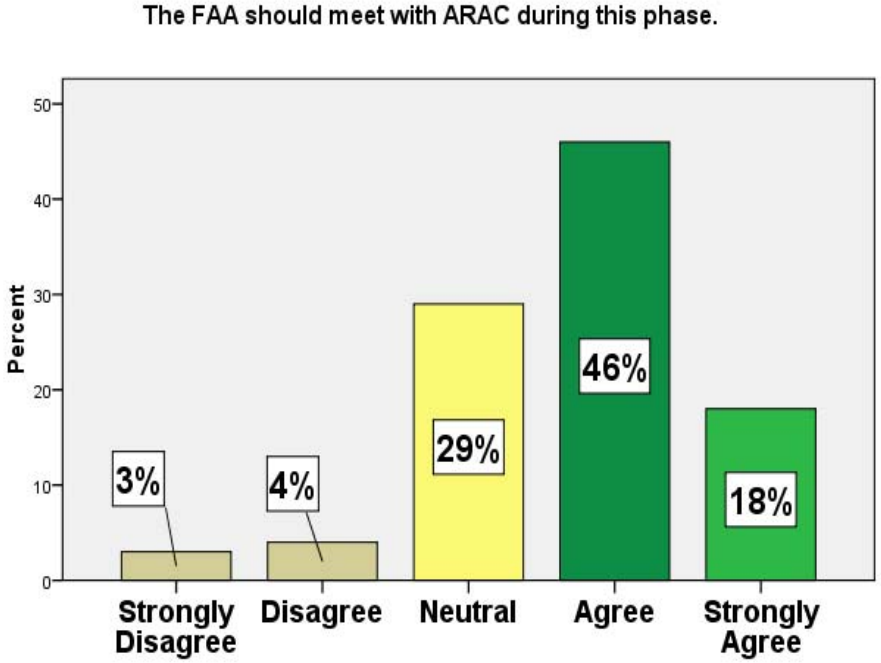
- NPRM preamble should also discuss dissenting positions and provide an FAA disposition of those positions.

- Any FAA/ARAC activity made post–ARAC recommendation should be addressed in the Preamble to help explain the NPRM as appropriate.

- ARAC respondents desired ability to have some form of dialog with FAA during this phase

4. FAA Consider and Address ARAC Recommendations





5. ARAC opportunity to address FAA response to ARAC Recommendations

- **The Objective**
  - To help ensure the FAA correctly understands the intent of the ARAC working group report prior to publication of the NPRM.
  - Identify any new issues or concerns
  - Provide for a better rule and fewer unexpected negative comments to the NPRM
  - 73% want an ARAC opportunity to respond to draft regulatory text before it is formally issued
    - Particularly important when the ARAC work product is a technical report

- **A process would need to be developed consistent with ex parte requirements**
  - The FAA has the discretionary authority to decide on whether and how to conduct this further communication.
  - An FAA request for further communication would go through the ARAC (either EXCOM or the Issue Group).
  - The request should include a document identifying issues to be discussed.
    - This document should be coordinated by the entire FAA rulemaking team

5. ARAC opportunity to address FAA response to ARAC Recommendations

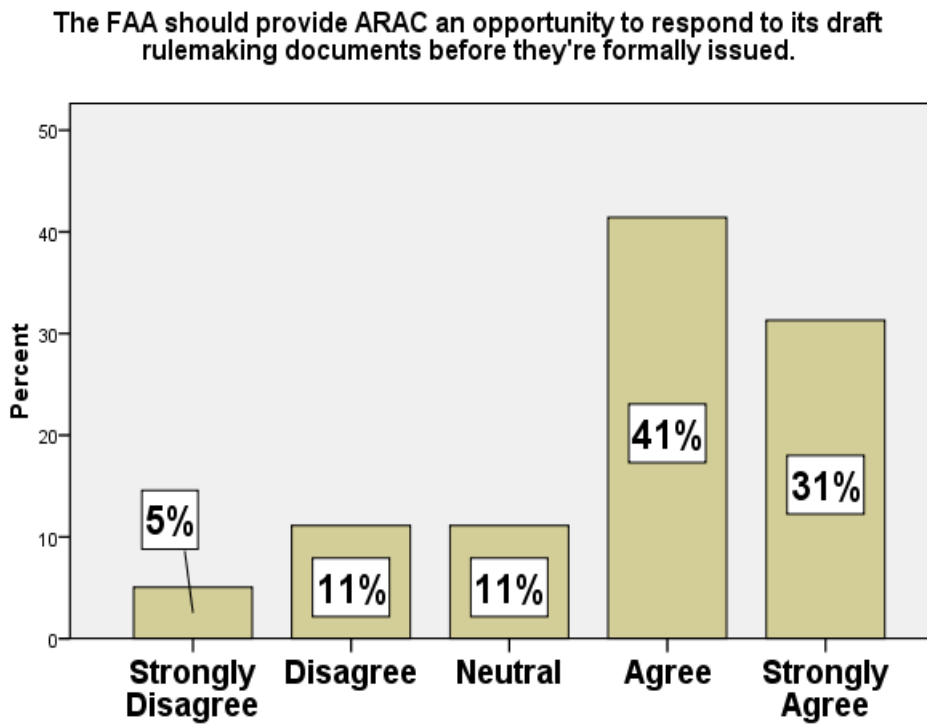
- Any discussion between the FAA and ARAC should include the entire FAA rulemaking team.

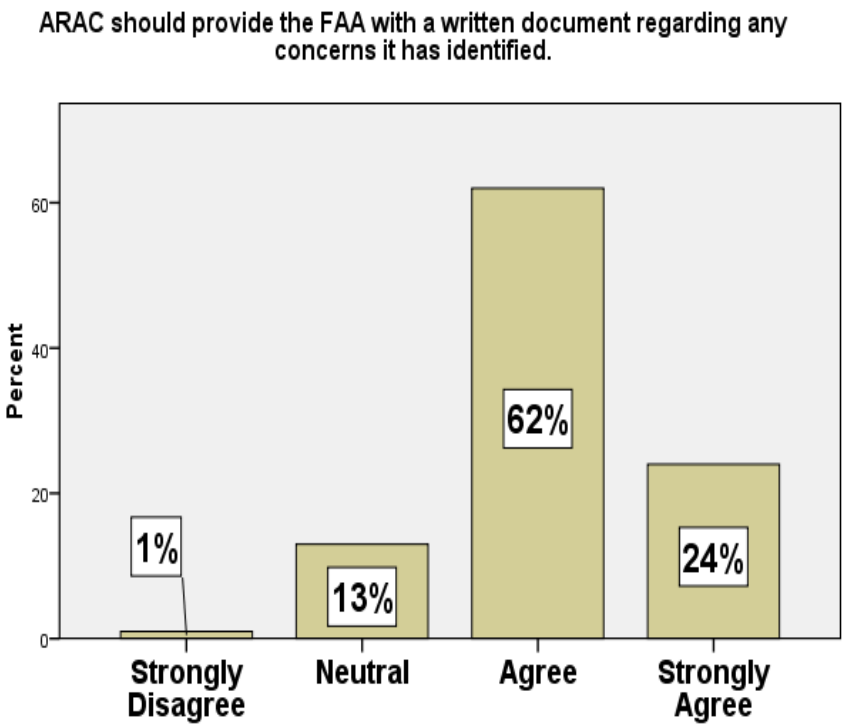
- The working group should document its response to the issues in writing
  - Any areas of agreement and/or disagreement
  - New issues, information, and/or concerns.
  - This is not to rehash the original ARAC report. It provides the opportunity for clarification of the issues.
  - Presented to EXCOM or Issues Group for transmittal to the FAA.

