APPENDIX II

FAA

Airworthiness Concern Sheet

Date: 11/6/00

Roy E. Boffo, III
Aerospace Engineer
Chicago Aircraft Certification Office
Systems and Flight Test Branch
2300 E Devon Ave.
Des Plaines IL 60018
847-294-7564 roy.boffo@faa.gov

Make, Model, Series, Serial No.: All twin reciprocating engine small airplanes certificated under CAR 3 or 14CFR Part 23 that have gyroscopic instruments which are powered by single or dual vacuum sources.

Reason for Airworthiness Concern: The loss of all or partial attitude and directional indication can cause the pilot to have spatial disorientation. Spatial disorientation can cause the pilot difficulty in recovering from unusual attitudes.

FAA Description of Airworthiness Concern (Who, What, Where, When, How? Attachments: RA and appropriate data) *and* **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.): A recent Cessna C335 accident occurred after the pilot reported problems with vacuum driven indicators. The airplane crashed killing all 3 persons on board. The check valves from the accident airplane were badly damaged in the crash and could not be evaluated. A review of the FAA Service Difficulty Reports (SDR) revealed that there have been 1,990 reports of vacuum system component failures which could cause similar problems encountered by the accident airplane. Eighteen of these reports occurred within the past 12 months.

A recent "Product Reference Memo" from Parker Hannifin (Airborne) denoted a potential latent failure of their check valves which could cause a dual vacuum system failure The loss of the vacuum system causes failure of the attitude and directional indicators in the cockpit. The loss of all or partial attitude and directional indication can cause the pilot to have spatial disorientation. Spatial disorientation can cause the pilot difficulty in recovering from unusual attitudes.

The FAA anticipates issuing a Notice of Proposed Rulemaking (NPRM) for an Airworthiness Directive to incorporate the replacement requirements of the attached Airborne Product Reference Memo (ten years after manufacture date). In addition, the NPRM will propose a change to the Airplane Flight Manual (AFM) to require a specific check of the vacuum system at engine start up. This check would require the pilot to start each engine separately and watch the vacuum driven gauges to verify proper opperation. In the interim, while the AFM has not been changed, the airplane would be restricted to DaytimeVisual Flight Rules (VFR). Terminating action for these requirements would be to install an alternative power source (such as electrical) or another type of system.

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

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

Response Requested By: 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)

INITIAL SAFETY RISK FACTOR CALCULATION

Aircraft Make:	Cessna	**Model/No. Acft.:**	C335/65(?)	**A/W Concern:**	Vacuum valve: single point of failure for flight instruments?
Component Make:	Parker Hannifin	**P/N:**	?		

Step 1: Determine **Safety Effect.**

a. **Safety Effect:**	b. **Operational Use:**	c. **% use by population:**	d. **Number of Occurrences:**	e. **Event vs Population:**	f. **Time between Events:**	g. **Aircraft Type:**
Catastrophic = 4	Part 135/121 = 3	>75% 135/121=4	5+ =3	10%+ = 2	Over 3 years = (-1)	Commuter/Twin Turbojet = 3
Hazardous = 3	Part 91 (for hire) = 2	>50% 135/121 = 3	3 to 5 = 2	1%+ = 1	Over 2 years = 0	Turboprop = 2
Major = 2	Part 91 (personal) = 1	>25% 135/121 = 2	1 to 3 = 1	0.1% = 0	1 to 2 years = 1	Twin Engine Recip. = 1
Minor = 1		<25% 135/121 = 1		Less than .1% = (-1)	Less than 1 year = 2	Single Engine Recip. = 0
						Single engine jet = 0
						Glider/Sailplane = (-1)
						AG Airplane = (-2)
						Airship/Balloon = (-3)

Step 2: Determine **Safety Risk Factor** by using the below formulae:

Safety Risk Factor =	**Safety Effect (a.) x**	Operational Use (b.) x	Percentage used by Population (c.) +	Number of Occurrences (d.) +	Event vs. Population (e.) +	Time between Events (f.) +	Aircraft Type (g.)
Enter #'s here:	3	2.5	3	1	1	1	1

Step 3: Enter **Safety Risk Factor** on the 'x' (abscissa) axis, on Initial Risk Assessment Chart (IREAC), Figure 1:

Calculated **Safety Risk Factor =** 26.5

Step 4: Enter **Safety Effect** on the 'y' (ordinate) axis, on Initial Risk Assessment Chart (IREAC), Figure 1:

Safety Effect = 3

(Note: The result will provide an initial indication of potential A/W concern corrective actions.)

(Reference: FAA Small Airplane Directorate AD Manual Supplement (A/W Concern Process (ACP) Guide), Appendix VI, Par. 3.0, and Fig. 1.) (Available at: http://www.faa.gov/avr/ace/acehome.htm.)

