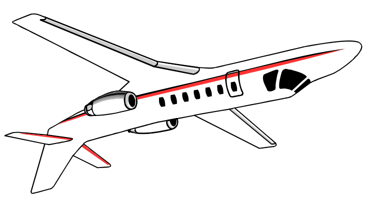
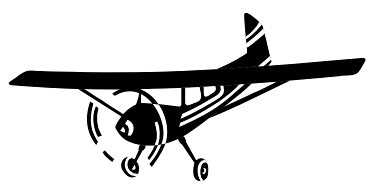
Small Airplane Directorate Airworthiness Directives Manual Supplement

(Airworthiness Concern Process Guide)





LOG OF REVISIONS

REVISION	REVISED PAGES	DESCRIPTION OF REVISION	Date
IR	-	1st Edition	7/21/2000
1	7-10, 12, 14-19, 20, 36-38, 59, 70	Clarify Process guidance; add statements to ACS; clarify completion of ACS; update contact information; change classification of landing gear failures for risk assessment.	3/1/2002

FORWARD

The Small Airplane Directorate Airworthiness Directives Manual Supplement (Airworthiness Concern Process Guide) is intended to provide the aviation community a standardized approach to resolve airworthiness issues. It is considered supplemental to the existing practices outlined in the Airworthiness Directive Manual (FAA-AIR-M-8040.1).

Aviation Safety Engineers are expected, whenever possible, to utilize the methods in the supplement guide to develop, prioritize, and administer solutions to airworthiness concerns on Small Airplane Directorate products. These methods facilitate early coordination between the FAA Aviation Safety Engineer, the affected manufacturers, and aviation interest groups (such as type clubs, industry associations, etc.) in the exchange of technical, operational, and economic data. Aviation Safety Engineers should utilize this additional information during the risk assessment process. It is anticipated that this process will result in more responsive, more effective decisions pertaining to airworthiness issues.

Although this guide is the culmination of an extensive development effort between the FAA and the flying organizations, there is always room for improvement. Please direct any pertinent comments to:

Continued Operational Safety Program Manager
Federal Aviation Administration
Small Airplane Directorate
901 Locust Street, Room 301
Kansas City, MO 64106

for Michael Gallagher
Manager, Small Airplane Directorate

Table of Contents

Table of Contents

Small Airplane Directorate
Airworthiness Directives Manual Supplement
Table of Contents

Purpose

Airworthiness Concern Process

- **Notification of Airworthiness Concern**
- **Communication and Data Gathering**
- **Perform Risk Assessment**
- **Take Appropriate Action(s)**
- **Monitor Airworthiness Concern**

APPENDIX I **Airworthiness Concern Process (Flow Chart)**

APPENDIX II **Airworthiness Concern Sheet (ACS)**

APPENDIX III **Associations and Type Club Listing**

APPENDIX IV **Airworthiness Contacts**

APPENDIX V **Risk Assessment for Reciprocating Engine Airworthiness Directives**

APPENDIX VI **Risk Assessment for Airworthiness Concerns on Small Airplane Directorate Products**

APPENDIX VII **Special Airworthiness Information Bulletin (SAIB) Guide**

APPENDIX VIII **AC 43-16A, GA Alerts Guide**

Purpose

The purpose of this Airworthiness (A/W) Concern Process Guide is to provide the aviation community (FAA Aviation Safety Engineers (ASEs), manufacturers, Type Clubs) a standardized approach to resolve airworthiness concerns. This guide describes the methods in which airworthiness concerns about Small Airplane Directorate (SAD) products should be identified, prioritized, and administered. ASEs are expected to use the procedures in this guide, although it is understood that it may be necessary, after consultation with the Directorate AD coordinator (Reference Appendix IV), to make exceptions.

This guide supplements the process located in the Airworthiness Directive Manual (FAA-AIR-M-8040.1). This guide focuses on the data gathering permitted to obtain factual (**technical and economic**) information before proposing an Advance Notice of Proposed Rule Making (ANPRM), Notice of Proposed Rule Making (NPRM), Supplemental NPRM, Immediately Adopted Rule, or Emergency AD. It is envisioned this early coordination with manufacturers, associations, Type Clubs, owners, operators, and mechanics will promote safety and streamline the AD process for both those airplanes with manufacturing support and for "orphaned" airplanes with no manufacturing support.

Airworthiness Concern Process

Airworthiness concerns come to the attention of the Aircraft Certification Office (ACO) in a variety of ways. The usual methods are shown below, but the list is not inclusive:

- NTSB Safety Recommendations
- FAA Safety Recommendations
- Mandatory Continued Airworthiness Instructions (MCAI) from foreign authorities
- Service Difficulty Reports (SDR)
- Manufacturers' FAR Part 21.3 Reports
- Notification from a Type Club

The ASE, as part of their continued operational safety duties, evaluates these concerns for possible corrective action. This guide provides a five step procedure to address any airworthiness concern.

1. Notification of Airworthiness Concern
2. Communication and Data Gathering
3. Perform Risk Assessment
4. Take the appropriate action
5. Monitor the area of concern

This process is depicted with the flow chart shown in Appendix I. The five steps are further described below.

<u>1. Notification of Airworthiness Concern</u>

When an ASE is notified of an airworthiness concern they should gather as much additional information as possible. The engineer uses the Airworthiness Concern Sheet (ACS) to obtain information from the field via aircraft associations and aircraft Type Clubs. The engineer will complete and disseminate the ACS. Appendix II includes the ACS form and helpful information about suggested and required content. The ACS should specify any detailed information that is requested from the field such as technical data and accurate cost of compliance data.

The ASE should perform an initial risk assessment as described in step 3. This helps determine what possible action is needed to address the concern. The ACS should also specify the requested response time (10, 30 or 90 days) according to the results of the initial assessment.

The information received from an ACS is used to help determine what corrective action, if any, the FAA should take regarding any particular concern. Usually, the ASE should complete the ACS process before beginning an AD proposal worksheet. The ACS is not to be confused with any rulemaking activity; its purpose is to solicit technical and economic impact comments. The ACS should always explain this. The ACS form in Appendix II contains the appropriate statement.

For a new routine AD action (NPRM), do not submit the AD proposal worksheet to the SAD AD coordinator until the ACS process is complete. The ASE needs to take time to evaluate any comments or information received and adjust the AD proposal worksheet accordingly.

It is important to note that if the safety concern indicates an urgent safety of flight condition, the ASE, in coordination with the SAD AD coordinator, should initiate Emergency AD or Adopted Rule AD action concurrently with the ACS process. (These ADs are issued without waiting for public comment.) In these instances, the ACS should request a 10 day response time. If, however, the service difficulty report or single reported incident is the first event of its type, additional information from user/operators may provide valuable insight. Often "emergency events" have root causes that do not directly affect the fleet. User operational and maintenance knowledge, if available, could change the scope of inspection and mandated inspection intervals.

Thus, for urgent safety concerns, ASEs should complete and disseminate an "Emergency (10 day response) ACS" at the same time they initiate the AD worksheet. The AD action will be prepared as the ACS is processed by the user groups. This enhances the decision making process by helping gather all available service information prior to issuing the Emergency AD or Adopted Rule AD. The AD will not be issued until the comments are received and evaluated. Later, if new information becomes available, the ASE working with the SAD AD group may initiate further rulemaking to adjust the regulatory impact as appropriate (increase or decrease the AD requirements, for instance).

Since Emergency ADs and Adopted Rule ADs are exceptions to the normal procedure, they will be issued only when justified.

2. Communication and Data Gathering (Technical and Economic)

The ASE sends the ACS to the Type Certificate holder, appropriate associations and Type Clubs. Appendix III, "Associations and Type Clubs Listing," contains a list of associations and Type Clubs. The ASE should also send a copy to the SAD COSM group. (This keeps the Directorate informed of possible concerns existing in the field. It also provides a means of cross referencing similar concerns from different offices.)

The Aircraft Owners and Pilots Association (AOPA) has agreed to forward the ACS to the appropriate Type Clubs or organizations. Therefore the ASE will send AOPA the completed ACS. Appendix III includes a sample cover letter that can accompany the ACS. These documents should be sent electronically. This is the most efficient means for AOPA to forward the ACS and expedites the data gathering. The type clubs will respond to AOPA with technical and economic information pertinent to the airworthiness concern and AOP will consolidate the feedback into one response.

Although AOPA is the primary conduit to the Type Clubs, this should not preclude directly sending the ACS to Type Clubs, if warranted. For instance, if the communication lines between the FAA and a Type Club are strong, notifying the Type Club directly, in addition to AOPA, can expedite the feedback time.

The ASE should also search other sources for additional data. The primary tool used to find related data is the Aircraft Certification Service's Aviation Safety Accident Prevention (ASAP) computer utility. ASAP is available to all ASEs. ASAP searches the NTSB and FAA accident/incident data system (A/IDS) and the FAA's Service Difficulty Reports (SDR) database for information as requested by the user. Appendix IV provides information about these sources.

For urgent safety of flight concerns, it is important that the user groups respond within 10 days. In order to assure that they give the ASC proper attention, it is recommended that the ASE communicate with them as needed.

Note: Appendix III is intended to be a "living document" maintained and provided to the FAA by the AOPA for FAA ACS use. The AOPA list is not exhaustive. It includes those associations and type clubs considered capable of disseminating ACS safety concerns to its members, compiling feedback, and submitting technical and economic cost impact data back to the ASE in a timely manner. The FAA welcomes all interested parties to be included in the listing.

3. Perform Risk Assessment

The ASE initially performs the risk assessment with readily available data and then as additional data are obtained from the field response to the ACS. Normally, if initial data indicate an urgent safety of flight condition, AD action should not be delayed. In all cases, data from the field should be monitored and evaluated throughout the AD process.

This guide provides two risk assessment methods. The ASE should use "Risk Assessment for Reciprocating Engine Airworthiness Directives" for engine related concerns. Appendix V describes this method. The ASE should use "14 CFR Part 23 (AD) Risk Assessment" for all airworthiness concerns regarding SAD products. Appendix VI describes this method and provides examples of how it is used.

4. Take Appropriate Action(s)

Except for urgent safety of flight conditions, the course of action should not be determined until ACS feedback is received and the risk assessment is complete. The ASE should consider all available data, including ACS feedback from the field, to evaluate the potential action(s).

The risk assessment is a tool used to help objectively determine the best course of action. The assessment results should always be tempered with good engineering judgement. Because of the nature of the method, it is possible that the final risk factor does not accurately characterize the severity of the concern. The ASE should always perform a "sanity check." If the ASE is unsure of the risk assessment's accuracy, he or she should seek input from colleagues or SAD staff.

Sometimes, the individual risk factors of Section 3.0 of Appendix VI may not represent a concern's risk to a particular design or use. In those cases, the ASE should justify any deviation from the Appendix V or VI method. This justification should become part of the risk assessment documentation. When the ASE decides the appropriate action, he or she should document any pertinent information that helped with that decision.

When the ASE is satisfied that sufficient data has been reviewed and the risk assessment produces a realistic course of action, the ASE may recommend one or more actions to the SAD AD group. The flow chart in Appendix I presents the steps to take for each action.

The possible recommended actions are:

- <u>Airworthiness Directive</u> (Reference Airworthiness Directives Manual FAA-AIR-M-8040.1)
    - Urgent Safety of Flight Situation (Emergency AD)
    - Urgent Safety of Flight Situation (Adopted Rule With Comments)
    - Final Rule after Notice
    - Notice of Proposed Rulemaking (NPRM) Followed by a Final Rule

- <u>Special Airworthiness Information Bulletin (SAIB)</u> (Reference Appendix VII)
    - Informs appropriate field personnel (owners, operators, and/or mechanics) of safety concern and recommended actions.
    - May reference manufacturers Service Letters or Service Bulletins
    - "**ADVISORY ONLY/NOT MANDATORY**"

- <u>General Aviation Alerts Advisory Circular (AC) 43-16A</u> (Reference Appendix VIII)

- <u>Manufacturer's Service Letters</u> (Coordinate development with manufacturer.)