- Public Comments to the NPRM
  - The FAA should have the discretion to request (Re-task) the working group to assist in disposition of public comments.
  - If the FAA requests help from the working group, it shall go through the ARAC (either EXCOM or the issue group).

- The working group should consider the following four questions:
  1. What does the commenter want?
  2. What is the commenter's reasoning?
  3. Does the working group agree or disagree?
  4. Why?

5. ARAC addresses FAA response to ARAC Recommendations





Summary of Key Points

1. FAA Tasking the ARAC
   - FAA would be requested to update and improve tasking statements with more information and would adopt detailed questions as a standard.

2. ARAC Team Formation
   - Careful selection of team leader and members, with appropriate team skills, leadership, project mgmt skills and stakeholder balance, is critical to success.

3. ARAC Addressing the Task
   - ARAC/FAA would need to take intentional steps to make sure the WG gets off to a good start (training, understanding requirements/tasking, etc).
   - Develop a report template to include key information and to document all views (majority and dissenting)

4. FAA Consider and Address ARAC Recommendations
   - Would request the FAA address WG recommendations (majority and dissenting) in the preamble.

5. ARAC Opportunity to Address FAA Response
   - Would request FAA develop a process (consistent with ex parte requirements) to facilitate further communication, as needed, with the WG in preparation of NPRM and disposition of public comments.

Next Steps

- Finalize team recommendations
- Write the recommendation report
- Submit report to EXCOM – Sept 2010
- EXCOM Vote on Team Recommendations – December 2010

Backup

Survey Respondents' ARAC Affiliation

The survey respondents identified their ARAC background as follows:

- AAWG (?)11
- IPHWG (Icing Protection Harmonization Working Group) 3
- PPIHWG (Power Plant Installation Harmonization Working Group) 6
- Part 147 12
- Other Responses:
  - Maintenance Issues Group - CATM
  - Part 139 - ASAWG
  - Avionics Harmonization - GSHWG
  - SDAHWG - AWOHWG
  - Human Factors HWG - PARC
  - Foreign Authority Observer - Specific Risk
  - TAEIG - ETOPS
  - Flight & Duty Time - Part 103
  - FTIHWG - NPOAG
  - Grand Canyon WG - CATM
- And more

EXCOM Update For TAEIG

October 6, 2010

EXCOM Meeting – June 16, 2010

- **Training and Qualification Position Open**
- **Process Improvement WG Report**
  - **See separate presentation**
- **ARAC Structure Review- Joe Hawkins**
- **Commercial Air Tour Maintenance WG Report**
  - **Working issue of requirements for occasional operations – Final report planned Q4 2010**
- **ARAC Charter Renewed for 2 Years**
- **ARAC Website Refresh**

EXCOM Meeting – June 16, 2010

- **ARAC Structure Review**
  - **Joe Hawkins review will continue into 2011**
  - **Near term recommendations**
    - **Add Transport Canada as an EXCOM non-voting member in addition to EASA – Agreed**
    - **Establish formal process for alternates on EXCOM – under study**
    - **Quarterly EXCOM meetings instead of twice per year – Agreed to meet as often as necessary**

MPS-750
(04/2009)

TCCA Report

TAEIG Oct 6th 2010





CAR 521 – Current Status

- **Background**
  - **CAR521 provides the requirements to design, create or modify aeronautical products in Canada and for foreign products to be used in Canada.**
  - **The purpose of the new CAR521 is to streamline and simplify the regulatory environment, clarify the responsibilities and accountabilities between the Minister and the holder of Canadian aviation documents, as well as to harmonize Canadian regulations to the greatest extent possible with our major trading partners.**
- **Rulemaking**
  - **Current NPA to address Miscellaneous issues with new law:**
    - **Reduce Confusion**
    - **Correct Errors**
  - **Work has commenced on the next NPA**
    - **Issues requiring more deliberation**
- **Guidance**
  - **Most guidance / advisory material is scheduled for completion Mid to Late 2011**





Canada-European Union Agreement on Civil Aviation Safety

- Signed May 6th 2009
- Next step - Waiting for diplomatic notes to be signed (on both sides): will occur shortly
- Covers both aircraft certification and maintenance
- Lower level working procedures being finalized
- Training being developed





Aging Airplane

- NPA proposing solution addressing fuel tank safety and flammability reduction:
  - Design Approval Holder rules in new CAR526 “Continued Airworthiness and Safety Improvements for Transport Category Aeroplanes”
  - Operational rules in new division V to CAR 605 “ Continued Airworthiness and Safety Improvements”
- Remainder of Aging Airplane rules will be worked on in the near to mid term
  - Enhanced Airworthiness Program for Aeroplane Systems (EAPAS)
  - Damage Tolerance (DT)
  - Widespread Fatigue Damage (WFD)
- Canadian Standards as provided in the Airworthiness Manual are already harmonized with FAA Aging Airplane rules
  - Currently affects new type designs





ASHWG Report; October 2010

- **AC/AMC 25-11A: Reviewed and dispositioned comments received from Boeing (draft report)**
  - **Weather Appendix**
  - **HUD Appendix**
  - **Consider the report complete**
  - **Recommend we continue with guidance supporting cockpit display of traffic information (CDTI)**

- **Current task for Low Airspeed Alerting**
  - **Meeting held in September**
  - **Initial draft almost complete**
  - **Excellent participation and cooperation**
  - **Two phase process; Phase 1 should be completed by end of 2010**

ASHWG Report; October 2010

- **Current task for Low Airspeed Alerting (Phase 1): Provide a report that addresses (list of 10) low speed alerting technical questions, relative to new aircraft designs (new Part 25 standards), and provide the rationale for the response**
  1. **How much time is needed to alert the crew in order to avoid stall warning or excessive deviation below the intended operating speed?**
  2. **What would make the alerting instantly recognizable, clear, and unambiguous to the flight crew?**
  3. **How could nuisance alerts be minimized?**
  4. **Could the alerting operate under all operating conditions, configurations, and phases of flight, including icing conditions?**
  5. **Could the alerting operate during manual and auto flight?**
  6. **Could the system reliability be made consistent with existing regulations and guidance for stall warning systems?**
  7. **Are there any regulations or guidance material that might conflict with new standards?**
  8. **What recommended guidance material is needed?**
  9. **After reviewing airworthiness, safety, cost, benefit, and other relevant factors, including recent certification and fleet experience, are there any additional considerations that should be taken into account?**
  10. **Is coordination necessary with other harmonization working groups (e.g., Human Factors, Flight Test)? (If yes, coordinate and report on that coordination.)**

NOTE: Phase 2 will address retrofit

ASHWG Report; October 2010

- **LAA task considerations**
  - **Need to have more accident/incident data analyzed**
  - **Need to ensure that Transport Canada is involved (will be via FTHWG)**
  - **The “10 questions” required interpretation in some instances – in the future a task clarification activity would have been helpful**
  - **Data requested of the OEMs to support this task included proprietary information at times, best to clarify that in advance**
  - **Timeframe is short, need to ensure we stay on task**
  - **Updated 25.1322/AC 25-1322 needs to be released**
  - **Draft report will consider both “low energy alert” as well as “low airspeed alert”**