Initial Risk Assessment Evaluation Chart (IREAC)

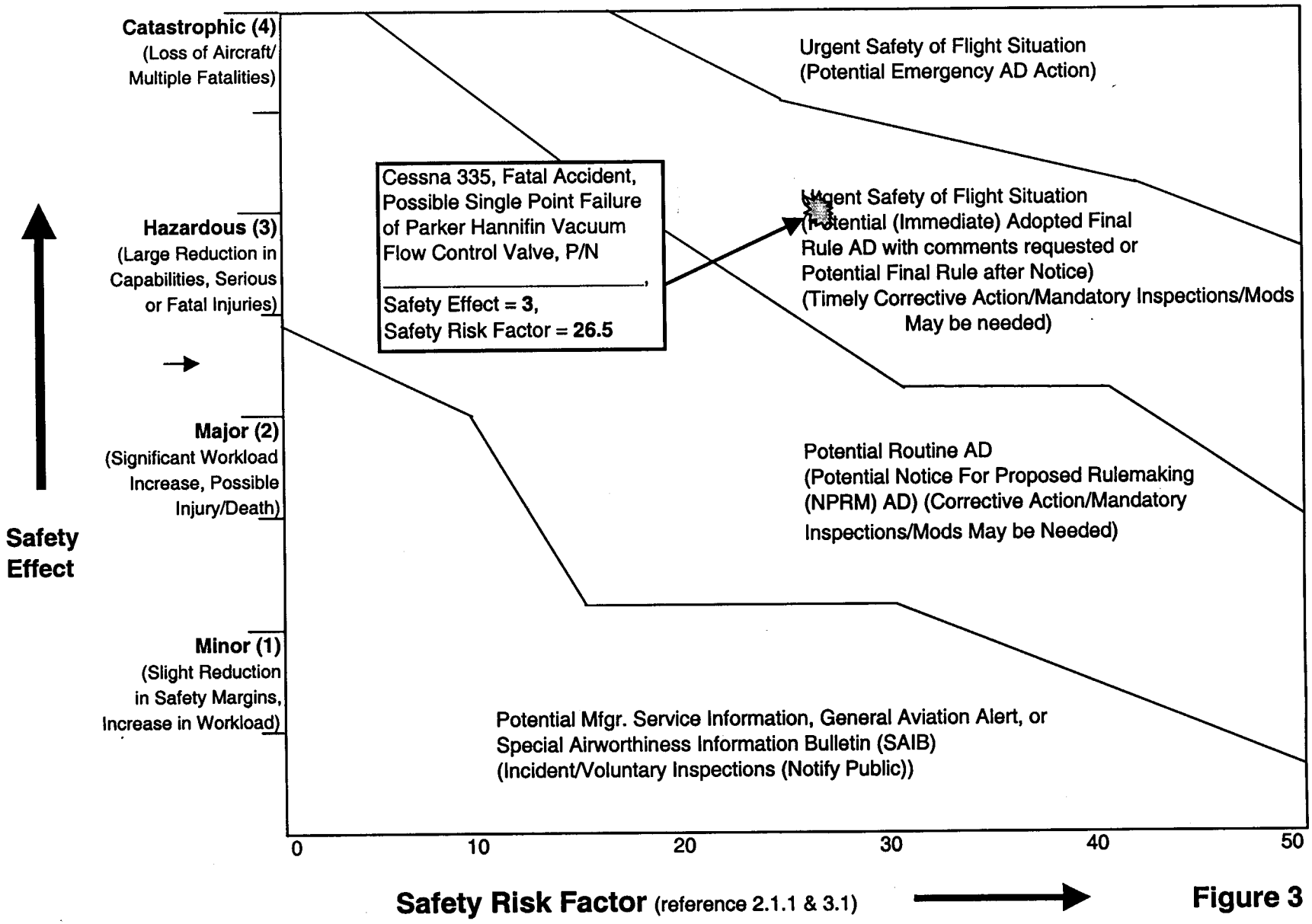

Figure 3

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

INITIAL SAFETY RISK FACTOR CALCULATION

Aircraft Make: Multiple
Component Make: Vacuum System
Model/No. Acft.: Twin Engine Recip.
P/N: ?
A/W Concern: Vacuum System failure causing incorrect information from flight instruments?

Step 1: Determine **Safety Effect.**

a. Safety Effect:	b. Operational Use:	c. % use by population:	d. Number of Occurrences:	e. Event vs Population:	f. Time between Events:	g. Aircraft Type:
Catastrophic = 4	Part 135/121 = 3	>75% 135/121=4	5+ =3	10%+ = 2	Over 3 years = (-1)	Commuter/Twin Turbojet = 3
Hazardous = 3	Part 91 (for hire) = 2	>50% 135/121 = 3	3 to 5 = 2	1%+ = 1	Over 2 years = 0	Turboprop = 2
Major = 2	Part 91 (personal) = 1	>25% 135/121 = 2	1 to 3 = 1	0.1% = 0	1 to 2 years = 1	Twin Engine Recip. = 1
Minor = 1		<25% 135/121 = 1		Less than .1% = (-1)	Less than 1 year = 2	Single Engine Recip. = 0
						Single engine jet = 0
						Glider/Sailplane = (-1)
						AG Airplane = (-2)
						Airship/Balloon = (-3)