- <u>No Action Required</u> (Continue to Monitor A/W Concern)

<u>5. Monitor Airworthiness Concern</u>

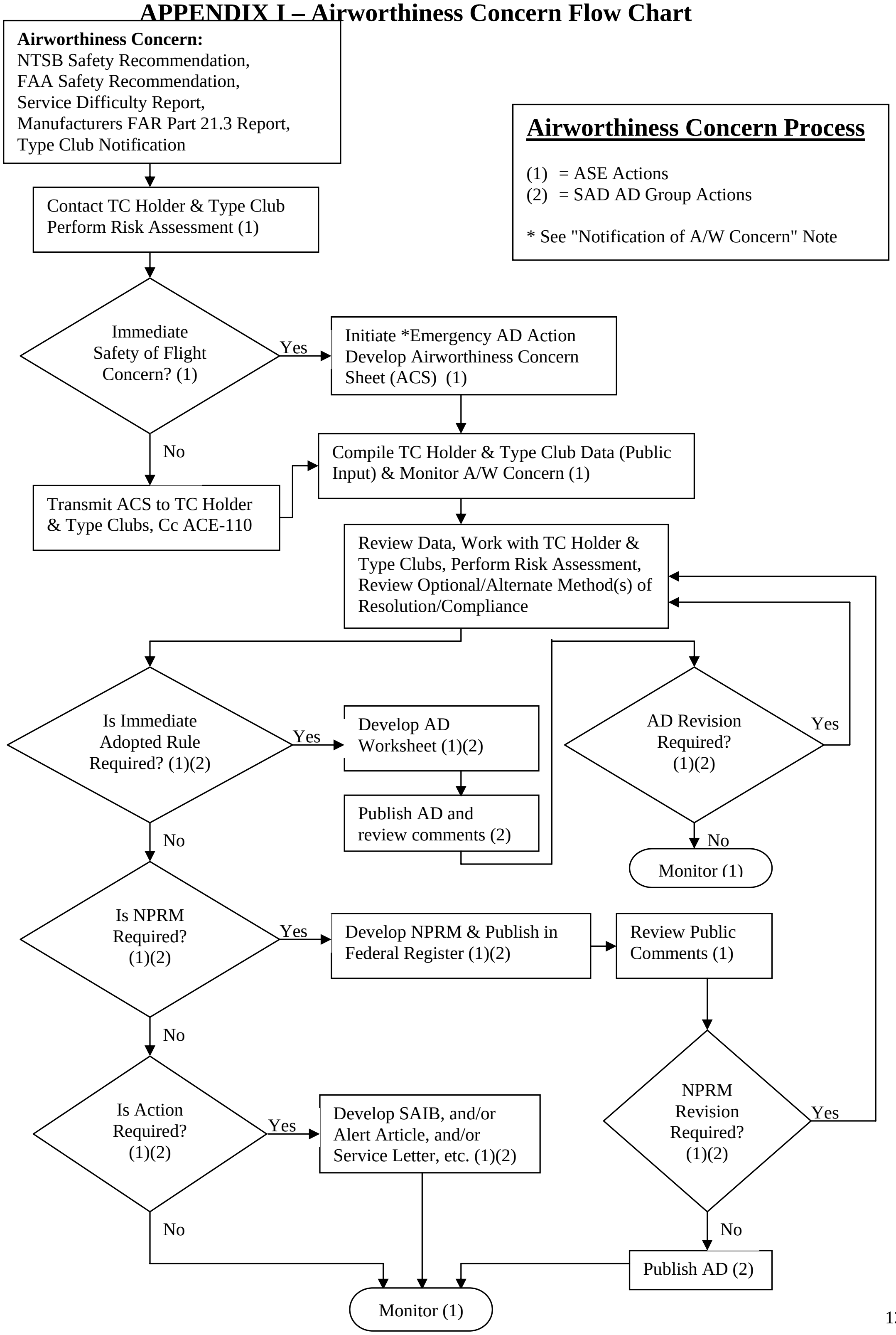
The ASE will communicate actions taken with the participating manufacturers, associations and Type Clubs. Appendix III includes a sample letter to explain the action taken.

Monitoring an airworthiness concern an important aspect of this process. It is a joint effort with the FAA, the manufacturer, and the field (associations, Type Clubs, and owner/operators, etc.). However, it is the FAA's responsibility to stay well informed, compile the information, and reevaluate the concern as new data (SDRs, A/IDS, manufacturer and type club comments, etc.) become available. This last step is essential to verify that the action adequately addressed the airworthiness concern.

Appendix I
A/W Concern Process Flow Chart

Appendix I
A/W Concern Process Flow Chart

APPENDIX I – Airworthiness Concern Flow Chart



Appendix II
A/W Concern Sheet

Appendix II
A/W Concern Sheet

APPENDIX II

Airworthiness Concern Sheet

FAA

Date:

Full Name Title Organization Department Address City State ZIP Telephone Number E-mail	**Make, Model, Series, Serial No.:** **Reason for Airworthiness Concern:**

FAA Description of Airworthiness Concern (Who, What, Where, When, How? Attachments: RA and appropriate data)

Request for Information (Proposed Alternate Inspection/Repair Procedures, **Cost Impact**, Etc. Note: Any comments or replies to the FAA need to be as specific as possible. Please provide specific examples to illustrate your comments/concerns.):

This Airworthiness Concern Sheet (ACS) is intended as a means for FAA Aviation Safety Engineers to coordinate airworthiness concerns with aircraft owner/operators through associations and type clubs. At this time, the FAA has not made a determination on what type of corrective action (if any) should be taken. The resolution of this airworthiness concern could involve an AD action or an SAIB, or the FAA could determine that no action is needed at this time. The FAA's final determination will depend in part on the information received in response to this ACS.

The FAA endorses dissemination of this technical information to all manufacturers and requests association and type clubs comments.

Attachments: *SDR(s)☐ *A/IDS☐ *SL(s)☐ *SAIB☐ *FAASR/*NTSBSR☐ *AD☐ *AMOC☐ *RA☐

Notification: FAA ☐ *AOPA ☐ *EAA ☐ Type Club ☐ *TC Holder ☐ Other:

Response Requested __/__/__: Emergency (10 days) ☐ Alert (30 days) ☐ Information (90 days) ☐

(Space Bar Adds "X" to Check Boxes)

*Service Difficulty Reports (SDRs); Accident/Incident Data System (A/IDS); Service Letter (SL); Special Airworthiness Information Bulletin (SAIB); Federal Aviation Administration (FAA)/National Transportation Safety Board (NTSB) Safety Recommendation (FAASR/NTSBSR); Airworthiness Directive (AD); Alternate Method of Compliance (AMOC); Risk Assessment (RA); Aircraft Owners & Pilots Association (AOPA); Experimental Aircraft Association (EAA); Type Certificate (TC)

Completion Instructions

(Initiated by FAA Office)

Block 1: Date

Date:

Insert into Block 1 the Date the ACS is completed

Block 2: Originator information

Full Name *(FAA Project Engineer)*
Title *(Aerospace Engineer, Program Manager)*
Organization *(______ ACO, ACE-123X)*
Department
Address
City State ZIP
Telephone Number
E-mail

Complete block 2 with pertinent information about the originator. Include title, FAA office and routing symbol, telephone and email address.

Block 3: Make, Model Series, Serial Number

Make, Model, Series, Serial No.: *(Ex.: Cessna, 401, 401A, 401B, 402, 402A, 402B, 411, 411A, See attached sheet for complete serial numbers.)*

(Ex.: Piaggio Aero Industries S.p.A P180, Mfg serial # 1001-1006, 1013)

Complete block 3 with as much make, model, series, and serial number information as possible. A complete description is often needed to determine the scope of the concern. If available, manufacturers' Service Bulletins usually contain this information. If the series or serial number range is unclear or unknown then this should be explained and requested as part of the information the users may be able to supply. (This information is required on AD worksheets, so it will be needed in the event the concern evolves into a proposed AD action.) Two examples are shown.

Block 4: Reason for Airworthiness Concern

Reason for Airworthiness Concern:
(Ex.: There have been several cases of main wheel bearing failures reported to the FAA within the past six months, that have resulted in wheel loss during take off.)

(Ex: The Italian Airworthiness Authority (ENAC) issued AD 2001-001, dated 1/1/01 to mandate [model} Service Bulletin SB-01-001, dated 1/1/01)

Complete block 4 with a short synopsis of the concern. Two examples are shown.

Block 5: FAA Description of Airworthiness Concern

FAA Description of Airworthiness Concern (Who, What, Where, When, How? Attachments: RA and appropriate data.)
(Ex.: On January 1, 2001, (Mfg) requested a new AD to replace AD 79-01-01. The current AD references (Mfg) Service Bulletin SB79-01, which requires an eddy current inspection of the (model) main spar lower cap for cracks. Since AD 79-01-01 was issued, five other incidents of either a cracked or completely failed spar have been discovered on (model) field aircraft. Fortunately, the cracked spars were discovered before wing separation occurred. A recent review of SB79-01 NDI procedure has led to the conclusion that the eddy current procedure may not find a crack in the spar cap before it reaches critical crack length, severing the spar. Also, analysis shows that the wing structure is not fail-safe.

Since (Mfg) does not believe a new NDI procedure can be developed to find a crack before it reaches a critical length, XX79-16 has been superceded by two new service bulletins and service kits: SB01-1 and K123-45 for the (model) and SB01-2 and K234-56 for the (model). These service bulletins and kits define a strap modification to the wing and are the only way (Mfg) believes that continued airworthiness can be assured. Therefore to assure continued airworthiness of the (model) and to eliminate confusion in the field caused by an AD that references a superceded service bulletin, (Mfg) requests that a new AD be written.

Cost: Approximately 500 man-hours per airplane. K123-45 has a list price of $2662 and K234-56 lists for $1105.

An airplane complying with SB01-1 and K123-11 or SB01-2 and K124-12 will have new initial and recurring inspection intervals for area A, B, and C as shown in the attached chart.)
\- - - - - - -

(Ex.: (Mfg) discovered that batches of defective bushings have been installed on four (model) aircraft. The defective bushings are installed on the horizontal stabilizer hinge on the vertical fin. The defects are because of a missing thermal process during bushing manufacturing. SB 08-01 provides instructions on replacement of these bushings. See Serial Number Block for affected serial numbers. This action has been mandated by the (Country of design) authority with AD 2001-001)

Request for Information (Proposed Inspection/Repair Procedures, **Cost Impact**, Etc. Note: Any comments or replies to the FAA need to be as specific as possible. Please provide specific examples to illustrate your comments/concerns.):
(Ex.: Users are encouraged to provide the FAA knowledge and supporting data regarding an NDI procedure that can detect the described cracks before reaching critical length. Users are also welcome to submit alternate modification designs or other cost information (with supporting data.)

This Airworthiness Concern Sheet (ACS) is intended as a means for FAA Aviation Safety Engineers to coordinate airworthiness concerns with aircraft owner/operators through associations and type clubs. At this time, the FAA has not made a determination on what type of corrective action (if any) should be taken. The resolution of this airworthiness concern could involve an AD action or an SAIB, or the FAA could determine that no action is needed at this time. The FAA's final determination will depend in part on the information received in response to this ACS.

The FAA endorses dissemination of this technical information to all manufacturers and requests association and type clubs comments.

Describe in Block 5 the airworthiness concern. Describe the concern as completely as possible. Attach the Risk Assessment and other appropriate data. Use additional sheets if necessary. Two examples are shown.

If certain key information is incomplete or unknown, request that the association or user group provide any data. One example is shown.

The box at the bottom of Block 5 explains that the ACS process is not rulemaking, but rather a solicitation for technical information. **This box is to be included on each ACS**.

Block 6: Attachments, Notification, and Response Time

Attachments: *SDR(s)☐ *A/IDS☐ *SL(s)☐ *SAIB☐ *FAASR/*NTSBSR☐ *AD☐ *AMOC☐ *RA☐

Notification: FAA ☐ *AOPA ☐ *EAA ☐ Type Club ☐ *TC Holder ☐ Other:

Response Date Requested __/__/__: Emergency (10 days) ☐ Alert (30 days) ☐ Information (90 days) ☐

(Space Bar Adds "X" to Check Boxes)

Attachments: Check all boxes in Block 6 that apply. (The acronyms are listed in block 7.) Always include results of the Risk Analysis (RA). **Do not include proprietary data.**

The initial risk assessment procedures are described in Appendices V and VI.

Note:
FAA Safety Recommendations are for FAA internal use only; however selected information may be shared with the public. NTSB Safety Recommendations are a matter of public record and may be shared with the public in entirety.

Notification: Check all boxes that apply. **Always notify FAA Small Airplane Directorate COSM group, Type Certificate holder, and AOPA.** AOPA is responsible for disseminating the information to the appropriate user groups. Email is the preferred method of notification. FAX is the second preference. Appendix III contains the addresses of many interested associations and type clubs.

Response Date Requested: Insert the date the response needs to be returned. (Calendar days from the Block 1 ACS date.) Based on the initial risk assessment, the following choices are:

"Emergency (10 days)" indicates that an "Emergency AD" is under consideration. The concern involves potential catastrophic failure/loss of life. Expect minimal owner/operator responses by request date.

"Alert (30 days)" indicates a high level of concern. AD worksheet/NPRM may be in process. Encourage associations and Type Clubs to utilize electronic and facsimile media. Expect fewer owner/operator responses by request date.

"Information (90 days)" indicates a "non-emergency" concern. This choice allows associations and Type Clubs time to utilize print media, mass mailings, etc., maximizing number and quality of owner/operator comments.

Block 7: List of Acronyms

*Service Difficulty Reports (SDRs); Accident/Incident Data System (A/IDS); Service Letter (SL); Special Airworthiness Information Bulletin (SAIB); Federal Aviation Administration (FAA)/National Transportation Safety Board (NTSB) Safety Recommendation (FAASR/NTSBSR); Airworthiness Directive (AD); Alternate Method of Compliance (AMOC); Risk Assessment (RA); Aircraft Owners & Pilots Association (AOPA);

SAMPLE ACS TRANSMITTAL LETTER

U. S. Department
of Transportation

Federal Aviation
Administration

_____ ________ Directorate
________ Aircraft Certification Office
____
__________, __ _____

(Date)

(Mr./Ms.____________) (Title)
(Type Club Name)
(Type Club Address)

Dear (*Mr./Ms.________________*):

Per our telecon of ______ __, ____, enclosed is the Airworthiness Concern Sheet (ACS*). This ACS has been coordinated with the current Type Certificate (TC) holder (delete if no current TC holder).* The ACS is intended for Federal Aviation Administration (FAA) Aircraft Certification Office Aviation Safety Engineers to convey known airworthiness (A/W) concerns to aircraft owner/operators through associations and type clubs. The FAA endorses the dissemination of this information. We request that you distribute this A/W concern to your membership for **technical** and **economic impact** comments.

Service Difficulty Report/s (SDR/s), **and/or** *a FAA Safety Recommendation* **and/or** *a National Transportation Safety Board (NTSB) Safety Recommendation* **and/or** *Accident/s/Incident/s* **and/or** *reports from the field, etc*., brought this concern to our attention, see enclosed.