Comment Response Template
for FAA Rulemaking/Guidance Documents

DOCUMENT TITLE:	AC 25-11A Appendix for HUD
COMMENTS PREPARED BY:	
Name: Boeing	Date: April 23, 2010

COMMENT #1 of 5	
Specific section of the proposed document that is of concern.	Section 2.2, "c. Autopilot disconnect warning (Visual)".
What is the proposed text?	Recommend change it to: "c. Autopilot engage status"
What about this proposed text do we want changed?	c. Autopilot ~~disconnect warning (Visual)~~ engage status "
Why is the change justified?	Revised wording provides a more appropriate flightdeck design criteria.
ASHWG Response	Recommend that we include both, as the autopilot disconnect alerting (warning) should be shown on the HUD, this may be different than the engage status in most applications.
COMMENT #2 of 5	
Specific section of the proposed document that is of concern.	Section 2.4 Dual HUDs, second paragraph on page 3.
What is the proposed text?	Recommended change - "For the simultaneous use of dual HUDs, ~~the applicant should demonstrate that~~ a means shall be provided so the flight crew is able to maintain an equivalent level of awareness of key information not displayed on the HUD."
What about this proposed text do we want changed?	For the simultaneous use of dual HUDs, ~~the applicant should demonstrate that~~ a means shall be provided so the flight crew is able to maintain an equivalent level of awareness of key information not displayed on the HUD.
Why is the change justified?	Provides language more appropriate for the applicant of the type design.
ASHWG Response	Concur, text changed accordingly
COMMENT #3 of 5	
Specific section of the proposed document that is of concern.	Section 2.4 Dual HUDs, first paragraph on page 3 of 12.

What is the proposed text?	Single HUD installations where the pilot is likely to use the HUD as a primary flight reference rely on the fact that the PNF will monitor, full-time, the head-down instruments and alerting systems, for failures of systems, modes, and functions not associated with primary flight displays or HUD.
What about this proposed text do we want changed?	Delete the text “full-time”.
Why is the change justified?	The PNF’s activities extend beyond simply monitoring head-down displays “full-time”, and include, for example; communication, checklist reading, tasks asked for by the PF and monitoring of the PF’s activities.
ASHWG Response	Concur and will delete text
COMMENT #4 of 5	
Specific section of the proposed document that is of concern.	Paragraph 3.3 Crew Safety, on page 5 of 12.
What is the proposed text?	
What about this proposed text do we want changed?	The discussion of paragraph 3.3 on Crew Safety could benefit from a lead-in sentence that says something like: "Installation of HUD equipment brings into consideration regulations and hazard assessments not traditionally associated with Electronic Flight Deck Displays."
Why is the change justified?	The content of the rest of paragraph 3.3 is fine.
ASHWG Response	This paragraph is really focused on the “physical” crew safety aspects, so we understand and concur with the intent of the comment, but will put in the following text instead of what was proposed: “Installation of HUD equipment brings into consideration potential physical hazards not traditionally associated with head down electronic flight deck displays.”
COMMENT #5 of 5	
Specific section of the proposed document that is of concern.	Paragraph 6 Safety Aspects, 3rd paragraph oh page 12 of 12.
What is the proposed text?	Since the flight information displayed on the HUD is visible only to one pilot, and since in most cases, failures of flight parameters shown on the HUD are not independent of those shown on the same pilot’s head down primary flight display, the HUD may not be a suitable means to comply with 25.1333(b) following loss of primary head down flight displays. The rule requires that at least one display of information essential to safety of flight remain available to the (both) pilots, not just one pilot.
What about this proposed text do we want changed?	The paragraph should not dismiss that a HUD could be a suitable means to comply with 25.1333(b).

Why is the change justified?	The discussion paragraph 6.0 on Safety Aspects (3rd paragraph on page 12) states that a HUD may not be a suitable means to comply with CFR 25.1333(b). We believe HUDs would not be a suitable means to comply with the required equipment described in CFR 121.305(k), but could be part of a totally satisfactory means of complying with 25.1333(b). We believe that even though the information displayed on any single HUD is visible to only one pilot, the information displayed therein satisfies the flight and navigation instrument requirements of 25.1303(b) and could be used to support the availability requirement of 25.1333(b). We don't believe the requirement of 25.1333(b), nor the safety assessment guidelines of AC 25-11A would lead one to conclude that loss of all flight instruments to one of the pilots must be extremely improbable. For example, It would not be catastrophic if the primary flight instruments to one pilot, and a centrally located standby display were both inoperative (an event that may not be extremely improbable), provided one crew member had a good display of primary flight instruments required by 25.1303(b), and which could conceivably be displayed on a HUD.
ASHWG Response	If both primary flight head down displays are inoperative, cross-monitoring from the PNF (pilot not using the HUD) would be lost. However, the literal translation of 25.1333(b) implies that "both pilots" need to have at least one display of required flight information. The standby indicator may still be required to show compliance. Rather than limiting or prohibiting the use of a HUD in this case, we recommend that the applicant demonstrate compliance to 25.1333(b) in a flight deck that has a HUD, should they choose to use it for compliance. Text will be changed as follows: Since the flight information displayed on the HUD is visible only to one pilot, and since in most cases, failures of flight parameters shown on the HUD are not independent of those shown on the same pilot's head down primary flight display, the *applicant should demonstrate that* the HUD only provides a suitable means to comply with 25.1333(b) following loss of primary head down flight display to the pilot using the HUD. The rule requires that at least one display of information essential to safety of flight remain available to the (both) pilots, not just one pilot.

AC 25-11A Head-Up Display Appendix

1 INTRODUCTION

The material provided in this appendix provides additional guidance related to the unique aspects and characteristics, the design, analysis, testing, and definition of intended functions of head-up displays (HUD) for transport category airplanes.

In most applications, the HUD provides an indication of primary flight references which allow the pilot to rapidly evaluate the aircraft attitude, energy status, and position during the phases of flight for which the HUD is designed. A common objective of HUD information presentation is to enhance pilot performance in such areas as the transition between instrument and visual flight in variable outside visibility conditions. HUDs may be used to display enhanced and synthetic vision imagery, however the scope of this appendix does not include specific guidance for systems that provide this imagery.

This appendix addresses HUDs which are designed for a variety of different operational concepts and intended functions. It includes guidance for HUDs that are intended to be used as a supplemental display, where the HUD contains the minimum information immediately required for the operational task associated with the intended function. It also addresses HUDs that are intended to be used effectively as primary flight displays. This appendix addresses both the installation of a single HUD, typically for use by the left-side pilot, as well as special considerations related to the installation and use of dual HUDs, one for each pilot. These dual HUD special considerations will be called out in the appropriate sections which follow.

For guidance associated with specific operations using a HUD, such as low visibility approach and landing operations, see the relevant requirements and guidance material (e.g. CS-AWO, AC120-28D).

Additional guidance for the design and evaluation of HUDs can be found in ARP 5288, AS 8055 and ARP 5287.

