



U.S. Department
of Transportation

**Federal Aviation
Administration**

Memorandum

Subject: **ACTION:** Equivalent Level of Safety, Gippsland
GA200, 14 CFR Part 23, § 23.1337(b)(1), Fuel
Quantity Indication; Finding No. ACE-97-2

Date: **SEP 25 1997**

From: Manager, Standards Office, ACE-110

Reply to
Attn. of:

To: Manager, Small Airplane Directorate, ACE-100

This memorandum is to document concurrence with an equivalent level of safety to the fuel quantity indication requirements of § 23.1337(b)(1).

Background: See attached Issue Paper P-1.

Applicable Regulations: 14 CFR Part 23, § 23.1337(b)(1).

Applicant's Position: See attached Issue Paper P-1.

FAA's Position: See attached Issue Paper P-1.

Compensating Features: See applicants position in attached Issue Paper P-1.

Recommendation: We concur with Gippsland's position as stated in Issue Paper P-1. The fuel quantity indicators and corresponding markings for the wing and header tanks provide an equivalent level of safety to the requirements of § 23.337(b)(1). The certification basis for the Model GA200 will include an equivalent safety finding for § 23.1337(b)(1).

Concurred by:

Mark Huss

ACTING Manager, Standards Office, ACE-110

9/25/97

Date

Henry A. Armstrong

ACTG Manager, Small Airplane Directorate
Aircraft Certification Service, ACE-100

9-25-97

Date

Attachment

cc: ANM-100L

ISSUE PAPER

PROJECT: Gippsland Aeronautics, Inc.
Model GA200
Project # TC3915LB-A

REG.REF.: §§23.1337(b)(1), 23.959(a)

NATIONAL

POLICY REF.: Advisory Circular (AC) 23-8A,
paragraph 308; AC 23.959-1

SUBJECT: Fuel Quantity Indication

ITEM: P-1

STAGE: 4

DATE: September 4, 1997

ISSUE STATUS: CLOSED

BRANCH ACTION: ANM-140L,
ANM-160L, ACE-110

COMPLIANCE

TARGET: Pre-TC

Equivalent Safety Finding

STATEMENT OF ISSUE:

The Los Angeles Aircraft Certification Office is currently processing an application for a restricted category Type Certificate (TC) for Gippsland Aeronautics, Inc. GA200 model aircraft through the bilateral with Australia. The single engine aircraft uses two mechanical sight gauges to indicate to the pilot the total quantity of usable fuel within two interconnected wing tanks. The gauges, one located on each wing, are marked EMPTY to 30 gallons and 30 gallons to 53 gallons (FULL), respectively. A third sight gauge, located on the header tank which directly provides fuel to the engine, has been marked entirely as unusable fuel. The markings of these fuel quantity indicators is unique and was not specifically considered within the regulations or current FAA guidance provided in AC 23-8A "Flight Test Guide for Certification of Part 23 Airplanes" or AC 23.959-1 "Unusable Fuel Test Procedures for Small Airplanes".

BACKGROUND:

The GA200 fuel system consists of two interconnected integral main wing tanks (27.75 gallons capacity each) and a header tank. The main wing tanks are interconnected by a "T" fitting at the right wing root rib allowing a uniform level of fuel in each wing tank during level flight. Fuel from the wing tanks is delivered to the dual electric emergency fuel pump which passes the fuel through one half of a duplex firewall shutoff valve to the main engine driven mechanical fuel pump. Fuel delivered from this pump passes back through the

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firewall to a float controlled needle/check valve in the system header tank. This arrangement ensures that the header tank is kept full (3.2 gallons). Fuel is gravity fed to the engine from the base of the header tank via the second half of the duplex firewall shutoff valve.

Two mechanical direct reading fuel sight gauges, one located on each wing, are used to indicate the quantity of usable fuel to the pilot during level flight. The left hand gauge, located in the inner fuel tank access panel, is incrementally marked from EMPTY to 30 gallons (bottom to top of gauge). The right hand gauge, located in the outer fuel tank access panel, is incrementally marked from 30 to 53 gallons (bottom to top of gauge). A third fuel quantity sight gauge is located on the header tank to indicate "FULL" with no other calibration markings. The entire capacity of the header tank has been designated by the applicant as unusable fuel and marked with a red arc.

FAA POSITION:

The applicant must provide a means to indicate to the pilot the quantity of usable fuel in each tank during flight. In accordance with §23.1337(b)(1), each quantity indicator must be calibrated to read "zero" during level flight when the quantity of fuel remaining in the tank is equal to the unusable fuel supply determined under §23.959(a). Unusable fuel is defined as the quantity of fuel remaining in the fuel system when the first evidence of engine malfunction occurs under the most adverse fuel feed conditions occurring under each intended operation and flight maneuver.

APPLICANT'S POSITION:

The GA200 fuel system design safely provides fuel to the engine through the use of the header tank. A warning system is incorporated such that if the transfer fuel pressure at the inlet to the header tank falls below approximately 2 psi, a red light will illuminate on the coaming above the instrument panel in the cockpit. This, in addition to the header tank quantity sight gauge entering the red arc, warns the pilot that the mechanical fuel pump is not delivering fuel to the header tank and that the emergency electric fuel pump should be turned "ON" or that the pilot has inadvertently run the main wing fuel tanks dry. In the latter case, the GA200 Airplane Flight Manual (AFM), Section 3 "Emergency Procedures", requires the pilot to conduct a precautionary / forced landing. The 3.2 gallons within the header tank, although designated as unusable, could allow the pilot additional time for the required forced landing before complete loss of engine power. Therefore, designating the entire capacity of the header tank, which directly feeds the engine, as unusable can be considered a conservative design.

A separate fuel quantity indicator for each tank is not required, §23.1337(b)(5), since the outlets and airspaces are permanently connected between the wing tanks. The GA200 aircraft utilizes two fuel quantity gauges, one on each wing, to provide a better fuel quantity

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indication of the usable fuel level over the complete FULL to EMPTY range. The left hand gauge registers accurately from EMPTY to 30 gallons and the right hand gauge from 30 gallons to FULL (53 gallons). Note that the two gauges are not intended to indicate the individual quantity levels within each tank. A complete description of the fuel quantity indicators has been provided in the AFM, Section 7 "Aircraft & System Description".

FCAA POSITION:

To be determined

CONCLUSION:

The FAA concurs that the Gippsland GA200 fuel quantity indicators and corresponding markings for the wing and header tanks provide an equivalent level of safety as envisioned in the regulation and therefore meet the requirement of §23.1337(b)(1).



Small Airplane Directorate
Aircraft Certification Service

9-25-97

Date

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