We developed an (*Engine & Propeller Directorate/Small Airplane Directorate*) (*EPD/SAD*) Risk Assessment (RA) based on all currently available data concerning this ACS. Please review the enclosed RA and provide comments concerning our initial determination. (Reference SAD A/W Concern Process Guide, Appendix V & VI.)

At this time, the FAA has not made a determination on what type of corrective action (if any) should be taken. The resolution of this airworthiness concern could involve an AD action or an SAIB, or the FAA could determine that no action is needed at this time. The initial Risk Assessment for this concern indicated that __*__ or __*__ might be considered. The FAA's final determination will depend in part on the information received in response to this Airworthiness Concern Sheet.

(Fill in the blanks with what your risk assessment has determined the appropriate action to be (e.g., NPRM, Adopted Rule AD, etc.))*

As described in the ACS, we consider this A/W Concern as *("Information/Alert/Emergency")*. Please provide your association/type club comments to this office within *(90/30/10)* days, *(respectively)*. If you have any questions, please contact _____ __________ at (___) ___-____, *(e-mail address, ex: john.doe@faa.gov)*.

Sincerely,

_________ _ _________
(ASE or Branch Manager Signature)
(Branch)

Enclosures

cc: Type Certificate Holder *(if available)*,
Aircraft Owners and Pilots Association (AOPA),
Experimental Aircraft Association (EAA)

bcc: ACE-110 (Barry Ballenger), A__-____:R/F,
A__-____:_______:(xxx) xxx-xxxx:__:xx/xx/xx:*________.___*
(internal office file code) (TC Holder Name/Make); (ACS Descriptive Title)
WM: N/A

Sample ACS Interim/Final Response Letter

U. S. Department
of Transportation

Federal Aviation
Administration

______________ Directorate
________ Aircraft Certification Office
____
___________, __. _____

(Date)

(Mr./Ms.)
Association/Type Club Name and Address)
____
____

Dear (Mr./Ms.) _______________________:

This is a (*interim/final*) response to your letter of _______, 200_, addressing our FAA Airworthiness Concern Sheet (ACS), dated ____ __, 200_, concerning __________________. We have reviewed your _______ and we (*agree/disagree*) that you're proposed inspection method of inspecting for ____________________, by (*removing/accessing/etc.*) _____ (*has/seems to have merit/concerns us for the following reason/s*:____________).

We have accomplished the following actions:

1. We determined that an Airworthiness Directive (AD) (*is/is not*) required at this time. We based our decision on *(#) of reported occurrences/service difficulty report/s*) (SDR/s) in the SDR data base (*compared to events versus population/time between events/operational use*) and (# of/no) accidents/incident reports and that the (*condition*) is accessible and inspectable *during (annual inspection intervals/routine scheduled maintenance/preflight/etc*).

2. We published an article in the __________ 200_ Alert No. ___ issue of AC No. 43-16A Aviation Maintenance Alerts (see enclosed copy). The article highlighted the potential for (*name the A/W concern*) the (*above/proposed/etc.*) inspection method of ____________________, and the need for (*a thorough annual inspection/inspecting for*)__________________________, etc.

3. On ________________ __, 200_, SAIB No. __-0__-__was posted on the FAA's web site at http://www.faa.gov/aircraft/safety/alerts/SAIB/. The SAIB (*was sent/will be*) sent to (*#*) registered _________________________ owners (*on/by*) _________________ __, 200_ (see enclosed copy). The SAIB highlights the potential for ______________ and the need for (*thorough annual inspections/inspecting for/etc.*)

We appreciate (*type club's name*) _________________________________ interest and response to our ACS request for information. If you have any questions or need additional information, please call me at (__) ___-____/fax: - ____, e-mail: (first).(last name)@faa.gov.

Sincerely,

____
Aerospace Engineer
_________________ Branch

Enclosures (2)
cc: ACE-110 (Barry Ballenger), A__-____:R/F,
A__-11_:______________( )___-____:___:__/__/0_:*___________________.DOC*
8110: (Acft. Make/Model/A/W Concern Condition) WM: 7

Appendix III
Type Club Listing

Appendix III
Type Club Listing

APPENDIX III -- Associations and Type Club Listing

(Contact AOPA/EAA for Current Information)

1-26 Association, A division of the Soaring Society of America
Bob Hurni
Secretary-Treasurer
516 East Meadow Lane
Phoenix, AZ 85022
(602) 993-8840
bhurni@aol.com
http://www.crosswinds.net/~sgs126

1-26 Association, a division of the Soaring Society of America
Clayton W. (Bill) Vickland
Eastern Vice President
629 N. Monroe Street
Arlington, VA 22201
(703) 527-5302
(703) 527-1529
c.vickland@aol.com

1-26 Association, A division of the Soaring Society of America
Del Blomquist
President
1706 Gotham St.
Chula Vista, CA 91913
(619) 482-7527

Aerostar Owners Association
Paul Neuda
Publisher
PO Box 460
Valdosta, GA 31603
(912) 244-7827
(912) 224-2604
info@aerostar-owners.com
http://aerostar-owners.com

Air Line Pilots Association
John O'Brien
Director of Engineering and Air Safety
535 Herndon Parkway
PO Box 1169
Herndon, VA 20172-9805
(703) 689-2270
(703) 689-4370
obrienj@alpa.org
http://www.alpa.org

Associations and Type Club Listing (continued)

(Contact AOPA/EAA for Current Information)

Air Transport Association of America
David Fuscus
Vice President of Communications
1301 Pennsylvania Ave., NW
Suite 1100
Washington, DC 20004-1707
(202) 626-4000
(202) 626-4149
http://www.air-transport.org

Aircraft Electronics Association
Paula Derks
President
4217 South Hocker Drive
Independence, MO 64055
(816) 373-6565
(816) 478-3100
paulad@aea.net
http://www.aea.net

American Bonanza Society
Nancy Johnson
Executive Director
Mid-Continent Airport
PO Box 12888
Wichita, KS 67277-2888
(316) 945-1700
(316) 945-1710
bonanza1@bonanza.org
http://www.bonanza.org

American Bonanza Society
Neil L. Pobanz
Technical Consultant
PO Box 32
Lacon, IL 61540
(309) 246-2002
(309) 246-2002
laconaero@aol.com

American Bonanza Society
Michael Hoeffler
43 Old Sugar Road
Bolten, MA 01740
(508) 351-9080
N48mh@mediaone.net

Associations and Type Club Listing (continued)

(Contact AOPA/EAA for Current Information)

American Navion Society
Jerry Feather
President
PO Box 148
Grand Junction, CO 81502
(970) 245-7459
(970) 243-8503

American Tiger Club and National Bucker Club (Aerobatic)
Celesta Price
President
300 Estelle Rice Drive
Moody, TX 76557
(254) 853-9067

American Yankee Association
Ronald B. Levy
Safety Director
1510 Aviemore Place
BelAir, MD 21015-5713
(410) 937-2819
rblevy@mindspring.com
http://www.aya.org

American Yankee Association
Guy Warner
President
2707 Sedgefield Ct. E.
Clearwater, FL 33761
(727) 462-6022
guyaya@attglobal.net
http://www.aya.org

American Yankee Association
Stewart Wilson
Secretary-Treasurer
PO Box 1531
Cameron Park, CA 95682-1531
530-676-4AYA
(530) 676-3949
http://www.aya.org

American Yankee Association
Jay D. Stout
40 Briar Rose Trail
Elizabethtown, PA 17022
(717) 653-8181
stout@redrose.net

Associations and Type Club Listing (continued)

(Contact AOPA/EAA for Current Information)

Antique Airplane Association, Inc.
Brent Taylor
Executive Director
22001 Bluegrass Road
Ottumwa, IA 52501-8569
(641) 938-2773
(641) 938-2084
aaaapmhq@pcsia.net
http://aaa-apm.org

AOPA
Andrew Werking
421 Aviation Way
Frederick, MD 21701
(301) 695-2167
(301) 695-2214
andy.werking@aopa.org
http://www.aopa.org

Balloon Federation of America
Charles Sundquist
Presient
PO Box 400
Indianola, IA 50125
(515) 961-3537
(515) 961-3537
bfaoffice@aol.com
http://www.bfa.net

Bellanca-Champion Club
Bob Szego
President
PO Box 100
Coxsackie, NY 12051-0100
(518) 731-6800
(518) 731-8190
szegor@bellanca-championclub.com
http://bellanca-championclub.com

California Pilots Association
Jay C. White
President
PO Box 6868
San Carlos, CA 94070
(800) 244-1949
(415) 366-1915
jay-white00@aol.com

Associations and Type Club Listing (continued)

(Contact AOPA/EAA for Current Information)

Cessna 150-152 Club
Royson Parsons
Executive Director
PO Box 1917
Atascadero, CA 93423-1917
(805) 461-1958

Cessna 170 Association
President
PO Box 1667
Lebanon, MO 65536
(417) 532-4847
(417) 532-4847
c170hq@llion.org
http://www.cessna170.org

Cessna 172-182 Club
Debbie K. Jones
Vice President
PO Box 22631
Oklahoma City, OK 73123
(405) 495-8666
(405) 495-8666
cessna172182@aol.com
http://www.cessna172-182club.com

Cessna Owner Organization
Trevor Janz
North 7450 Aanstad Rd.
Iola, WI 54945
(715) 445-5000
(715) 445-4053
sales@cessnaowner.org
http://www.cessnaowner.org
or www.piperowner.org

Cessna Pilots Association
John Frank
President
Technical and Educational Facility
PO Box 5817
Santa Maria, CA 93456
(805) 922-2580
(805) 922-7249
Jfrank@cessna.org

Associations and Type Club Listing (continued)

(Contact AOPA/EAA for Current Information)

Citabria Owners Group
Carl Peterson
President
636 Iona Lane
Roseville, MN 55113
http://www.citabria.com

Commander Owners Organization
Sven Faret
30-a Main Parkway
Plainview, NY 11803

Confederate Airforce, Inc.
Keith Lawrence
Director of Administration
PO Box 62000
Midland, TX 79711-2000
(915) 563-1000
(915) 563-8046
diradmin@cafhq.org
http://www.confederateairforce.org

Culver Aircraft Association
Dan Nicholson
723 Baker Drive
Tomball, TX 77375
(281) 351-0114
(713) 850-3579
dann@gie.com

Culver Club
Larry Low
President
60 Skywood Way
Woodside, CA 94062-4811
(650) 851-0204

deHavilland Moth Club
Michael Maniatis
Chairman
48 West 22nd. Street
New York, NY 10010
(212) 620-0398
(212) 620-0398
moth@sprintmail.com

Associations and Type Club Listing (continued)

(Contact AOPA/EAA for Current Information)

Ercoupe Owners Club
Skip Carden
Executive Director
PO Box 15388
Durham, NC 27704
(919) 471-9492
(919) 477-2194
coupeclub@aol.com

Experimental Aircraft Association
Earl Lawrence
EAA Aviation Center
PO Box 3086
Oshkosh, WI 54903-3086
(920) 426-6522
(920) 426-4828
elawrence@eaa.org
http://www.eaa.org

Helicopter Association International
Roy Resavage
President
1635 Prince Street
Alexandria, VA 22314-2818
(703) 683-4646
(703) 683-4745
http://www.rotor.com

Howard Aircraft Foundation
David Schober
PO Box 252
Volga, WV 26238
(304) 457-5026
HowardClub@aol.com

International 195 Club
Dwight M. Ewing
President
PO Box 737
Merced, CA 95340
(209) 722-6283
(209) 722-5124
ewing@elite.net
http://www.cessna195.org

Associations and Type Club Listing (continued)

(Contact AOPA/EAA for Current Information)

International Bird Dog Association
Mitch Leland
President
406 North AV.R
Clifton, TX 76634-1252
L-19Birddog@worldnet.att.net
http://www.L-19BowWow.com

International Cessna 120/140 Association
Bill Rhoades
Editor
6425 Hazelwood Ave.
Northfield, MN 55057
(612) 652-2221
(507) 663-0098
pilot140@aol.com

International Cessna 120/140 Association
David Lowe
Maintenance Advisor
1231 Coffman Road
Sacramento, Kentucky 42372
(270) 736-5392
(270) 736-9051
Loweaviate@aol.com

International Cessna 170 Association
Miles Bowen
President
PO Box 1667
Lebanon, Missouri 65536
(417) 532-4847
C170HQ@mail.llion.org
http://www.cessna170.org

International Cessna 180/185 Club
Scott White
President
PO Box 639
Castlewood, VA 24224
(540) 738-8450

International Comanche Society, Inc.
Bruce Berman
Editor
Wiley Post Airport, Hangar 3
Bethany, OK 73008
(405) 491-0321
(405) 491-0325
comancheflyer@compuserv.com
http://www.ics.pxl.net

Associations and Type Club Listing (continued)

(Contact AOPA/EAA for Current Information)

International Comanche Society, Inc.
Roy Roberts
President
902 Old ReFugio Rd.
Victoria, TX 77905
rgrob@Techisp.com
http://www.ics.pxl.net

International Stinson Club
Dennis Dow
President
3005 6th Street
Sacramento, CA 95818
(916) 446-3729
stinson@aeromar.com
http://www.aeromar.com/swsc.html

International Stinson Club
Ray Herrick
5860 34th Street
Vero Beach, Florida 32966
(561) 770-1932
Ray9502k@aol.com

Luscombe Association
John Bergeson
6438 West Millbrook
Remun, MI 79340-9625
(517) 561-2393
(517) 561-5101