2 HUD FUNCTION

The applicant is responsible for identifying the intended function of the HUD. The intended function should include the operational phases of flight, concept of operation, including how, when, and for what purpose the HUD is intended to be used. For example, the HUD systems may provide a head-up display of situational information and/or guidance information that may be used during all phases of flight.

2.1 Primary Flight Information

If the HUD is providing primary flight information, its primary flight information should be presented to allow easy recognition by the pilot while causing no confusion due to ambiguity with similar information presented on other aircraft flight deck displays.

If a HUD displays primary flight information, it is considered the de facto primary flight information while the pilot is using it, even if it is not the pilot's sole display of this information.

Primary flight information displayed on the HUD should comply with all the requirements associated with such information in Part 25 (e.g., §§ 25.1303(b) and 25.1333(b)). The requirements for arranging primary flight information are specified in § 25.1321(b). For specific guidance regarding the display of primary flight information see the main body of this AC and also Appendix 1.

2.2 Other Information

Other information displayed on a HUD may be dependent on the phases of flight and flight operations supported by the HUD. This additional information is mainly related to the display of command guidance or situational information.

For example, if the HUD is to be used to monitor the autopilot, the following information should be displayed:

a. Situation information based on independent raw data;
b. Autopilot operating mode;
c. Autopilot engage status;
c. Autopilot disconnect warning (visual).

Additional information should also be displayed if required to enable the pilot to perform aircraft maneuvers during phases of flight for which the HUD is approved. These may include:

a. Flight path indication;
b. Target airspeed references and speed limit indications;
c. Target altitude references and altitude awareness (e.g., DH, MDA) indications;
d. Heading or course references.

2.3 Head-Up to Head-Down Transition

Events that may lead to transition between the HUD and the Head Down Display (HDD) should be identified and scenarios developed for evaluation (e.g., simulation, flight test). These scenarios should include systems failures, as well as events leading to unusual attitudes. Transition capability should be shown for all foreseeable modes of upset.

There may be differences between the way in which the head up and head down displays present information (e.g., flight path, situational, or aircraft performance information). Differences between the head up format and head down format should not create pilot confusion, misinterpretation, unacceptable delay, or otherwise hinder the pilot's transition between the two displays. HUD information should be easy to recognize and interpret by the pilot while causing no confusion due to ambiguity with similar information presented on other aircraft flight deck displays.

The HUD symbols should be consistent, but not necessarily identical, with those used on head down instruments to prevent misinterpretation or difficulty in transitioning between the two types of display. Similar symbols on the HUD and on the head down displays should have the same meaning.

The use of similar symbols on the HUD and on the head down displays to represent different parameters is not acceptable.

2.4 Dual HUDs

The applicant should define the operational concept for the use of the dual-HUD installation that details Pilot-Flying/Pilot-Not-Flying (PF/PNF) tasks and responsibilities in regards to using and monitoring head-down displays (HDD) and HUD's during all phases of flight. The Dual HUD concept of operation should specifically address the simultaneous use of the HUD by both pilots during each phase of flight, as well as cross cockpit transfer of control.

Single HUD installations where the pilot is likely to use the HUD as a primary flight reference rely on the fact that the PNF will monitor the head-down instruments and alerting systems, for failures of systems, modes, and functions not associated with primary flight displays or HUD.

For the simultaneous use of dual HUDs, a means shall be provided so that the flight crew is able to maintain an equivalent level of awareness of key information not displayed on the HUD (e.g. powerplant indications, alerting messages, aircraft configuration indications).

The operational concept, defined by the applicant and used during the piloted evaluation of the installation, should account for the expected roles and responsibilities of the PF and the PNF, considering the following:

- When a pilot is using a HUD as the PFD, the visual head down indications may not receive the same level of vigilance by that pilot, compared to a pilot using the head down PFD.
- How the scan of the head down instruments is ensured during all phases of flight, and if not, what compensating design features are needed to help the flightcrew maintain awareness of key information (e.g., powerplant indications, alerting messages, aircraft configuration indication) not displayed on the HUD.
- Which pilot is expected to maintain a scan of head down instrument indications and how often. For any case where the scan of head down information is not full-time for at least one pilot, the design should have compensating design features which ensure an equivalent level of timeliness and awareness of the information provided by the head down visual indications.
- Cautions and warnings, if the visual information, equivalent to the head down PFD indications, is not presented in the HUD, the design should have compensating features that ensure the pilot using the HUD is made aware with no additional delay and able to respond with no reduction of task performance or degraded safety

For those phases of flight where airworthiness approval is predicated on the use of the HUD, or when it can be reasonably expected that the pilot will operate primarily by reference to the HUD, the objective is to not redirect attention of the pilot flying to another display when an immediate maneuver is required (e.g., resolution advisory, windshear). The applicant should either provide in the HUD the guidance, warnings, and annunciations of certain systems, if installed, such as a Terrain Awareness and Warning System (TAWS), or a traffic alert and collision avoidance system (TCAS) and a wind shear detection system, or provide compensating design features (e.g., a combinations of means such as control system protections and an unambiguous reversion message in the HUD) and procedures that ensure the pilot has equivalently effective visual information for timely awareness and satisfactory response to these alerts.

A global (re-)assessment of the alerting function should be performed to assess the HUDs alerting design and techniques together with the Alerting attention getting (visual MW and MC/aural) and other alerting information in the flight deck to ensure that timely crew awareness and response are always achieved when needed.

Comment [H1]: Per feedback received during the TAEIG report, PNF will have other duties including reviewing checklist, performing communications, etc, and will not monitor "full time"

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3 INSTALLATION

3.1 HUD Field of View

The design of the HUD installation should provide adequate display field-of-view in order for the HUD to function as intended in all anticipated flight attitudes, aircraft configurations, or environmental conditions, such as crosswinds, for which it is approved. All airworthiness and operational limitations should be specified in the AFM.

The optical characteristics of the HUD make the ability to fully view essential flight information more sensitive to the pilot's eye position, compared to head down displays. The HUD design eye-box is a three dimensional volume, specified by the manufacturer, within which display visibility requirements are met. For compliance to §§ 25.773 and 25.1301, whenever the pilot's eyes are within the design eyebox, the required flight information will be visible in the HUD. The minimum monocular field of view (FOV) required to display this required flight information, should include the center of the FOV and must be specified by the manufacturer.

The fundamental requirements for instrument arrangement and visibility that are found in §§ 25.1321, 25.773 and 25.777 apply to these devices. Section 25.1321 requires that each flight instrument for use by any pilot be plainly visible at that pilot's station, with minimum practicable deviation from the normal position and forward line of vision. Advisory Circular (AC) 25.773-1 defines the Design Eye Position (DEP) as a single point that meets the requirements of §§ 25.773 and 25.777. For certification purposes, the DEP is the pilot's normal seated position, and fixed markers or other means should be installed at each pilot station to enable the pilots to position themselves in their seats at the DEP for an optimum combination of outside visibility and instrument scan. The Design Eye Box should be positioned around the Design Eye Position.

The visibility of the displayed HUD symbols must not be unduly sensitive to pilot head movements in all expected flight conditions. In the event of a total loss of the display as a result of a head movement, the pilot must be able to regain the display rapidly and without difficulty.