Step 2: Determine **Safety Risk Factor** by using the below formulae:

Safety Risk Factor =	**Safety Effect (a.) x**	Operational Use (b.) x	Percentage used by Population (c.) +	Number of Occurrences (d.) +	Event vs. Population (e.) +	Time between Events (f.) +	Aircraft Type (g.)
Enter #'s here:	3	3	4	3	2	2	1

Step 3: Enter **Safety Risk Factor** on the 'x' (abscissa) axis, on Initial Risk Assessment Chart (IREAC), Figure 1:

Calculated **Safety Risk Factor =** 44

Step 4: Enter **Safety Effect** on the 'y' (ordinate) axis, on Initial Risk Assessment Chart (IREAC), Figure 1:

Safety Effect = 3

(Note: The result will provide an initial indication of potential A/W concern corrective actions.)

(Reference: FAA Small Airplane Directorate AD Manual Supplement (A/W Concern Process (ACP) Guide), Appendix VI, Par. 3.0, and Fig. 1.) (Available at: http://www.faa.gov/avr/ace/acehome.htm.)

Initial Risk Assessment Evaluation Chart (IREAC)

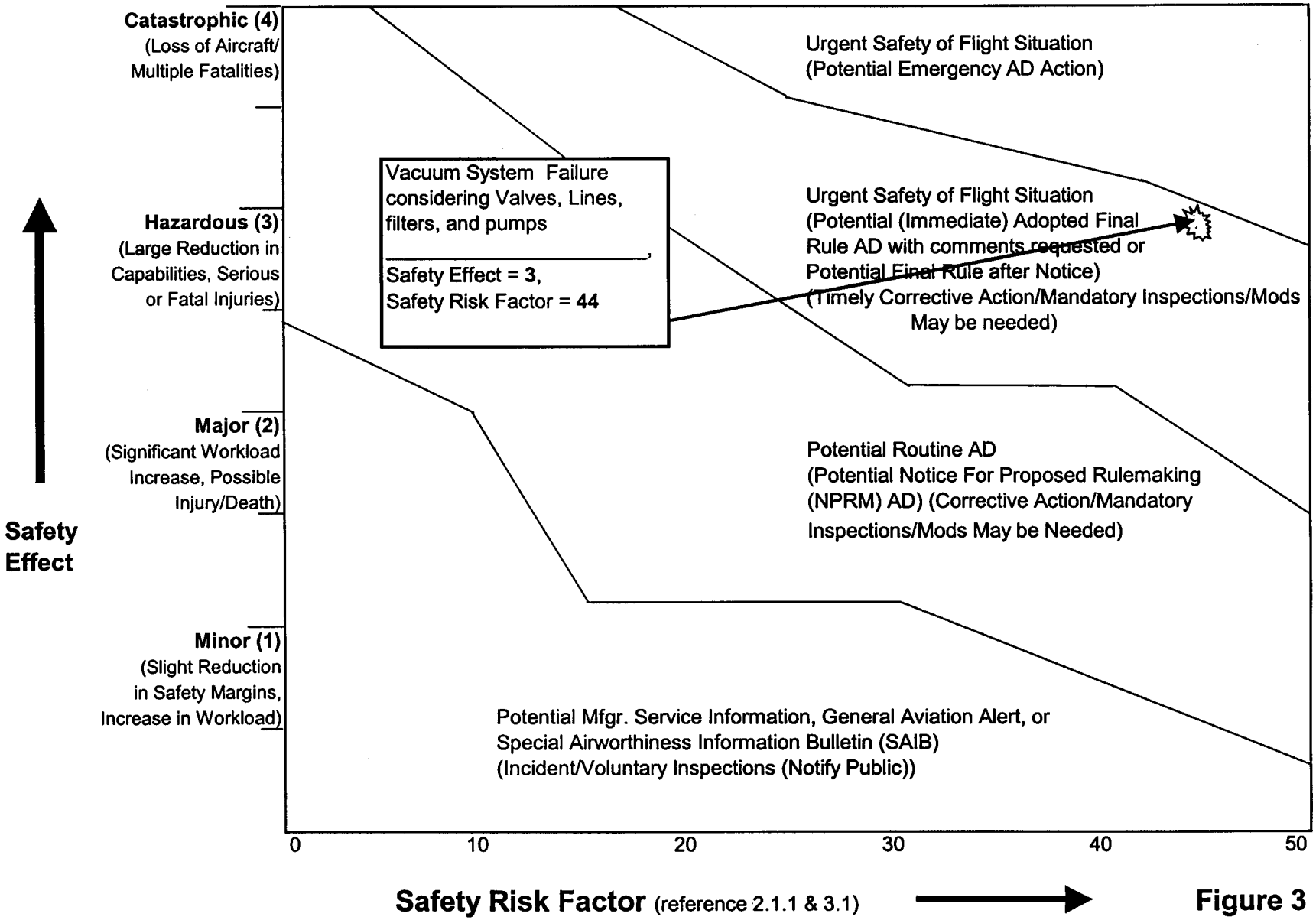

Figure 3

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