Malibu/Mirage Owners and Pilots Association
Russ Caauwe
Executive Director
PO Box 1288
Green Valley, AZ 85614
(520) 399-1121
(520) 648-3823
mmopa@uswest.net
http://www.MMOPA.com

Maule Aircraft Association
Dave Neumeister
Publisher
5630 South Washington Road
Lansing, MI 48911-4999
(800) 594-4634
(800) 596-8341

Associations and Type Club Listing (continued)

(Contact AOPA/EAA for Current Information)

Meyers Aircraft Owners Association
William E. Gaffney
Secretary
PO Box 158
Cragsmoor, NY 12420
(845) 565-8005
(845) 565-8039
wgaffne@banet.net

Mooney Aircraft Pilots Association
Bob KromerTom Canavera
100 Sandau, Suite 200
San Antonio, TX 78216
(210) 525-8008
(210) 525-8085
Lela@Txdirect.net

Musketeer Mail Group
Bob Steward
9220 A-1 Parkway East #240
Birmingham, AL 35206
(205) 833-5200
n76lima@mindspring.com

National Agricultural Aviaton Association
James Callan
Executive Director
1005 E Street, SE
Washington, DC 20003
(202) 546-5722
(202) 546-5726
information@agaviation.org
http://www.agaviation.org

National Business Aviation Association
Eli Cotti
Senior Manager of Technical Operations
1200 18th Street, NW
Suite 400
Washington, DC 20036
(202) 783-9000
(202) 331-8364
ecotti@nbaa.org
http://www,nbaa.org

National Stinson Club
George Almond
1229 Rising Hill Road
Placerville, CA 95667
(530) 622-4004

Associations and Type Club Listing (continued)

(Contact AOPA/EAA for Current Information)

National Stinson Club (108 Section)
Robert L. Taylor
Editor
PO BOX 127
Blakesburg, IA 52536
(641) 938-2773
(641) 938-2084
aaaapmhq@pcsia.net
http://www.aaa-apm.org

North American Trainer Association (T-6,T-28, B-25,F-51)
Stoney and Kathy Stonich
25801 N.E. Hinness Road
Brush Prairie, WA 98606
(360) 256-0066
(360) 896-5398
natrainer@aol.com
http://www.natrainer.org

Popular Rotorcraft Association
Pam Bundy
Office Manager
PO Box 68
Mentone, IN 46539
(219) 353-7227
(219) 353-7227
http://www.pra.org

Short Wing Piper Club
Tom Anderson
5401 Crooked Tree Drive
Mason, Ohio 45040
(513) 398-2656
Tanderson@sprintmail.com

Short Wing Piper Club
Michael Crowe
2568 Old Snapping Shoals Rd.
McDonough, GA 30252
(770) 957-4225
tripacer@bellsouth.net

Soaring Society of America
Jim Short
15232 Vaysee Ct.
Lockport, IL 60441
(708) 301-3198
short@megsinet.net

Associations and Type Club Listing (continued)

(Contact AOPA/EAA for Current Information)

Soaring Society of America, Inc.
Larry Sanderson
President
PO Box 2100
Hobbs, NM 88241
(505) 392-1177
(505) 392-8154
larry@ssa.org
http://www.ssa.org

Swift Association, International
Charlie Nelson
PO Box 644
Athens, TN 37371
(423) 745-9547
swiftlychs@aol.com

T-34 Association
George Braly
2800 Airport Road
Hangar A
Ada, OK 74820
(580) 436-4833
gwbraly@gami.com

T-34 Association
Charles Nogle
President
PO Box 925
Champagne, IL 61824
217-56-3063

Twin Beech 18 Society
Mattie Schultz
Executive Director
C/O Staggerwing Museum Foundation, Inc.
PO Box 550
Tullahoma, TN 37388
(931) 455-1974
(931) 455-2577
http://tullahoma.com/staggerwing/swm.html

Twin Bonanza Assocation
Richard I. Ward
Director
19684 Lakeshore Drive
Three Rivers, MI 49093
(616) 279-2540
(616) 279-2540
forward@net-link.net
http://www.twinbonanza.com

Associations and Type Club Listing (continued)

(Contact AOPA/EAA for Current Information)

Twin Cessna Flyer
Anthony Saxton
Technical Director
Box 860
Definance OH 43512
(419) 658-4444
(419) 658-2988
tony@tas-aviation.com

Twin Cessna Flyer
Larry Ball
President
512 Broadway, Ste. 102
New Haven, IN 46774
(219) 749-2520
(219) 749-6140
larry@twincessna.org
http://www.twincessna.org

World Beechcraft Society
Bill Robinson
President
500 SE Everett Mall Way
Suite A7
Everett, WA 98208-8111
(425) 267-9235
(425) 355-6173
bill@worldbeechcraft.com
http://www.worldbeechcraft.com

Appendix IV
A/W Contacts

Appendix IV
A/W Contacts

APPENDIX IV -- Airworthiness Contacts

Public contact number for SDRs/AIDs: **(405) 954-4173**
To Request SDR Data Reports: 9-AMC-AFS620-REQUEST@mmacmail.jccbi.gov

Aviation Safety Inspectors (ASIs)/Aviation Safety Engineers (ASEs) call:

Aviation Data Systems Branch** (AFS-620)**:		**(405) 954-4391, Fax: -4748**
David W. Fox**, Branch Manager (david.w.fox@faa.gov)**		**(405) 954-6502**
Misty Grantham**, Branch Secretary**		**(405) 954-6429**
Thomas (Tom) M. Marcotte *(thomas.m.marcotte@faa.gov)*	***(SDR Program Manager)*** 9-AMC-SDR-PrgMgr@mmacmail.jccbi.gov	**(405) 954-6500**
Robert M. (Mickey) Kedigh ***(robert.m.kedigh@faa.gov)***	***(Transport, Rotorcraft, and Amateur Built)***	**(405) 954-6509**
Isaac A. Williams *(isaac.a.williams@faa.gov)*	***(Small Airplanes)***	**(405) 954-6488**

National Transportation Safety Board (NTSB) Accident Reports:

***Analysis and Data Section*:**

Latricia Carter (carterl@ntsb.gov)	**(202) 314-6554**
Carol Floyd (floydc@ntsb.gov)	**(202) 314-6553**

Aircraft Certification Website: http://www.faa.gov/aircraft/air_cert

R1

Electronic version of this Small Airplane Directorate Airworthiness Concern Process Guide
http://www.faa.gov/aircraft/air_cert/design_approvals/small_airplanes/cos/continued_airworthiness/media CSGuide.doc

This cite also includes an explanation of the AD process, general certification information. etc. Select Aircraft Certification, then select "Airworthiness Directives" to launch "Regulatory and Guidance Library," which contains all ADs, aircraft certification related ACs, and aircraft certification regulatory action.

Flight Standards Web Sites/E-Mail Addresses:

FAA Flight Standards Service Aviation Information Web Site: http://av-info.faa.gov

SDR and M or D Electronic Form , SDR Query/Search Tool, ADs, NPRMs, Air Operator, Air Agency, Pilot Schools, Mechanic Schools, Repair Stations, SAIBs, NTSB Accidents, FAA Incidents, AFS Directory, etc.

FAA National Aviation Safety Data Analysis Center (NASDAC): http://intraweb.nasdac.faa.gov

NTSB and FAA Accident/Incident Data (A/IDS), FAA SDR Data Base Search Engine, etc.

AFS-600 HomePage Internet Address:
http://www.faa.gov/about/office/office_org/headquarters_offices/avs/offices/afs/afs600/

Use Search Button for: ACs, ADs, Alerts, Joint Aircraft System/Component Code Table & Definitions (Modified Air Transport Association (ATA) Codes)

FAA Advisory Circular (AC) 43-16A, General Aviation (GA) Alerts:

Phil Lomax | **(405) 954-6487**
Editors
FAA | **Fax: -4570**
ATTN: **AFS-640 ALERTS**
P.O. Box 25082
Oklahoma City, OK 73125-5029
E-Mail: phil_w_lomax@mmacmail.jccbi.gov | cc:Mail:Lomax, Phil W.

Special Airworthiness Information Bulletins (SAIBs):

Mary Ellen Anderson | **(405) 954-7071/-4103**
Information Program Manager
FAA
Airworthiness Programs Branch, AIR-140 | **Fax: -4104**
P.O. Box 26460
Oklahoma City, OK 73125-0460
Email: mary.ellen.anderson@faa.gov

SAIBs on the Web: http://av-info.faa.gov

Regional AD Coordinators:

Engine and Propeller Directorate, ANE-103:

Mary Culver, *AD Coordinator* — **(781) 238-7125**, **Fax: -7199**

Rotorcraft Directorate, ASW-111:

Patrick Long, *AD Coordinator* — **(817) 222-5115**, **Fax: -5961**

Small Airplane Directorate, ACE-103:

Larry Werth, *AD Coordinator* — **(816) 329-4147**, **Fax: -4149**

Transport Airplane Directorate, ANM-114

Rose Opland, *AD Coordinator* — **(425) 227-2154**, **Fax: -1232**

Airworthiness Programs Branch, AIR-140:

Mary Ellen Anderson, *Information Program Manager* **(AD Distribution)** — **(405) 954-7071/-4103**, **Fax: -4104**

Small Airplane Directorate Continued Operational Safety Program, ACE-110

R1

For clarification about ACS process, suggestions for improvements or changes, contact:

Marv Nuss **(816) 329-4117**
Email: marvin.nuss@faa.gov **Fax: -4090**
Barry Ballenger **(816) 329-4152**
Email: barry.ballenger@faa.gov **Fax: -4090**

Aviation Safety Accident Prevention (ASAP):

For questions about SDR searches using ASAP, contact:

R1

Melinda Alexander, *SAD Service Difficulty Specialist* **(316) 946-4114**
Email: melinda.alexander@faa.gov **Fax: -4407**
Cora Byrd, *Wichita ACO Service Difficulty Specialist* **(316) 946-4126**
Email: cora.byrd@faa.gov **Fax: -4407**
Kaye Henson, *Atlanta ACO Technical Support Specialist* **(770) 703-6047**
Email: kaye.henson@faa.gov **Fax: -6097**
Deborah Knight *Chicago ACO Aircraft Certification Assistant* **(847) 294-7053**
Email: deborah.knight@faa.gov **Fax: -7834**

For desktop access to the SDR data base/AIDS/ADs/etc., contact:

Ben Beets, **(817) 222-5169**
Software Engineer/Continued Operational Safety, ASW-110 **Fax: -5961**
Note: Windows based program allows ASEs/ASIs direct access to the SDR database. Internet access software, IDs, LAN system passwords, and modem software available upon request. ASEs/ASIs: Contact Ben to add selected aviation manufactures to the ASAP system. (for Mfgrs. data base searches.)

Aircraft Owners and Pilots Association (AOPA):

Andrew Werking, **(301) 695-2167**
Government Specialist of Regulatory & Certification Policy
Aircraft Owners and Pilots Association
421 Aviation Way
Frederick, Maryland 21701-4798
E-Mail: andrew.werking@aopa.org
AOPA's Web Site: http://www.aopa.org

Experimental Aircraft Association (EAA):

Earl Lawrence **(920) 426-6522**
VP Government Relations
Experimental Aircraft Association
P.O. Box 3086
Oshkosh, WI 54903-3086
E-Mail: Elawrence@eaa.org
EAA's "Aviation Safety Data Exchange" Web Site:
http://www.safetydata.com

Appendix V
Engine Risk Assessment

Appendix V
Engine R A

APPENDIX V

Memorandum

U.S. Department
of Transportation
Federal Aviation
Administration

INFORMATION: Risk Assessment for Reciprocating Engine Airworthiness Directives

Date: MAY 24 1999

Manager, Engine and Propeller Standards Staff, ANE-110

Reply to Attn. of: Mark Rumizen, ANE-110
781-238-7113
FAX 781-238-7199

To: Manager, Aircraft Manufacturing Division, AIR-200
Manager, Brussels Aircraft Certification Staff, AEU-100
Manager, Engine Certification Office, ANE-140
Manager, Engine Certification Branch, ANE-141
Manager, Engine Certification Branch, ANE-142
Manager, Boston Aircraft Certification Office, ANE-150
Manager, New York Aircraft Certification Office, ANE-170
Manager, Airframe and Propulsion Branch, ANE-171
Manager, Rotorcraft Directorate, ASW-100
Manager, Rotorcraft Standards Staff, ASW-110
Manager, Airplane Certification Office, ASW-150
Manager, Rotorcraft Certification Office, ASW-170
Manager, Special Certification Office, ASW-190
Manager, Small Airplane Directorate, ACE-100
Manager, Small Airplane Standards Office, ACE-110
Manager, Atlanta Aircraft Certification Office, ACE-115A
Manager, Propulsion Branch, ACE-140A
Manager, Chicago Aircraft Certification Office, ACE-115C
Manager, Propulsion Branch, ACE-118C
Manager, Wichita Aircraft Certification Office, ACE-115W
Manager, Propulsion Branch, ACE-140W
Manager, Anchorage Aircraft Certification Office, ACE-115N
Manager, Transport Airplane Directorate, ANM-100
Manager, Transport Standards Staff, ANM-110
Manager, Airframe and Propulsion Branch, ANM-112
Manager, Seattle Aircraft Certification Office, ANM-100S
Manager, Propulsion Branch, ANM-140S
Manager, Denver Aircraft Certification Office, ANM-100D
Manager, Los Angeles Aircraft Certification Office, ANM-100L

APPENDIX V – Engine Risk Assessment

1. INTRODUCTION

This memo provides guidance for Aircraft Certification Offices (ACOs) to use when evaluating reciprocating engine service problems for determination of appropriate FAA action. Airworthiness Directives (AD's) are required for unsafe conditions, but the determination of which types of engine service problems should be considered unsafe conditions is dependent upon the type of airplane in which the engine is installed. Reciprocating engines are typically installed in small airplanes intended for personal use, and the regulations governing the design and operation of these airplanes incorporate "mitigating features" to lessen the criticality of the engine. These mitigating features include low stall speeds, handling and stability criteria, emergency landing procedures, crashworthiness, and pilot training. These mitigating factors don't guarantee safety when an engine service problem occurs, but instead provide a level of assurance that a pilot can reasonably fly the airplane to a safe landing. Using loss of engine power as measure of an airplane's ability to accommodate engine failures, actual service data indicates that total aircraft power losses on turbine powered transport aircraft are ten times more likely to result in fatalities than on small piston powered GA aircraft. Therefore, it can be substantiated that General Aviation (GA) aircraft equipped with reciprocating engines differ from turbine powered transports relative to the criticality of the engine.