The lateral and vertical dimensions of the eyebox represent the total movement of a monocular viewing instrument with a 1/4 in. (6.35 mm) entrance aperture (pupil). The eye-box longitudinal dimension represents the total fore-aft movement over which the requirement of this specification is met. (Reference SAE AS8055).

The HUD design eyebox should be laterally and vertically positioned around the respective pilot's design eye position (DEP), and be large enough that the required flight information will be visible to the pilot at the minimum displacements from the DEP listed below. When the HUD is a Primary Flight Display, or when airworthiness approval is predicated on the use of the HUD, or when the pilot can be reasonably expected to operate primarily by reference to the HUD, larger minimum design eyebox dimensions, than those shown below, may be necessary.

Lateral:	1.5 inches left and right from the DEP (three inches wide)
Vertical:	1.0 inches up and down from the DEP (two inches high)
Longitudinal:	2.0 inches fore and aft from the DEP (4 inches deep)

The HUD installation must comply with §§ 25.1321, 25.773 and accommodate pilots from 5'2" to 6'3" tall (per 25.777), seated with seat belts fastened and positioned at the DEP.

3.2 Obstruction of View

When installed, whether deployed or not, the HUD equipment must not create additional significant obstructions to either pilot's compartment view (§ 25.773). The equipment must not restrict either pilot's view of any controls, indicators or other flight instruments.

The HUD should not significantly degrade the necessary pilot compartment view of the outside world for normal, non-normal, or emergency flight maneuvers during any phase of flight for a pilot seated at the DEP. The HUD should be evaluated to ensure that it does not significantly affect the ability of any crewmember to spot other traffic, distinctly see approach lights, runways, signs, markings, or other aspects of the external visual scene.

The optical performance of the HUD must not degrade, distort or detract from the pilot's view of external references or in regards to seeing and avoiding other aircraft such that it would not enable them to safely perform any maneuvers within the operating limits of the airplane (§25.773). Where the windshield optically modifies the pilot's view of the outside world, the conformal HUD symbols must be optically consistent with the perceived outside view. The combination of the windshield and the HUD must meet the requirements of § 25.773(a)(1).

The optical qualities of the HUD should be uniform across the entire field of view. When viewed by both eyes from any off-center position within the eyebox, non-uniformities shall not produce perceivable differences in binocular view. Additional guidance is provided in ARP 5288.

3.3 Crew Safety

Installation of HUD equipment brings into consideration potential physical hazards not traditionally associated with head down electronic flight deck displays.

The HUD system must be designed and installed to prevent the possibility of pilot injury in the event of an accident or any other foreseeable circumstance such as turbulence, hard landing, bird strike, etc. The installation of the HUD, including overhead unit and combiner, must comply with the head injury criteria (HIC) of § 25.562 (c)(5). Additionally, the HUD installation must comply with the retention requirements of § 25.789(a) and occupant injury requirements of §§ 25.785 (d) and (k).

For a dual HUD installation, there is the potential for both pilots to experience an incapacitating injury as a result of flight or gust loads. This becomes a safety of flight issue, since the entire flightcrew would be incapacitated. The types of injuries of concern may be long duration, low impact, high load, as opposed to the high impact, short duration injuries assessed by HIC. A dedicated method of compliance may be needed should analysis of the installation geometry indicate that flight or gust loads will produce occupant contact with the HUD installation.

For compliance to §§ 25.803, 25.1307, 25.1411 and 25.1447, the HUD installation must not interfere with or restrict the use of other installed equipment such as emergency oxygen masks, headsets, or microphones. The installation of the HUD must not adversely affect the emergency egress provisions for the flight crew, or significantly interfere with crew access. The system must not hinder the crew's movement while conducting any flight procedures.

3.4 HUD Controls

For compliance to § 25.777, the means of controlling the HUD, including its configuration and display modes, must be visible to, identifiable, accessible, and within the reach of, the pilots from their normal seated position. For compliance to §§ 25.777, 25.789 and 25.1301, the position and movement of the HUD controls must not lead to inadvertent operation. For compliance to § 25.1381, the HUD controls must be adequately illuminated for all normal ambient lighting conditions, and must not create any objectionable reflections on the HUD or other flight

instruments. Unless a fixed level of illumination is satisfactory under all lighting conditions, there should be a means to control its intensity.

To the greatest extent practicable, the HUD controls should be integrated with other associated flight deck controls, to minimize the crew workload associated with HUD operation and to enable flightcrew awareness.

HUD controls, including the controls to change or select HUD modes, should be implemented to minimize pilot workload for data selection or data entry and allow the pilot to easily view and perform all mode control selections from his seated position.

4 INFORMATION PRESENTATION

4.1 Displayed Information

The HUD information display requirements will depend on the intended function of the HUD. Specific guidance for displayed information is contained within the main body and Appendix 1 of this AC. In addition, the following sections provide guidance related to unique characteristics of the HUD. As in the case of other flight deck displays, new and/or novel display formats may be subject to an Authority human factors pilot interface evaluation(s).

4.1.1 Alternate Formats of Displaying Primary Flight Information

There may be certain operations and phases of flight during which certain primary flight reference indications in the HUD do not need to have the analog cues for trend, deviation, and quick glance awareness that would normally be necessary. For example, during the precision approach phase, HUD formats have been accepted that provide a digital only display of airspeed and altitude. Acceptance of these displays has been predicated on the availability of compensating features that provide clear and distinct warning to the flight crew when these and certain other parameters exceed well-defined tolerances around the nominal approach state (e.g., approach warning), and these warnings have associated procedures that require the termination of the approach.

Formats with digital-only display of primary flight information (e.g., airspeed, altitude, attitude, heading) should be demonstrated to provide at least:

- a satisfactory level of task performance,
- a satisfactory awareness of proximity to limit values, like Vs, VMO and VFE, or
- a satisfactory means to avoid violating such limits.

If a different display format is used for go-around than that used for the approach, the format transition should occur automatically as a result of the normal go-around or missed approach procedure.

Changes in the display format and primary flight data arrangement should be minimized to prevent confusion and to enhance the pilots' ability to interpret vital data.

4.1.2 Aircraft Control Considerations

For those phases of flight where airworthiness approval is predicated on the use of the HUD, or when it can be reasonably expected that the pilot will operate primarily by reference to the HUD, the HUD should adequately provide:

- information to permit instant pilot evaluation of the airplane's flight state and position. This should be shown to be adequate for manually controlling the airplane, and for monitoring the performance of the automatic flight control system. Use of the HUD for manual control of the airplane and monitoring of the automatic flight control system, should not require exceptional skill, excessive workload, or excessive reference to other flight displays.

- cues for the pilot to instantly recognize unusual attitudes and shall not hinder its recovery. If the HUD is designed to provide guidance or information for recovery from upsets or unusual attitudes, recovery steering guidance commands should be distinct from, and not confused with, orientation symbology such as horizon “pointers.” This capability should be shown for all foreseeable modes of upset, including crew mishandling, autopilot failure (including "slowovers"), and turbulence/gust encounters.

4.1.3 Airspeed Considerations

As with other electronic flight displays, the HUD airspeed indications may not typically show the entire range of airspeed. Section 25.1541 (b)(2) of the Federal Aviation Regulations states: "The airplane must contain - Any additional information, instrument markings, and placards required for the safe operation if there are unusual design, operating, or handling characteristics. "

Low speed awareness cues presented on the HUD should provide adequate visual cues to the pilot that the airspeed is below the reference operating speed for the airplane configuration (i.e., weight, flap setting, landing gear position, etc.); similarly, high speed awareness cues should provide adequate visual cues to the pilot that the airspeed is approaching an established upper limit that may result in a hazardous operating condition.

The cues should be readily distinguishable from other markings such as V-speeds and speed targets (bugs). The cues should not only indicate the boundary value of speed limit, but also clearly distinguish between the normal speed range and the unsafe speed range beyond those limiting values. Cross-hatching may be acceptable to provide delineation between zones of different meaning.

4.1.4 Flight Path Considerations

An indication of the aircraft’s velocity vector, or flight path vector, is considered essential to most HUD applications. Earth-referenced flight path display information provides an instantaneous indication of where the aircraft is actually going. During an approach this information can be used to indicate the aircraft’s impact or touchdown point on the runway. The earth referenced flight path will show the effects of wind on the motion of the airplane. The flight path vector can be used by the pilot to set a precise climb or dive angle relative to the conformal outside scene or relative to the HUD’s flight path (pitch) reference scale and horizon displays. In the lateral axis the flight path symbols should indicate the aircraft track relative to the boresight.

Air mass derived flight path may be displayed as an alternative, but will not show the effects of wind on the motion of the airplane. In this case the lateral orientation of the flight path display represents the aircraft’s sideslip while the vertical position relative to the reference symbol represents the aircraft’s angle of attack.

The type of flight path information displayed (e.g., earth referenced, air mass) may be dependent on the operational characteristics of a particular aircraft and the phase of flight during which the flight path is to be displayed.

4.1.5 Attitude Considerations

An accurate, easy, quick glance interpretation of attitude by the pilot should be possible for all unusual attitude situations and command guidance display configurations. The pitch attitude display should be such that during all maneuvers a horizon reference remains visible with enough margin to allow the pilot to recognize pitch and roll orientation. For HUDs that are capable of displaying the horizon conformally, display of a non-conformal horizon reference should be distinctly different than the display of a conformal horizon reference.

In addition, extreme attitude symbology and automatically decluttering the HUD at extreme attitudes has been found acceptable (extreme attitude symbology should not be visible during normal maneuvering).

When the HUD is designed not to be used for recovery from unusual attitude, there should be:

- compensating features (e.g., characteristics of the airplane and the HUD system),
- immediate direction to the pilot to use the head down PFD for recovery, and
- satisfactory demonstration of timely recognition and correct recovery maneuvers.

4.2 Display Compatibility

The content, arrangement and format of the HUD information should be sufficiently compatible and consistent with the head down displays to preclude pilot confusion, misinterpretation, or excessive cognitive workload. Transitions between the HUD and head down displays, whether required by navigation duties, failure conditions, unusual airplane attitudes, or other reasons, should not present difficulties in data interpretation or delays/interruptions in the flight crew's ability to manually control the airplane or to monitor the automatic flight control system.

The HUD and HDD formats and data sources need to be compatible to ensure that the same information presented on both displays have the same intended meaning. HUD and HDD parameters should be consistent to avoid misinterpretation of similar information, but the display presentations need not be identical.

Deviation from these guidelines may be unavoidable due to conflict with other information display characteristics or requirements unique to head up displays. These may include minimization of display clutter, minimization of excessive symbol flashing, and the presentation of certain information conformal to the outside scene. Deviations from these guidelines will require additional pilot evaluation.

The following should be considered:

(a) Symbols that have the same meaning should be the same format;

(b) Information (symbols) should appear in the same general location relative to other information;

(c) Alphanumeric readouts should have the same resolution, units, and labeling (e.g., the command reference indication for “vertical speed” should be displayed in the same foot-per-minute increments and labeled with the same characters as the head-down displays);

(d) Analogue scales or dials should have the same range and dynamic operation (e.g., a Glideslope Deviation Scale displayed head-up should have the same displayed range as the Glideslope Deviation Scale displayed head-down, and the direction of movement should be consistent);

(e) FGS modes (e.g. autopilot, flight director, autothrust) and state transitions (e.g. land 2 to land 3) should be displayed on the HUD, and except for the use of colour, should be displayed using consistent methods (e.g., the method used head-down to indicate a flight director mode transitioning from armed to captured should also be used head-up); and

(f) Information sources should be consistent between the HUD and the head-down displays used by the same pilot.

(g) When command information (i.e., flight director commands) is displayed on the HUD in addition to the head-down displays, the HUD depiction and guidance cue deviation “scaling” needs to be consistent with that used on the head-down displays. This is intended to provide comparable pilot performance and workload when using either head-up or head-down displays.

(h) The unique information concerning current HUD system mode, reference data, status state transitions, and alert information that is displayed to the pilot flying on the HUD, should also be displayed to the pilot not flying using consistent nomenclature to ensure unambiguous awareness of the HUD operation.

4.3 Indications and Alerts

In order to demonstrate compliance with 25.1322 and to the extent that most HUDs are currently single color (monochrome) devices, caution and warning information should be emphasized with the appropriate use of attention-getting properties such as flashing, outline boxes, brightness, size, and/or location to compensate for the lack of color coding. A consistent documented philosophy should be developed for each alert level and conflicts of meaning with head-down display format changes will need to be avoided.

Additional guidance is in AC 25.1329 and AC 25.1322 and the associated regulations.

4.4 Display Clutter

Clutter has been addressed elsewhere in this A(M)C. However, for a HUD, special attention is needed regarding the effects of clutter affecting the see-through characteristics of the display.

5 VISUAL CHARACTERISTICS

The following paragraphs highlight some areas, which are related to performance aspects that are specific to the HUD. ARP5288 and AS8055 provide performance guidelines for a head-up display. As stated in Chapter 3, the applicant should notify the Airworthiness Authority if any visual display characteristics do not meet the guidelines in AS8055 and ARP 5288.

5.1 Luminance Control

The display luminance (brightness) should be satisfactory in the presence of dynamically changing background (ambient) lighting conditions (0 to 10,000 fL per AS8055), so that the HUD data is visible to the pilot(s). To accomplish this, the HUD may have both manual and automatic luminance control capabilities. It is recommended that automatic control is provided in addition to the manual control. Manual control of the HUD brightness level should be available to the flight crew in order to provide the means to set a reference level for automatic brightness control. If automatic control for display brightness is not provided, it should be shown that a single manual setting is satisfactory for the range of lighting conditions encountered during all foreseeable operational conditions and against expected external scenes. Readability of the displays should be satisfactory in all foreseeable operating and ambient lighting conditions. AS8055 and ARP 5288 provide guidelines for contrast and luminance control.

5.2 Alignment

Proper HUD alignment is needed to match conformal display parameters as close as possible to the outside (real) world, depending on the intended function of those parameters.

If the HUD combiner is stowable, means should be provided to ensure that it is fully deployed prior to using the symbology for aircraft control. The HUD system shall provide means to alert the

pilot if the position of the combiner causes normally conformal data to become misaligned in a manner that may result in display of misleading information.

The range of motion of conformal symbology can present certain challenges in rapidly changing and high crosswind conditions. In certain cases, the motion of the guidance and the primary reference cue may be limited by the field of view.