This uniqueness of the GA fleet has resulted in inconsistent bases for issuance of ADs related to reciprocating engine service problems. In some cases, ADs have been issued where other, less burdensome forms of FAA action would have been more appropriate. And, conversely, in some cases where no FAA action was taken, an AD was warranted based on the potential safety risk. The FAA and the turbine engine industry have addressed similar continued airworthiness inconsistencies by instituting formalized, quantitatively-based risk assessment methodologies for evaluation of service problems. Risk assessment methodologies can also be applied to the GA reciprocating engine fleet, but must be modified to accommodate the less sophisticated technical resources and the incompleteness and inaccuracies of service data that is typical of the GA industry. The risk assessment methodology presented below should be considered a general guideline, rather than a specific procedure, to use for the evaluation of GA reciprocating engine service problems. It must be emphasized that, because each service problem presents its own unique set of circumstances, the risk assessment methodology will need to be customized to accommodate each analysis.

2. RISK ASSESSMENT METHODOLOGY

A risk analysis utilizes data and information on a service problem to quantify the expected number of future events over a specified time period. The risk analysis should consider the consequences of the service problem relative to safety of flight, the probability of that service problem occurring, and the exposure of the current GA fleet to the problem. The following procedure is provided to assist in development of a risk

analysis for a GA engine service problem. Because the particular details of any given service problem vary, this procedure can only be considered a starting point; evaluation methods will likely require customization to fit the specific data. It should also be noted that in many cases, all of the necessary data may not be available, and estimates must be used in place of the actual data. If necessary, engineers or flight test pilots can be consulted regarding the characteristics of airplane response to a given engine problem.

An example based on an actual service problem will be provided to parallel each step of the following risk assessment process. Each subparagraph will contain its respective step from the example at the end of the descriptive text. The example will be based on the service problem evaluated for issuance of recent AD, which addressed failures of engine crankshafts.

a. Consequences of the Engine Service Problem

The first step in the process involves evaluation of the engine service problem to determine the potential effect on flight safety. For the purpose of this Guidance Memo, engine service problems that are being considered for AD action can typically be grouped in one of the three following hazard levels:

1. *Hazardous*: Engine service problems that cause fire, uncontainment or other problems that could result in immediate collateral damage to the aircraft. These require minimal evaluation as they represent a direct safety hazard to the aircraft and they should be considered an unsafe condition that warrants an AD. However, a risk analysis should still be performed to help determine compliance times for the AD.
2. *Major:* Engine Service Problems that cause a significant power loss. These events pose an indirect hazard to the aircraft and do not necessarily require an AD. As discussed above, the design of GA airplanes incorporate mitigating features that contribute to lessening the severity of an engine service problem. Other factors, such as probability of the event occurring and fleet exposure, need to be considered for these service problems before initiating an AD.
3. *Minor:* Other types of service problems that do not result in a significant power loss, such as a partial power loss, rough running, pre-ignition, backfire, single magneto failures. These are potential AD candidates only if the probability of the event is very high.

Information on the consequences of the service problem should be obtained from the production approval holder (PAH), which includes the engine manufacturer, STC holder, or PMA holder.

EXAMPLE: Manufacturing defects in a certain population of engine crankshafts had experienced numerous failures resulting in 13 accidents over a six year time period. Failure of the crankshaft resulted in immediate engine shutdown, but did not result in uncontained engine destruction, failure of the engine mounting system, fire, or other *collateral damage. Therefore, the failure mode posed an indirect hazard to the airplane and was classified as "major".*

b. Identification of Suspect Population

The suspect population consists of all engines on which the service problem might occur. This could include the entire fleet of a particular engine model, or a subset of that fleet. For example, a quality escape might only impact a range of engine serial numbers shipped over a certain time period. Identification of the suspect lot requires input from the PAH. The suspect population can be defined in the following terms:

- Direct Population: this represents the engines that are confirmed to have the suspect part or condition and on which the service problem might occur. The direct population can be defined only if records exist that specifically define engine serial numbers, or a range of engine serial numbers, on which the risk of the service problem exists. However, the number of engines in the direct population can be determined based on the number of parts shipped. The conversion of the number of suspect spare parts to an equivalent number of engines must take a conservative approach, and assume that a minimum number of the suspect parts were installed in each engine.
- Indirect Population: this represents the engines that require further inspection or maintenance action to determine if they have the suspect part or condition. This would apply if, for example, a suspect lot of spare parts were shipped to various third party repair facilities, and records are not available to identify which engine serial numbers the parts were installed in. Or, if the failure condition results from an improper repair or maintenance procedure, and it is not known which engines underwent the repair or action, then all engines of the particular model must be considered suspect.

Determination of the total number of engines of a particular model that are currently in service can be obtained from the engine manufacturer, or from the FAA aircraft registry in Oklahoma City.

<u>*EXAMPLE:*</u> *Data from the engine manufacturer and from the FAA indicates that the suspect crankshafts are installed on approximately 10,100 engines.*

- *Because the FAA/APO GA Survey presents operating hours for airplanes, not engines, the number of equivalent airplanes needs to be calculated:*
    - *assume 13% aircraft are twin engine (FAA/APO GA Survey)*
    - *10,100 engines = 87% N + 2 x (13% N), where N = total no. of airplanes*
    - ***N = 8938 airplanes**, (1162 twins + 7775 singles)*
- *this is the direct population because this is an estimate of the number of engines equipped with the suspect crankshafts*

c. Event Rate

The event rate is expressed as the number of service problem events per operating hour. The rate can be based on actual service experience, test data, or analysis. The rate may change with time; for example, for a fatigue-related problem, the rate may increase as a part or engine accumulates more total time.

In many cases, only data on the number of accidents is available, not the number of total events. The event rate will then need to be estimated from the available data. To accomplish this, the following relationship between shutdowns, accidents and fatal accidents was derived from an analysis of FAA SDR data and NTSB accident data:

- Shutdowns/power losses: >1 every 10,000 hours
- Accidents: 1 every 100,000 hours
- Fatal Accidents: 1 every 1,000,000 hour

For the purpose of the risk assessment, the event rate is assumed to be equivalent to the shutdown/power loss rate. The following formulas can then be used to estimate the number of events from available accident data:

- No. of events = (No. of accidents) X 10, or
- No. of events = (No. of fatal accidents) X 100

<u>EXAMPLE:</u>

- *NTSB accident data indicated 13 accidents due to failures of engine crankshafts over the period from 1986 to 1992*
    - *The event rate needs to estimated from the accident rate*
    - *It is assumed that the event rate will not change in the future.*
- *estimate applicable airplane flight hours over relevant time period*
    - *piston fleet est'd at 198,335 aircraft (FAA/APO GA Survey)*
    - *applicable airplanes estimated as 8938 (step b above)*
    - *applicable airplanes as % of piston fleet = 8938/198335 = 4.5% of fleet*
    - *189,947,000 hours for total fleet over '86-'92 time period*
    - *4.5% of total fleet hrs for applicable population =* ***8,559,036 aircraft hours***

- *calculate event rate*
    - *13 accidents/incidents over '86-'92 time period*
    - *13 accidents/ 8,559,036 hrs = 1.52 x 10^{-6} accident rate*
    - *10 x (accident rate) =* ***15.2 x 10^{-6} event rate***

d. Exposure to Failure Condition

The exposure to the service problem is a function of the suspect population, and the number of hours those engines can be expected to operate over a specified time period.

- Determination of the appropriate time period to use for the analysis depends on the characteristics of the service problem. In some cases, for high utilization aircraft, it may be appropriate to use the overhaul period and assume that maintenance is not performed between overhauls. A one year specified time period may be used if no other basis exists for the estimate.
- The number of hours per engine must be estimated. Manufacturer's data can be used, or the General Aviation and Air Taxi Activity Survey, published by the FAA Office of Aviation Policy and Plans, provides GA fleet utilization hours to estimate the number of hours the suspect population of engines are operated.
- The total hours of exposure of the suspect population can then be found by multiplying the direct population by the number of hours per engine per year, multiplied by the specified time period.

EXAMPLE: A one-year time period was chosen for this analysis and the utilization rate was estimated as 130 hour/airplane/year (based on FAA/APO GA Survey).

- *Exposure = (130 hrs/airplane/yr) x (8938 airplanes)* ***= 1.16x10^6 hours***

c. Expected Events

The expected number of events can then be found by multiplying the event rate by the number of hours of exposure over the specified time period. The expected number of events can then be compared to historical data or FAA safety objectives for the respective event criticality level (hazardous, major or minor) to determine the appropriate form of FAA action, if any. However, for small populations of at-risk engines, the risk exposure may be unacceptable even if the analysis forecasts a low number of expected events. In those cases, further analysis may be required.

The following table illustrates possible alternative courses of FAA action based on the risk assessment results. It is provided as a recommended guideline, and as previously stated, each service problem will have unique aspects that may require modifications to this process.

Recommended FAA Action[1]

Expected Number of Events[2]	Minor Failure Consequences	Major Failure Consequences	Hazardous Failure Consequences
Low	None ANPRM	GA Alert AC 43-16 Or SAIB	Airworthiness Directive (AD)
Medium	GA Alert AC 43-16 Or SAIB[3]	Airworthiness Directive (AD) (EXAMPLE)	Airworthiness Directive (AD)
High	Airworthiness Directive (AD)	Airworthiness Directive (AD)	Airworthiness Directive (AD)

1. This assumes that company actions such as Service Letters, Service Bulletins, and Type Club or other association publications will be taken. If not, then FAA action may be required to compensate for the lack of company action.
2. More precise objectives or levels for hazardous, major and minor events will be defined as reciprocating engine risk assessment experience is accumulated.
3. Special Airworthiness Information Bulletin

EXAMPLE:

- *Expected events = (event rate) x (exposure)*
  = (15.2 x 10^{-6} events/hour) x (1.16x10^{6} hours) ***= 18 expected events***
- *For the purposes of the table shown below, 18 expected events are assumed to represent a "medium" value, and for a major failure condition, an AD is recommended.*

f. Other Considerations

The following additional factors should be considered when evaluating the need to issue an AD:

- If the suspect parts are installed on an identifiable group of engines (i.e., by engine serial number), or if only a small fleet of the suspect engine model exists, then the per flight risk, or risk exposure of any individual aircraft, to the service problem is higher for a given event probability. In these cases, an AD would be more likely to be required.

- Service problem occurrence rates that change over time must be considered in the analysis. These service problems are typically fatigue-related and are more likely to occur as the part or engine accumulates more operating hours. Additional data is often required to properly assess these conditions.
- In some instances, where the indirect population greatly exceeds the direct population (those engines with the suspect part), the number of expected events will be low relative to the size of the fleet. If an AD is required, the AD compliance section should structured to limit the burden on the indirect population of engines.
- Other sources of data that can be used to support the risk analysis include FAA Service Difficulty Report (SDR) and Accident/Incident data, and data from GA organizations such as Airplane Owners and Operators Association (AOPA) or Aeronautical Repair Station Association (ARSA). These organizations can conduct surveys of their members to obtain specific information.

Thomas A. Boudreau

Appendix VI
Small Airplane Risk Assessment

Appendix VI -- Risk Assessment for Airworthiness Concerns on Small Airplane Directorate Products

1. Introduction and Overview/ General Discussion

This process is for Aircraft Certification Office (ACO) personnel to use when performing a service problem risk assessment on Small Airplane Directorate products for determination of appropriate FAA Airworthiness (A/W) corrective actions.

Airworthiness Directives (AD's) are required to address unsafe conditions, but the determination of which types of service problems should be considered as unsafe conditions is generally dependent upon the type and use of the aircraft. Small Airplane Directorate 14 CFR Part 23 product line ranges considerably from manned free balloons, airships, gliders, small single engine personal use airplanes, to business jets and multi-engine commuter turboprops used in 14 CFR Part 135 and 121 service

Operational Performance Risk (OPR) Groups: For Risk Assessment (RA) purposes, three groups within the SAD product line will be generally considered herein: Lower (OPR) group (1); Medium OPR group (2); and Higher OPR group (3):

<u>Lower OPR Group (1)</u>:
Includes manned free airships, gliders, sailplanes, primary category airplanes and restricted category airplanes and some (small) non-pressurized single engine airplanes. These aircraft are typically used in day only or day and night visual flight rules (VFR) operations. Limited instrument flight rules (IFR) operational capability. Predominately private use (14 CFR Part 91 Operations) Non-pressurized. The regulations governing the design and operation of these aircraft typically incorporate design features that make them somewhat more tolerant of failures (short of major structural failures). Features include low stall speeds, excellent low speed handling and stability, and typically operated under day-only VFR conditions. These factors don't guarantee safety in the event of a failure or service problem, but instead provide a level of assurance that a pilot can reasonably fly the airplane to a landing. Includes 14 CFR Part 91/135 (private use, flight instruction, private rental, and some air taxi operations).