It should be shown that, in such cases, the guidance remains usable and that there is a positive indication that it is no longer conformal with the outside scene. It should also be shown that there is no interference between the indications of primary flight information and the flight guidance cues.

5.2.1 Symbol Positioning Accuracy (External)

External Symbol Positioning Accuracy, or Display Accuracy, is a measure of the relative conformality of the HUD display with respect to the real world view seen by the pilot through the combiner and windshield from any eye position within the HUD Eyebox. Display Accuracy is a monocular measurement, and, for a fixed field point, is numerically equal to the angular difference between the position of a real world feature as seen through the combiner and windshield, and the HUD projected symbology.

The total HUD system display accuracy error budget (excluding sensor and windshield errors) includes installation errors, digitization errors, electronic gain and offset errors, optical errors, combiner positioning errors, errors associated with the CRT and yoke (if applicable), misalignment errors, environmental conditions (i.e., temperature and vibration), and component variations. Optical errors are both head position and field angle dependent and are comprised of three sources: uncompensated pupil and field errors originating in the optical system aberrations, image distortion errors, and manufacturing variations. The optical errors are statistically determined by sampling the HUD FOV and Eyebox. (See 4.2.10 of SAE 8055 for a discussion of field of view and Eyebox sampling);

- The optical errors shall represent 95.4% (2 sigma) of all sampled points.
- The display accuracy errors are characterized in both the horizontal and vertical planes.
- Total display accuracy shall be characterized as the root-sum square (RSS) errors of these two component errors.

All display errors shall be minimized across the display field of view consistent with the intended function of the HUD. The following are the allowable display accuracy errors for a conformal HUD as measured from the HUD Eye Reference Point:

- HUD Boresight <= 5.0 mrad
- <= 10° diameter <= 7.5 mrad (2 Sigma)
- <= 30° diameter <=10.0 mrad (2 Sigma)
- >30° diameter < 10 mrad + kr[(FOV)(in degrees) - 30)] (2 Sigma)
  kr = 0.2 mrad of error per degree of FOV

The HUD manufacturer shall specify the maximum allowable installation error. In no case shall the display accuracy error tolerances cause hazardously misleading data to be presented to the pilot viewing the HUD.

5.2.2 Symbol Positioning Alignment

Symbols which are interpreted relative to each other shall be aligned to preclude erroneous interpretation of information. Symbols which are not interpreted relative to each other may overlap but shall not cause erroneous interpretation of display data, even when they overlap.

5.2.3 Combiner Position Alignment:

The HUD system shall provide a warning to the pilot if the position of the combiner causes conformal data to become hazardously misaligned.

5.3 Reflections and Glare

The HUD must be free of glare and reflections that could interfere with the normal duties of the minimum flight crew (per 14 CFR 25.1523 and 25.777).

5.4 Ghost Images

The visibility of ghost images within the HUD of external surfaces must be minimized so as not to impair the pilot's ability to use the display.

A ghost image is an undesired image appearing at the image plane of an optical system. Reflected light may form an image near the plane of the primary image. This may result in a false image of the object or an out-of-focus image of a bright source of light in the field of the optical system (e.g., a "ghost image").

5.5 Design Eye Position

The HUD Design Eye Position (DEP) must be the same as that defined for the basic cockpit in accordance with AC 25.773-1. The Design Eyebox must contain the DEP. The displayed symbols which are necessary to perform the required tasks must be visible to the pilot from the DEP and the symbols must be positioned such that excessive eye movements are not required to scan elements of the display.

5.6 Field Of View

The Field of View should be established by taking into consideration the intended operational environment and potential aircraft configurations.

5.7 Head Motion

The visibility of the displayed symbols must not be unduly sensitive to pilot head movements in all expected flight conditions. In the event of a total loss of the display as a result of a head movement, the pilot must be able to regain the display rapidly and without difficulty.

5.8 Accuracy and Stability

The system operation should not be adversely affected by aircraft manoeuvring or changes in attitude encountered in normal service.
The accuracy of positioning of symbols must be commensurate with their intended use. Motion of non-conformal symbols must be smooth, not sluggish or jerky, and consistent with aircraft control response. Symbols must be stable with no discernible flicker or jitter.

5.9 HUD Optical Performance

As far as practicable, the optical performance of the HUD must not degrade, distort or detract from the pilot's view of external references or of other aircraft. Where the windshield optically modifies the pilot's view of the outside world, the conformal HUD symbols must be optically consistent with the perceived outside view. The combination of the windshield and the HUD must meet the requirements of 14 CFR/CS 25.773(a)(1).

6 SAFETY ASPECTS

The installation of HUD systems in flight decks may introduce complex functional interrelationships between the pilots and other display and control systems. Consequently, a Functional Hazard Assessment (FHA) which requires a top down approach, from an airplane level perspective, should be developed in accordance with FAR/CS 25.1309. Development of a FHA for a particular installation requires careful consideration of the role the HUD plays within the flight deck in terms of integrity of function and availability of function, as well the operational concept of the installation to be certified (dual vs single, type and amount of information displayed, etc.). Chapter 4 of this AC provides material that may be useful in supporting the FHA preparation.

All alleviating flight crew actions that are considered in the HUD safety analysis need to be validated for incorporation in the airplane flight manual procedures section or for inclusion in type-specific training.

Since the flight information displayed on the HUD is visible only to one pilot, and since in most cases, failures of flight parameters shown on the HUD are not independent of those shown on the same pilot's head down primary flight display, the *applicant should demonstrate that* the HUD only provides a suitable means to comply with 25.1333(b) following loss of primary head down flight display to the pilot using the HUD. The rule requires that at least one display of information essential to safety of flight remain available to the (both) pilots, not just one pilot.

Deleted: Since the flight information displayed on the HUD is visible only to one pilot, and since in most cases, failures of flight parameters shown on the HUD are not independent of those shown on the same pilot's head down primary flight display, the HUD may not be a suitable means to comply with 25.1333(b) following loss of primary head down flight displays. The rule requires that at least one display of information essential to safety of flight remain available to the (both) pilots, not just one pilot. ¶

7 CONTINUED AIRWORTHINESS

Depending on the type of operation and the intended function of the HUD, instructions for the continued airworthiness of a display system and its components have to be prepared to show compliance with §§ 25.1309 and 25.1529 (including Appendix H)

8 FLIGHT DATA RECORDING

The installation of HUDs has design aspects and unique operational characteristics requiring specific accident recording considerations. HUD guidance modes and status (in use or inoperative) and display declutter mode should be considered to be recorded to comply with § 25.1459(e) and 121.344.