<u>Medium OPR Group (2)</u>:
Generally includes medium performance single and multi-reciprocating engine airplanes approved for IFR operation. Includes pressurized airplanes used in known icing conditions. Considered less tolerant of failures due to typically higher gross weight and higher landing speeds. Multi-engined airplanes with more redundant features normally are prone to asymmetric thrust issues in the event of an engine failure. Typical single pilot operations. Service experience indicates an acceptable level of safety even for emergency landings. Includes 14 CFR Part 91 and 135 (non-scheduled airline) operations.

<u>Higher OPR Group (3)</u>:
Generally includes airplanes with complex systems, pressurized, two or more turbine engines, used in known icing conditions, and/or high speed/high altitude operations and with high stall speeds. Includes 14 CFR Part 91 (business jets), and 14 CFR Part 121 & 135 (scheduled and non-scheduled airline) operations.

This wide variety of Small Airplane Directorate products may result in an inconsistent basis for issuance of AD's. In some cases, AD's have been issued where other, less burdensome forms of FAA action would have been more appropriate. Conversely, in some cases where no FAA action was taken, an AD may have been warranted based on the potential safety risk.

Risk assessment methodologies can be applied to these products, but must be modified to consider the wide variation in technical resources, the service data completeness, and accuracy of service data. The risk assessment methodology that follows should be considered a general guideline to aid in evaluating a service problem, rather than a specific procedure that must be followed without exception. It must be emphasized that, because each service problem presents its own unique set of circumstances, the risk assessment methodology will need to be customized to accommodate each analysis.

1.1 Assumptions

This risk assessment is applicable to certificated small airplane directorate products that include (reference Section 3.1.b.):

OPR Group (1):
- Manned Free Balloons
- Airships
- Gliders and Sailplanes
- Primary Category Airplanes
- Restricted Category Airplanes

OPR Group (1/2):
- Single Reciprocating Engined Airplanes
- Multi Reciprocating Engined Airplanes

OPR Group (2):
- Single Turbine Engined Airplanes

OPR Group (2/3):
- Multi Turbine Engine Airplanes

OPR Group (3):
- Commuter Category Airplanes

These aircraft can be operated under 14 CFR part 91 "General Operating and Flight Rules" (for personal use and for hire). Some can be operated under 14 CFR part 135 and part 121 (for hire).

This diversity of aircraft classes and uses may make it difficult to determine appropriate airworthiness action. This process has been developed to help determine the airworthiness impact on aircraft based on service difficulty reports, accident data, and safety analysis.

The objective is to use this measurable and structured analytical process to determine appropriate airworthiness corrective actions. It is intended as a diagnostic tool for the FAA aviation safety engineer (ASE) as a supplement to the AD Handbook, in coordination with the respective Small Airplane Directorate AD technical writers and coordinators. It is recognized that many variables and circumstances beyond the scope of this process can influence the outcome. Since airworthiness actions differ, the SAD AD coordination group and FAA legal counsel can influence final AD actions.

14 CFR part 25 (Transport category) airplanes may require a different level of review. Other processes and procedures may also be valid in determining the probability or risk of occurrence, (e.g. FAA Advisory Circular (AC) 39.XX, ACE-110, ANE-110 and ANM-110 guidance/policies documents, etc.). This procedure compliments those efforts.

1.2 Consideration of Cost:

When an immediate safety of flight concern has been presented, cost should not be a primary consideration. The primary focus should be what corrective action must be taken to mitigate the A/W problem and the most effective means to notify the public.

When a safety of flight concern has been identified that does not require immediate action (e.g. NPRM), the consideration of cost (burden) can be effectively applied. It is important to remember that the great majority of airplanes in our country are privately owned and operated. AD actions require expenditure of limited resources. We should always minimize the burden on the public. Often, the public believes the FAA does not consider cost when identifying A/W corrective actions. To responsibly perform our duties, we should always strive to find the most effective means at the lowest cost to correct or mitigate potential safety of flight concerns. Seek type club economic impact input.

Note: Both Original Equipment Manufacturer (OEM) recommended method of compliance and any alternate method of compliance should be considered and incorporated if it maintains the appropriate level of safety while reducing the operator's economic compliance burden.

1.3 Immediate Safety Problems:

> Address *immediate safety problems* with Emergency AD mandatory inspection, or other appropriate means. Develop a short-term solution to *mitigate the immediate A/W safety problem* and then *use the expertise of the industry and users groups* to <u>create a cost-effective long-term corrective action</u>. Usually the longer term solution need not be immediately adopted as the mandatory inspection requirement would still be in place until public comments could be received, dispositioned, and then incorporated in the final AD action (e.g. NPRM process).

2. Definition of Terms

2.1 Safety Effect

The *Safety Effect* is the actual service report or potential outcome of the known failure condition. The more adverse the consequences, the higher the risk weighting. Information on the consequences of the service problem should be coordinated with the production approval holder

(PAH) and/or Industry Group. The weighting for each safety effect are shown in parentheses in the summary below:

Catastrophic effect (4)- High potential for loss of aircraft, multiple fatalities.

Hazardous effect (3)- Large reduction in functional capabilities or safety margins that can cause serious or fatal injuries.

Major effect (2)- Significant reduction in functional capabilities or safety margins that will cause physical discomfort or a significant increase in workload, possible injuries or fatalities.

Minor effect (1) - Slight reduction in functional capabilities or safety margins that will cause an increase in workload or require use of emergency procedures.

2.1.1

Safety Risk Factor is the potential risk based on potential safety effect listing (+ plus) aircraft type, operational use, etc. (see Section 3.1). The higher the number, the greater impact on overall risk on continued airworthiness.

2.2 Operational Use:

Operational use may play a role in appropriate A/W corrective action by impacting the priority in which the corrective action is accomplished. Because of this, an airworthiness safety condition in a single engine airplane operated under 14 CFR Part 91 may be treated differently from a 14 CFR Part 121 or 135 airplane in airline service. Note: A/W problems that result in an immediate safety of flight condition must be handled in the same manner regardless of operational type. **In no particular order:**

Passenger Service, (14 CFR Part 121 scheduled, part 135 unscheduled) - Scheduled passenger service requires the highest level of airworthiness oversight, prompt attention, and actions are needed when safety problems are reported.

Trainers - Rigorous operational use demanded. Numerous takeoffs, landings and power changes tend to stress airframe and powerplant/s. Accumulates hours (time-in service) quickly and are usually maintained under a structured maintenance program. Historically 100 hour or equivalent inspections per 14 CFR Part 43, were developed to mitigate higher number of hours per month operating rates and maintain a reasonable level of safety.

Agricultural Airplanes/Aircraft - Typically used in sparsely populated areas, single place (pilot) and Day VFR flight conditions. Several certification standards define agricultural aircraft including Civil Air Manual (CAM) 8, Civil Air Regulations (CAR) 3, 14 CFR Part 21.25 and Part 23, etc.

Acrobatics - Usually a special designed airplane with additional structural capability and wider range of performance. 14 CFR Part 23 acknowledges the higher structural loading and defines specific certification requirements.

Personal Use - Usually owned by individuals or small groups and operated under 14 CFR Part 91. Day VFR to night IFR operations. Generally, low fleet average operating hours per month. Annual inspection intervals. Low use can contribute to different airworthiness concerns than higher use aircraft.

Special Use - Banner towing, parachute jumping, aerial photography, medical transport, etc., may generate special concerns from this wide variety of operation.

2.3 Number of Occurrences of the Event:

The event is defined as the action that causes the ASE to begin an investigation to determine if an A/W corrective action is necessary. The event can be an aircraft accident, incident, NTSB Safety Recommendation, FAA Safety recommendation, SDR Study, congressional inquiry, or public inquiry, etc.

The number of occurrences is the total number of recorded events of that failure condition on that make and model aircraft.

2.4 Events versus Population:

The number of occurrences divided by the total number of registered aircraft of that make and model and configuration. Alternately, where a component is used on multiple makes and/or models, the number of occurrences divided by the total number of registered aircraft that incorporate the component. This is to be used as a “rough order of magnitude” number. Exact number is service is not necessary but would be helpful.

2.5 Time between Events:

Using all the occurrences counted in paragraph 2.3 above, determine the average of the times between events. For single events, use "average fleet age" as "time between events".

Default: If 'time' is unknown the following average flight hours per year (ball park estimate) may be used:

Primary Operational Use:	Hours per Year/Hours per Month:
Private Use:	75 hrs./year/6.25 hrs./month)
Business Use:	300 hours per year (25 hrs./month)
Air Taxi Use:	1200 hours per year (100 hrs./month)
Scheduled Airline Use:	2400 hours per year (200 hrs./month)

2.6 Aircraft Type:

Airships, Manned Free Balloons etc. – Better safety record than powered airplanes, gliders and sailplanes. Low safety impact due to failures. Treat separately on a case by case basis.

Gliders and Sailplanes - Unique operational use and safety impact. Lower safety effect (impact) than powered airplanes. Treat similar to single reciprocating engine airplanes.

Single Engine (reciprocating) - Single engine airplane design features tend to mitigate the hazardous effects of an engine failure. Low stall speed (61 knots or less), stable handling characteristics, good glide ratio, 14 CFR Part 23 structural requirements all indicate acceptable level of safety. Pilots typically make successful landings without power.

Studies indicate fatal accidents occur less than 1% of the time as a result of engine failures. Reasons include low stall speeds, conservative flight and stall handling characteristics, and 14 CFR Part 91 pilot training requirements, etc. Generally as airplane weight and performance increases, the impact of continued flight to a landing due to engine failure, increases. Service experience indicates private pilots typically land safely (on/off-airport) after engine failures. Refer to the Engine and Propeller Directorate for additional guidance in this area.

Multi Engine (reciprocating) - Shares design commonality with many twin engine turboprop airplanes; e.g. two engines, system backups, etc. to help mitigate failures that could impact continued safe flight to landing. Many twin-engine (reciprocating) airplanes have a stall speed of 61 knots or less (Reference 14 CFR Part 23). These airplanes typically provide for single pilot operations and service experience indicates an acceptable level of safety even for off-airport landings. It is noted that certain twin-engined (reciprocating) airplanes cannot maintain single engine level flight under all operating conditions. The glide may be extended with the remaining engine to allow the pilot to locate optional landing sites.

Single Engine Turbojet or Turboprop - Similar design certification requirements as a single reciprocating engine airplane, (e.g. low stall speed, etc.) with additional requirements to account for higher performance and mission capability. Some airplanes may have stall speeds above 61 knots. In these cases, other technologies are typically incorporated to mitigate the increased energy and other factors in an emergency situation (e.g. off-airport landing).

Twin Engine Turbojet or Turboprop Class - Considered high performance airplanes with relatively high stall speeds. Typically requires improved landing fields and fairly long runways for successful operations. Off-airport landings are significant in that damage to the airplane can involve occupant injuries. Airplane systems have built in redundancies to mitigate the potential for failures resulting in off-airport landings. There are usually two or more engines, airplane systems backups, usually a minimum crew of two, with extensive pilot training and recurrency requirements. These are a few examples used for continued safe flight to landing after a failure occurs that compromises safety.

Commuter Class - Considered same as Part 25, highest level of safety desired and needed.

3.0 Risk Assessment Methodology

Determine the **Safety Effect** and the **Safety Risk Factor** and plot the results of the assessment on the Initial Risk Assessment Evaluation Chart (shown in Figure 1 and 3) using the methodology that follows. From the chart, determine the most likely AD action or other method of alerting the public to the service difficulty such as SAIB, GA Alert, Manufacturer's Service Bulletin, etc. The chart provides a global perspective to assist the evaluator to determine potential corrective action means.

3.1 Initial Risk Assessment Evaluation Chart

The chart is not intended to mandate A/W corrective actions, but is intended to supplement the decision-making process. The chart values were determined from prior experience and may be revised further as dictated by future experience. In certain cases, experience and judgement may drive the user to a different conclusion. In those cases, please consult with the Small Airplane Directorate AD coordinator.

The **ordinate (y-axis)** denotes the **Safety Effect** and it's effect on continued airworthiness. The four categories are Minor, Major, Hazardous, and Catastrophic (see section 3.1). The categories are intended to weigh the relative effects of an airworthiness problem and it's effect on *continued flight to a landing*. The user can interpolate and assess a safety effect score between the values stated below, although it is not recommended to refine the **Safety Effect** number below a 0.5 (1/2) range.

The higher the Safety Effect, the more negative the airworthiness effect. The airworthiness impact determination is very important and must be carefully analyzed to minimize the burden on the public while maximizing the mandatory corrective action (if necessary) to mitigate the airworthiness problem.

The **abscissa (x-axis)** denotes the **Safety Risk Factor.** The safety risk factor increases from left to right and is calculated using the following:

Safety Risk Factor = <u>Safety Effect (**a**)</u> x <u>Operational Use (**b**)</u> x <u>Percentage used by population (**c**)</u> + <u>Number of Occurrences (**d**)</u> + <u>Events versus Population (**e**)</u> + <u>Time between Events (**f**)</u> + <u>Aircraft Type (**g**)</u>

Where:

a. Safety Effect (reference Section 2.1):

Catastrophic	**(4)**
Hazardous	**(3)**
Major	**(2)**
Minor	**(1)**

b. Operational Use (reference Sections 1.1 and 2.2):

14 CFR Part 135/121	**(3)**
14 CFR Part 91 (for hire)	**(2)**
14 CFR Part 91 (personal)	**(1)**

c. Percentage Use by Population (*):

>75% 14 CFR Part 135/121	**(4)**
>50% 14 CFR Part 135/121	**(3)**
>25% 14 CFR Part 135/121	**(2)**
<25% 14 CFR Part 135/121	**(1)**

d. Number of Occurrences (reference Section 2.3):

5 +	**(3)**
3 to 5	**(2)**
1 to 3	**(1)**

e. Events versus Population (reference Section 2.4)*:

10% +	**(2)**
1% +	**(1)**
0.1%	**(0)**
Less than .1%	**(-1)**

f. Time between Events (reference Section 2.5):

Over 3 years	**(-1)**
Over 2 years	**(0)**
1 to 2 years	**(1)**
Less than 1 year	**(2)**

g. Aircraft Type (reference Section 2.6):

Commuter/Twin Turbojet	**(3)**
Turboprop	**(2)**
Twin Engine Reciprocating	**(1)**
Single Engine Reciprocating	**(0)**
Single Engine Jet**	**(0)**
Glider/Sailplane	**(-1)**
AG Airplane	**(-2)**
Airship/Balloon	**(-3)**

* Exact numbers are not necessary. The important issue is to determine applicable values based on sound engineering judgement. Industry and association databases or other expertise including airline trend analysis personnel may be utilized to determine best numerical values.

**Assumes similar operational performance (stall/landing speed) to high performance single engine reciprocating aircraft.

4.0 Safety Effect Determination

The Safety Effect determination has a significant impact on the response to an airworthiness concern or service problem.

4.1 Accident/Incidents:

SDR reports, NTSB safety recommendations, FAA safety recommendations, or an airplane accident/incident are the most common triggers of airworthiness investigations. An actual aircraft accident or incident event is very significant and should influence the ASE's decision on what action to take. Understanding the actual aircraft accident/incident event versus a SDR report provides important insight on the actual safety effect versus a potential safety effect.

Example: An airplane experiences a partial hydraulic failure in a critical flight control system. The flight crew is able to control the airplane to a landing but runs off the end of the runway damaging the airplane. In the Safety Effect Listing (reference Section 5.0), a partial hydraulic failure is identified as a potentially a **hazardous** safety effect. The actual accident/incident outcome may have contributed to a **major** safety effect impact on the continued safe fight to a landing.

Note: Some airplane designs may provide additional capabilities enabling the crew to cope with a partial hydraulic failure lowering the safety effect from **hazardous** to **major to even minor**. Other designs may not be as robust. This is where additional data gathering and expert engineering consultation would help. Reviewing the FAA's SDR Aviation Safety Accident Prevention (ASAP) database may provide more reports of similar service difficulties for that particular type design. Other examples of similar failure conditions may result in a **catastrophic** outcome. In that case, your investigation may lead you to conclude that a partial hydraulic failure has a bigger safety impact than the Safety Effect Listing indicates (**catastrophic** vs. **hazardous**).

In conclusion, real world outcomes often provide valuable insight when making safety effect determinations.

4.2 Service Difficulty Reports:

The *trend or pattern* from service difficulty reports (SDRs) should be an integral part of the evaluation. In general, the greater *number of SDRs per fleet size*, the more concern or attention needs to be paid depending on the airworthiness *impact concerning continued flight to a landing*. The *time frame* in which the reports are cited is also important. Often an initial SDR is followed or preceded by additional reports of the same or similar condition over a relatively short period of time (2 years or less.). At the same time SDRs with *minor or minimal (No) effect upon airworthiness* may occur several times over a relatively short period. These may need less attention/action, as the overall negative effect on continued flight to a landing is low.

The chart and process can be used by considering Safety Effect impact using two definitions and averaging. For example, a particular type of failure report may potentially be both hazardous and catastrophic. In those cases, engineering judgment is required, however a reasonable approach is to add the two Safety Effect numbers and average the sum. This may provide additional insight on the appropriate AD action.

5.0 Safety Effect Listing

The following list of safety of flight examples is broken-down by potential airworthiness *impact*. This is a guide, not hard and fast rules, or an exhaustive list. The listing is provided to assist the evaluator. Some of the examples shown in each category listing may result in a higher probability for that identified outcome than another in the same category. Examples were grouped together by service experience, FAA AC documents, Society of Automotive Engineers (SAE) Aerospace Recommended Practices (ARP) publications, and engineering judgement. An obvious example is failure of the primary structure versus failure of a powered flight control system. Primary structural failure *results* in a catastrophic event while failure of a powered flight control system *may have high potential* for a catastrophic event. This difference needs to be evaluated during the AD review process. Engineering judgement is needed and the intent of these listings is to provide a basis for the evaluator. Other sources of information and expertise that can be helpful include senior engineering experts, industry groups, industry guidelines, AD coordination group, Directorate specialists, etc.

5.1 Examples of Conditions that have a potentially CATASTROPHIC effect (4)

Failure of the primary aircraft structure
Failure of powered flight control system
Failure of a propeller blade (at the shank)
Failure of a propeller hub
Failure of a propeller control system
Total loss of flight instruments
Engine fire that causes an accident
Cabin fire
Significant electrical system fire
(Engine) failure of the rotating system (Not reciprocating engines)
Engine turbine wheel burst
Engine compressor wheel failure
Engine shaft disconnect/failure
Complete hydraulic system failure
Runaway trim system
Autopilot hardovers
Failure or malfunction of the engine Full Authority Digital Electronic Control (FADEC) Powerplant Control) overspeed protection system
Malfunction of an airplane stick pusher
Malfunctioning thrust reverser in flight
Structural, engine and or propeller repairs not performed properly and a failure occurs

5.2 Examples of Conditions that have a potentially HAZARDOUS effect (3)

Crack in Primary Structure (Repairs Needed)
Engine fires
Carbon monoxide in cabin
Failure or malfunction of engine control system (FADEC) causing loss of powerplant control
Powerplant performance enhancement trim system
Stick pusher if warning is given
Powered flight controls if one loss on one axis only
Total loss of navigation and communication
Loss of or misleading airspeed information for high performance airplanes
Loss of altitude information
Total power loss
Partial hydraulic failure (flight critical systems)
Partial propeller blade failure (mid-span or outboard)
Partial electrical system failure
Failure of the pilot's seat
Failure of Vacuum pump
Engine system accessories
Failure of propeller governor
Failure of trim tabs R1

Deleted: Failure of landing gear¶

5.3 Examples of Conditions that potentially have a MAJOR effect (2)

Crack in Primary Structure (Inspections Needed)
Total loss of or misleading airspeed information
Total loss of directional heading information
Total loss of navigation information
Failure of landing gear R1
Loss of Landing gear control (up/down)
Loss of airplane steering
Airplane tire failure
Total loss of braking (airplanes greater than 6,000 lbs.)
Total loss of powerplant fire warning system
Loss of one engine (multi-engined aircraft) (results in A/C damage)
Partial loss of hydraulic system (multi-circuit systems)
Failure of primary engine overspeed governor
Failure of auxiliary fuel pump
Failure of the primary engine fuel pump (results in A/C damage)
Failure of the engine coolant system
Improper structural, engine, or propeller repairs

<u>5.4 Examples of Conditions that potentially have a MINOR effect (1)</u>

Cracks found in secondary aircraft structures
Unusual wear found in rotating aircraft assemblies (landing gear components, mechanical flight control systems, bearing, etc.)
Loss of one engine (multi-engined aircraft)
Loss of primary engine fuel pump (does not cause engine failure – may cause performance degradation)
Failure of air temperature gauge
Failure of the aircraft overspeed warning
Electrical power indicating gauge/system
Loss of powerplant torque indicating system
Failure of thrust reverser to deploy on ground
Failure of powerplant fuel flow indicating system
Failure of fuel pressure indicating system
Loss of powerplant air inlet temperature system
Loss of engine EGT/CHT indicating system
Loss of engine manifold pressure indicating system
Failure of oil pressure indicating system
Failure of oil temperature indicating system
Loss of engine tachometer/indicating system
Failure of engine coolant indicator
Failure of landing gear position indicating system
Total loss of braking (airplanes under 6,000 lbs.)
Loss of trim indicating system
Loss of trim control
Failure of the stall warning system
Failure of the vertical speed indicator
Loss of communication
Loss of time indicating system

6.0 Other Considerations

The following additional factors should also be considered during the risk assessment process:

- Sometimes, suspect parts are installed on an identifiable group of airplanes (i.e., by serial number), or only a small fleet of the suspect engine model exists. In these cases the risk exposure to the service problem of any individual aircraft in that group is higher than if the service problem were distributed randomly. If an AD is required, the AD compliance section should be structured to limit the burden on the unaffected airplanes.

- Service problem occurrence rates that change over time must be considered in the analysis. These service problems are typically fatigue-related and are more likely to occur as the aircraft or component accumulates more operating hours. Additional data is often required to properly assess these conditions.

- In general, an airworthiness report involving an Urgent Safety of Flight Situation falls within two AD rulemaking procedures (e.g. Emergency AD or (Immediate) Adopted Final Rule (With Request for Comments). Use the most expeditious means to correct an A/W issue. A/W corrective actions impose a burden on the public. It is important that the ASE properly assesses this public impact. Use this procedure for a “first cut” of appropriate A/W corrective actions. Include the Directorate AD coordination group early in your A/W corrective action decision making process for additional insight in addressing the safety of flight condition.

7.0 Sample Calculations (reference Section 3.1 and Fig's. 2 & 3)

Safety Risk Factor = Safety Effect (**a**) x Operational Use (**b**) x Percentage used by population (**c**) + Number of Occurrences (**d**) + Events versus Population (**e**) + Time between Events (**f**) + Aircraft Type (**g**)

Example 1: 14 CFR Part 91 Airplane Fatal Accident (Failure of propeller hub)

Safety Effect = Hazardous (a = 4)
Safety Risk Factor = (a = 4) x (b = 2) x (c = 3) + (d = 1) + (e = 0) + (f = 1) + (g = 2) = **28**
A/W Action = Potential Emergency AD

Example 2: 14 CFR Part 91 Airplane Accident (No Fatalities), substantial damage, some injuries (Loss of One Engine)

Safety Effect = Major (a = 2)
Safety Risk Factor = (a = 2) x (b = 2) x (c = 2) + (d = 1) + (e = 0) + (f = 1) + (g = 1) = **11**
A/W Action = Potential NPRM

Example 3: 14 CFR Part 121/135 Airplane Accident (No Fatalities) (Total Loss of Navigation Information.)

Safety Effect = Major (a = 2)
Safety Risk Factor = (a = 2) x (b = 3) x (c = 4) +(d = 1) + (e = 1) + (f = 1) + (g = 3) = **30**
A/W Action = Potential NPRM

Example 4: 14 CFR Part 121/135 Engine or Propeller Failure (No Fatalities) (Engine or propeller had uncontained failure)

Safety Effect = Hazardous to Catastrophic (a = 3.5)
Safety Risk Factor = (a = 3.5) x (b = 3) x (c = 4) + (d = 1) + (e = 1) + (f = 1) + (g = 2) = **47**
A/W Action = Potential Emergency AD

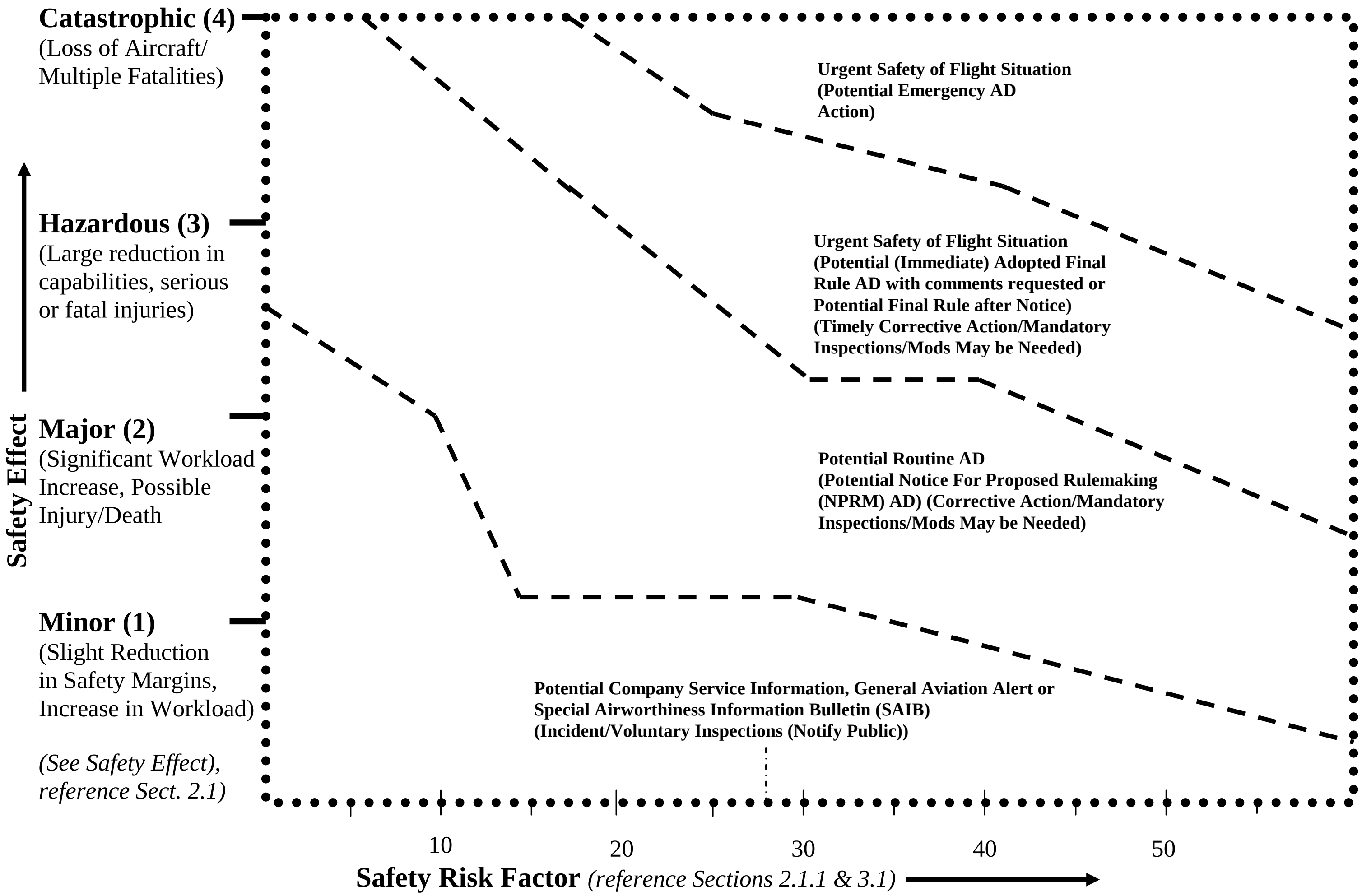
Example 5: 14 CFR Part 91 Airplane Accident (Fatalities) (Total Loss of Flight Instruments)