Comment Response Template
for FAA Rulemaking/Guidance Documents

DOCUMENT TITLE:	AC 25-11A Appendix for Wx
COMMENTS PREPARED BY:	
Name: Boeing	Date: April 23, 2010

COMMENT #1 of 2	
Specific section of the proposed document that is of concern.	**Paragraph 2.J.** For products that have the ability to present weather for varying altitudes (e.g., potential or reported icing, radar, lightning strikes), information should be presented that allows the flight crew to distinguish or identify which altitude ~~ranges are being presented~~ **or altitude range applies to each feature**.
What is the proposed text?	
What about this proposed text do we want changed?	For products that have the ability to present weather for varying altitudes (e.g., potential or reported icing, radar, lightning strikes), information should be presented that allows the flight crew to distinguish or identify which altitude ~~ranges are being presented~~ **or altitude range applies to each feature**.
Why is the change justified?	Provides clearer description of acceptable means of compliance.
ASHWG Response	Concur and will change text
COMMENT #2 of 2	
Specific section of the proposed document that is of concern.	**Paragraph 2.L.** If the pilot or system has the ability to turn a weather source on and off, **there must be a clear means for the flight crew to determine if it is turned on or off** ~~it should be clearly indicated when it is turned off~~.
What is the proposed text?	
What about this proposed text do we want changed?	If the pilot or system has the ability to turn a weather source on and off, **there must be a clear means for the flight crew to determine if it is turned on or off** ~~it should be clearly indicated when it is turned off~~.
Why is the change justified?	Allows for a "Quiet Dark" flightdeck concept. Allows the uses a positive alpha/numeric display on the nav displays when wxr is turned

	ON, whether or not there is a wxr return, and blanks this indication when the wxr is turned off.
ASHWG Response	Concur and will change text, except will replace the proposed “must” with “should”

Appendix W
Weather Displays

1. Background and Scope:

This appendix provides additional guidance for displaying weather information in the flight deck. Weather displays provide the flight crew with additional tools to help the flight crew make decisions based on weather information.

Sources of weather information may include, but would not be limited to: onboard, real-time weather, data-linked weather, turbulence information, pilot/air traffic reports, and may be displayed in a variety of graphical or text formats.

Because there are many sources of weather information, it is important that the applicant identify and assess the intended function for a particular source and display of weather information, and apply the guidance contained within this AC/AMC.

2. Key Characteristics

In addition to the general guidelines provided in this AC, there are unique aspects of the display of weather information so that the information is being used as intended.

A. The display should enable the flight crew to quickly, accurately, and consistently differentiate among sources of displayed weather, as well as differentiate between time-critical weather information and dated, non-time critical weather information.

B. Weather presentations (display format, the use of colors, labels, data formats, and interaction with other display parameters) should be clear and unambiguous and not result in a flight crew member's misunderstanding or misinterpretation of the weather information being displayed. Weather displays may use red and amber/yellow provided that all of the following criteria are met;

   1. The use of color is in compliance with 14 CFR/CS 25.1322, AC 25.1322, and this AC.
   2. The use of color is appropriate to the task and context of use, and,
   3. The proposed use does not affect the attention getting qualities of flight crew alerting and does not adversely affect the alerting functions across the flight deck, and,
   4. Color conventions (such as ARINC 708; AC 20-149) are utilized.

Note: AC 20-149 indicates an exclusion to the acceptability of DO-267A (paragraph 7.d) for part 25 airplanes.

C. If more than one source of weather information is available to the flight crew, an indication of the weather source selection should be provided.

D. If weather information is displayed as an overlay on an existing display format, both the weather information and the information it overlays should be readily distinguished and correctly interpreted from each other. It also should be consistent with the information it overlays, in terms of position, orientation, range, and altitude.

E. When simultaneously displaying multiple weather sources (e.g. weather radar and data link weather), each source should be clear and unambiguous and not result in a misunderstanding or misinterpretation of the displayed weather information by the flight crew. This is applicable also for symbols (e.g. winds aloft, lightning) having the same meaning from different weather information sources.

F. Fusion of sensor information to create a single weather image may be acceptable provided the fused weather information meets its intended function, and the fused information is shown to be in compliance with the guidance in this AC (e.g the pilot understands the source of the fused information). When fusing or overlaying multiple weather sources, the resultant combined image should meet its intended function despite any differences in image quality, projection, data update rates, data latency, or sensor alignment algorithms.

G. If weather information is displayed on the HUD, the guidelines of this AC including appendix H need to be considered.

H. When weather is not displayed in real time, some means to identify its relevance (e.g. time stamp or product age) should be provided. Presenting product age is particularly important when combining information from multiple weather products.

I. If a weather radar looping (animation) feature is provided, means to readily identify the total elapsed time of the image compilation should be provided, to avoid potential misinterpretation of the movement of the weather cells.

J. For products that have the ability to present weather for varying altitudes (e.g., potential or reported icing, radar, lightning strikes), information should be presented that allows the flight crew to distinguish or identify which altitude range applies to each feature.

Deleted: s are being presented.

K. Weather information may include a number of graphical and text information "features" or sets of information (e.g. text and graphical METARS, winds aloft) There should be a means to identify the meaning of each "feature" to ensure that the information is correctly used.

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L. If the pilot or system has the ability to turn a weather source on and off, there should be a clear means for the flight crew to determine if it is turned on or off.

M. When weather information is presented in a vertical situation display (VSD), it should be depicted sufficiently wide to contain the weather information that is relevant to the current phase of flight or flight path. In addition:

1. Weather information displayed on VSD shall be accurately depicted with respect to the scale factors of the display (i.e., vertical and horizontal), all vertical path information displayed, including glide slope, approach path, or angle of descent.
2. Consideration should be given to making the weather information display width consistent with the display width used by other systems, including Terrain Awareness and Warning System (TAWS), if displayed.

3. On-Board Weather Radar Information

On-Board Weather Radar may provide forward-looking weather detection, including windshear and turbulence detection.

The display of on-board weather radar information should be in accordance with the applicable portions of RTCA DO-220, "Minimum Operational Performance Standards for Airborne Weather Radar With Forward-Looking Windshear Capability."

The weather display echoes from precipitation and ground returns should be clear, automatic, timely, concise and distinct for rapid pilot interpretation so flight crews can easily analyze and avoid areas of detected hazards. The radar range, elevation, and azimuth indications should provide sufficient indication to the flight crew to allow for safe avoidance maneuvers.

4. Predictive Windshear Information

The display of windshear information, if provided, should be clear, automatic, timely, concise and distinct for rapid pilot interpretation so flight crews can easily detect and avoid areas of windshear activity.

When a windshear threat is detected, the corresponding display may be automatically presented or selected by pilot action, at a range which is appropriate to identify the windshear threat. Pilot workload necessary for its presentation should be minimized and should not take more than one action when the cockpit is configured for normal operating procedures.

The display of a predictive windshear threat, including relative position and azimuth with respect to the nose of the airplane, should be presented in an unambiguous manner to effectively assist the flight crew in responding to the windshear threat; the symbol should be presented in accordance with DO-220.

The size and location of the windshear threat should be presented using a symbol that is sufficient to allow the pilot to recognize and respond to the threat

The range selected by the pilot for the windshear display should be sufficient to allow the pilot to distinguish the event from other displayed information. Amber radial lines may be used to extend from the left and right radial boundaries of the icon extending to the upper edge of the display.

5. Safety Aspects

Both the loss of weather information plus the display of misleading weather information should be addressed in the functional hazard assessment (FHA). In particular, this should only address failures of the display system that could result in loss of or misleading weather information, not the sensor itself.

In accordance with paragraph 4 of this AC, display of misleading weather radar includes the display of weather radar information that would lead the pilot to make a bad decision and introduce a potential hazard. Examples of misleading weather radar information include, but are not limited to: storm cells presented on the display that are not in the correct position, are at the wrong intensity, not displayed when they should be displayed, or mis-registered in the case of a combined (e.g fused) image.