Safety Effect = Catastrophic (a = 4)
Safety Risk Factor = (a = 4) x (b = 1) x (c = 1) + (d = 1) + (e = 0) + (f = 1) + (g = 1) = **7**
A/W Action = Potential NPRM/Emergency AD (Judgement Call)

Example 6: 14 CFR Part 91 Service Difficulty Reports (Part failure) (No accident)

Safety Effect = Major (a = 2)
Safety Risk Factor = (a = 2) x (b = 1) x (c = 1) + (d = 3) + (e = 0) + (f = 0) + (g = 0) = **5**
A/W Action = Potential SAIB, GA Alerts article and/or manufacturer's service bulletin.

Figure 1. Initial Risk Assessment Evaluation Chart

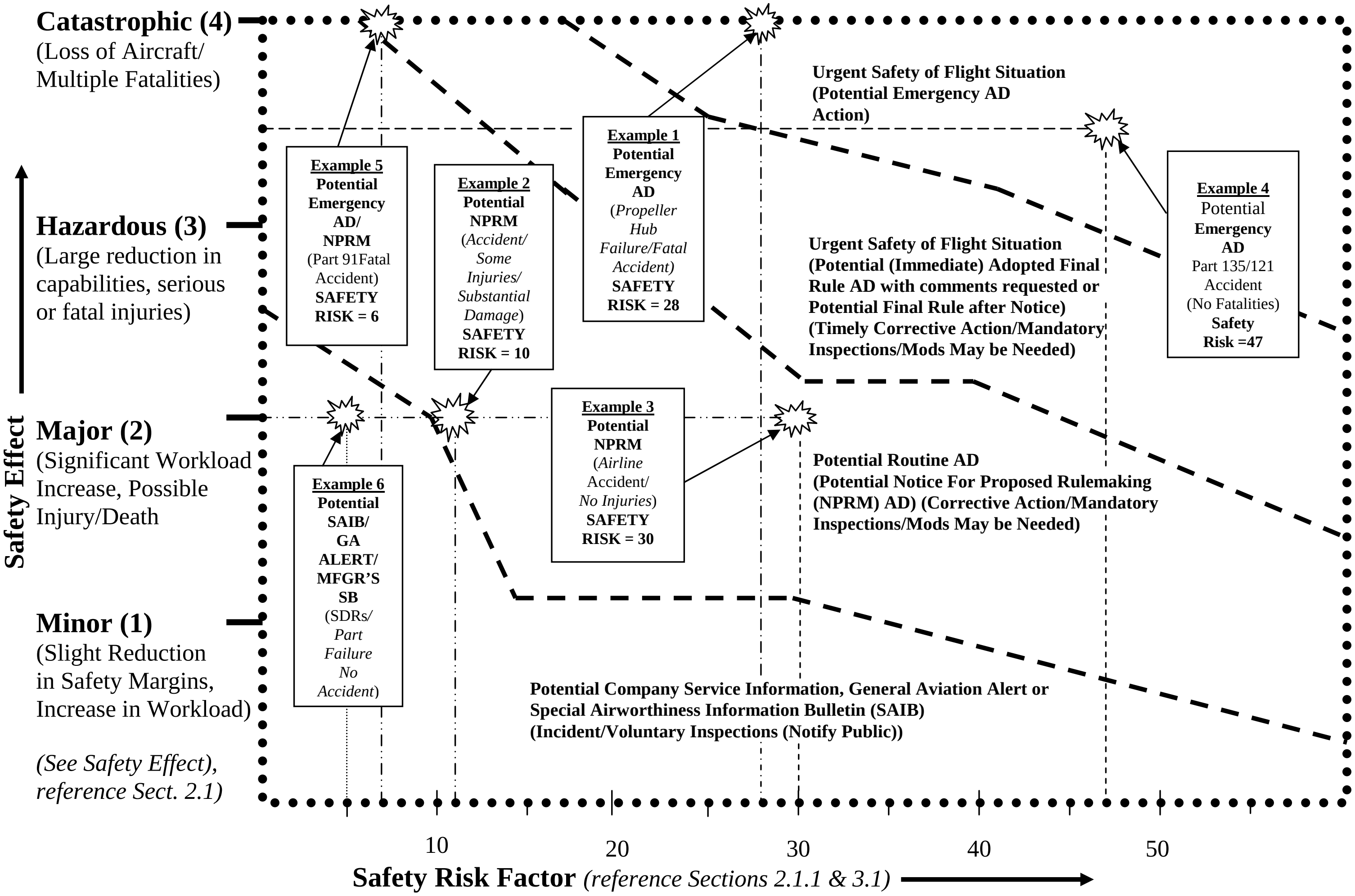


Note: This chart is not intended to mandate A/W corrective actions, but is intended to supplement the decision-making process.

Figure 2. Sample Calculations (reference Section 7.0)

Accident/ Incident Examples (ref. 7.0)	a. Safety Effect (ref. 3.1.a.)	X	b. Operational Use (ref. 3.1.b.)	X	c. Percentage Use by Population Part 135/121 (Vs. Part 91) (ref. 3.1.c.)	+	d. Number of Occurrences (ref. 3.1.d.)	+	e. Events Vs. Population (ref. 3.1.e.)	+	f. Time Between Events (ref. 3.1.f.)	+	g. Aircraft Type (ref. 3.1.g.)	=	Safety Risk Factor from (ref. 2.1.1, 3.1)
Example 1 *Fatality, Prop Hub Failure*	**4** *Catastrophic*		**2** *Part 91 (for hire)*		**3** *Part 135/121 (50% +)*		**1** *(1 to 3)*		**0** *0.10%*		**1** *(1 to 2 years)*		**2** *Turboprop*		**28** *Potential Emergency AD*
Example 2 *Part 91, Injuries, Substantial Damage*	**2** *Major*		**2** *Part 91 (for hire)*		**2** *Part 135/121 (25%+)*		**1** *(1 to 3)*		**0** *0.10%*		**1** *(1 to 2 yrs.)*		**1** *Twin Engine Recip.*		**11** *Potential NPRM*
Example 3 *Part 135/121 Accident No Fatalities*	**2** *Major*		**3** *Part 135/ 121*		**4** *Part 135/121 (75%+)*		**1** *(1 to 3)*		**1** *1% +*		**1** *(1 to 2 yrs.)*		**3** *Commuter / Twin Turbojet*		**30** *Potential NPRM*
Example 4 *Part 135/121 Engine or Prop Failure No Fatalities (Uncontained)*	**3.5*** *Hazardous to Catastrophic*		**3** *Part 135/ 121*		**4** *Part 135/121 (75%+)*		**1** *(1 to 3)*		**1** *1% +*		**1** *(1 to 2 yrs.)*		**2** *Turboprop*		**47** *Potential Emergency AD*
	* Note: Engineering judgment may dictate adding/subtracting half points for failures bordering between safety effect criteria.														
Example 5 *Fatal* Airplane Accident	**4** Catastrophic		**1** *Part 91* (Personal Use)		**1** *Part 135/121 (Less than 25%)*		**1** *(1 to 3)*		**0** *0.10%*		**1** *(1 to 2 yrs.)*		**1** *Twin Engine Recip.*		**7** *Potential Emergency AD or NPRM*
Example 6 *Part 91 SDRs*	**2** Major		**1** *Part 91* (Personal Use)		**1** *Part 135/121* (Less than 25%)		**3** *(5+)*		**0** *0.1%*		**0** *(Over 2 yrs.)*		**0** *Single Engine/ Jet*/Recip.*		**5** *Potential SAIB, GA Alerts, Mfg.'s SB*

Figure 3. Initial Risk Assessment Evaluation Chart (IRAEC)



Note: This chart is not intended to mandate A/W corrective actions, but is intended to supplement the decision-making process.

Appendix VII
Special Air Worthiness Information Bulletin (SAIB) Guide

APPENDIX VII
Special Airworthiness Information Bulletin (SAIB) Guide

I. <u>When an SAIB is appropriate</u>:

- **<u>Type Certificated (TC'd) Aircraft</u>:**

- A risk analysis determines the safety condition does not warrant Notice of Proposed Rule Making (NPRM) Airworthiness Directive (AD) action, but warrants owner/operator notification.
    - The safety condition warrants enhanced operational or maintenance awareness, but not at the mandatory rule making level.
    - The safety condition warrants an General Aviation Maintenance Alerts article (see Appendix VIII).
- If not sure, coordinate with your Directorate AD coordinator, to determine if an SAIB is warranted (see Appendix IV).

- **<u>Experimental aircraft:</u>**
    - ADs are not applicable to non-TC'd amateur built aircraft (unless addressing a safety condition involving a TC'd engine or propeller).
    - SAIBs are the most serious action the FAA may take for amateur built aircraft.
    - Appropriate for a serious safety condition (catastrophic effect), that if not corrected, could result in a future accident.

II. <u>How to fill out an SAIB:</u>

Note: check the Web at http://av-info.faa.gov to review sample SAIBs.

- **<u>Introduction</u>**:
    - The purpose is to inform registered owners of a potential safety problem in general terms. "The SAIB is advisory in nature and is not mandated by regulation."
- **<u>Background</u>**:
    - "This SAIB is prompted by reports of …" (describe the safety condition that warrants owner/operator notification of the potential safety condition).
    - Describe the conditions under which the safety condition can occur.
        - Who, What, When, Where, How, Why ?
- **<u>Recommendation</u>**:

- “The FAA is recommending, but not mandating the following:”

- “The FAA highly recommends registered owners of (make/model), etc…”

  - The description should succinctly explain what is recommended and the expected benefits (and potential risk) expected if the recommended action is or is not taken.

- **For Further Information Contact**:

  - List your office address.

- **Attention**:

  - Provide your name, phone and facsimile numbers, cc:Mail address, etc.

  - The manufacturer’s name, phone and facsimile numbers, and Email address.

  - Web site address where service information, letters, bulletins, etc. may be reviewed and downloaded.

III. Coordinate the SAIB draft with your Directorate’s AD Coordinator (see Appendix IV):

- The SAIB is coordinated within the ACO, then forwarded to the applicable Directorate AD Coordinator (Reference Appendix IV).

- The Directorate AD Coordinator forwards the draft SAIB to AFS-600.

IV. Contact the SAIB Information Program Manager at AFS-600 (see Appendix IV):

- Determine mailing list:

  - Owners
  - Repair Stations
  - Foreign CAAs
  - Inspection Authorized (AI) Repairmen (authorized to sign off annual inspections)
  - Associations
  - Type Clubs

- Note: AFS-600 may make mail list recommendations.

Appendix VIII
General Aviation (GA) Alerts
Guide

Appendix VIII
GA Alerts Guide

APPENDIX VIII -- AC 43-16A, GA Alerts Guide

I. How to determine if an Alerts article is appropriate:

- A risk analysis determines the safety condition does not warrant Airworthiness Directive (AD) action:
    - The safety condition warrants enhanced operational or maintenance awareness, but not at the mandatory rule making level.
    - The safety condition warrants or does not warrant an SAIB (see Appendix VI). If the safety condition can be addressed by maintenance, default with an Alerts article.

II. Alerts article examples:

- Review published Aviation Maintenance Alerts articles by checking the AFS-620 web site at: http://www.faa.gov/about/office_org/headquarters_offices/avs/offices/afs/afs600/afs620/ then select **Maintenance Alerts**

III. Filling Out the Alerts article:

- The **article** line includes the following:
    - Make; Model; Popular Name; Defective Part Name/Operational Condition, etc.; ATA Code (Check JASC Code Table (formerly ATA) at the AFS-600 web site, above.
- The **body** of the article includes the following:
    - Describe the who, what, where, when, how of the safety condition followed with recommended action as appropriate.
- **Part total time** (if known). If not known or not applicable, so state.

Coordination with AFS-640:

- Contact the AFS-640 Alerts editor (see Appendix IV).
    - The editor will review the draft and have final say on its contents.
    - Ask to review the finished version.
    - Provide technical input. The editor will retain final article composition responsibility.