Accident Investigation
Aero Commander 500B
National Transportation Safety Board

Simmonds Precision Products, Inc.
A Collins Aerospace Systems Company

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	PREPARED	APPROVED	APPROVED	APPROVED	APPROVED
BY	B. Crossman	B. Crossman	R. Brown	T. Ueda	
APPROVALS ON FILE					

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1.0 Introduction

This document provides the investigation report for Tank Unit Part Number EA515B-1404M, being returned to Collins Aerospace as part of an accident investigation. This Tank Unit was equipped on the Aero Commander 500B which had a flight accident on January 28, 2023.

1.1 Reference Documents

1.1.1 Simmonds Precision Products, Inc. (SPPI)

EA515B-1404M	Tank Unit
SPPI-WRK-0021	Calibration System for Monitoring and Measuring Devices and Standards
Procedure 2789	Personal Protective Equipment (PPE)
E-8082	Test Plan for Tank Unit Part Number EA515B-1404M Serial Number 968.

1.1.2 Simmonds Atlantic and Inertial Systems (SAI)

SAIS-PRO-0122	Electrostatic Discharge Sensitive Devices and Assemblies

1.1.3 Collins Aerospace

COL-PSM-GUI-1001-05	Externally Driven Investigation Handbook

1.2 Background Information

1.2.1 Notification

Collins Aerospace was notified of this incident by way of an external email from the NTSB on January 31, 2023.

1.2.2 Articles Under Investigation

The article under investigation is Tank Unit Part number EA515-1404M Serial Number 968. The date of manufacture of this unit is unknown. There are no records of prior returns within Collins Aerospace's previous or current ERP System.

1.2.3 Receipt of Article

The articles were received to Collins Aerospace on February 7, 2023.

Pursuant to COL-PSM-GUI-1001-05 Appendix A, the article was isolated and contained in government bonded storage. The shipping container remained sealed until the investigation commenced.

2.0 Investigation Plan

2.1 Investigation Process

The investigation shall be conducted in accordance with COL-PSM-GUI-1001-05 for a Facility Supported External Investigation. This test plan shall be approved by the Investigator In-Charge (IIC) and/or National Transportation Safety Board (NTSB) prior to starting the investigation. The identity of the IIC and NTSB will be listed in this document. The NTSB Investigator will participate via Zoom meeting and pictures are to be taken by Collins and attached to the test report appendix.

2.2 Article Under Investigation Handling

The following requirements shall be in effect during the investigation. These requirements are based on guidance from COL-PSM-GUI-1001-05 Appendix A.

- The article was photographed upon receipt in the original packaging from all sides.
- The article under investigation remained locked in a secure cage in the MRO department during off business hours or when not accompanied by Collins Aerospace personnel.
- The article was accompanied at all times by Collins Aerospace personnel when not locked in the MRO cage.
- Handling, testing, and disassembly of the article was performed by Cognizant Engineer and Qualified Support Personnel.
- All test equipment was calibrated per Procedure SPPI-WRK-0021.
- All disassembly occurred in an isolated area using proper ESD equipment per SAIS-PRO-0122.

2.2.1 Test Equipment

Test equipment shall be recorded in the test report along with calibration date and identifying SPPI number.

2.3 Visual Examination

There was no sign of external damage to the box. The tank unit was well wrapped and secure within the center box and encased in bubble wrap. There were no signs of damage incurred during shipping. The Tank Unit was removed from its container and packaging and placed on a lab bench. The article was visually examined and photographed from all sides. Examiners looked at the following per Test Plan E-8082.

2.4 Observations

Visual inspection was performed and compared to assembly drawing EA515B-1404M.

2.4.1 **Damage or missing sealant:**

No physical damage to the tank unit or connector seals. The tank unit float arm does appear to be slightly bent between the mid-point and float assembly.

2.4.2 Nameplate:

The nameplate is attached and legible however does exhibit some scratch marks. See Figure 1.

Figure 1: Nameplate

2.4.3 Damaged or Missing Paint:

Several small scratches on the housing cover. See Figure 2.

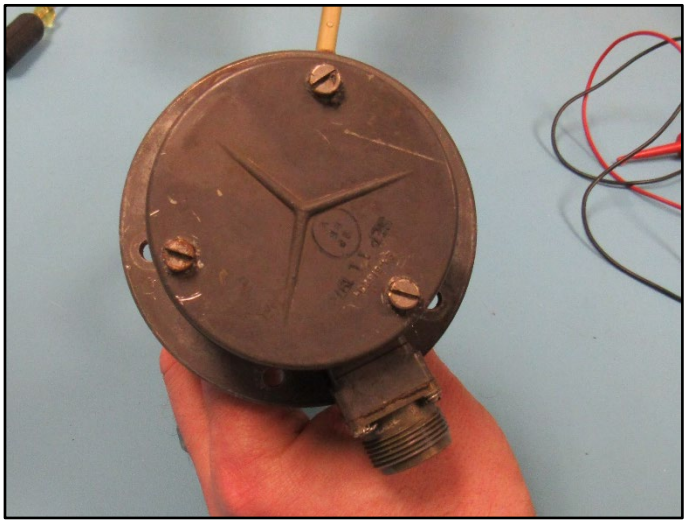


Figure 2: Housing Cover

2.4.4 Damaged or missing lock wire:

Lock wire on top of the housing had been removed. Lock wire screws do appear to be original and secure. See Figure 2. The lock wire used to secure the connector screws is intact and secure. See Figure 3.

Figure 3: Connector

3.0 Functional Testing/Verification

Functional testing was performed per E-8082 as follows:

- Verify that the float operates freely.
- Verify the Resistance between Pin A and Pin B.
- Monitor the resistance along the Potentiometer (Pin C).
- Inspect for null spots in the resistor element or gaps between wiper and resistive element.
- Inspect connector pins for damage that could cause damage to mating connector or test equipment.

3.1 Observations/Results

- Test equipment used was a Fluke Model 179 Digital Multimeter, calibrated on 6/17/2022.
- Float arm assembly moved throughout its range freely without any binding. There was a small amount of drag consistent with the wiper dragging on the resistive element inside the housing.
- Pins A and B are the ends of the resistor element inside the housing. The result of the resistance test is acceptable at 195.6 Ohms.
- When monitoring the resistance value along the sweep of the wiper, the resistance measurement started at 196.7 Ohms (full) and ended at 23.4 Ohms (empty). These values align with what is expected of a functioning fuel transmitter.
- The wiper maintained contact with the resistive element throughout the sweep and did not exhibit any voids or null spots throughout the sweep.
- There are no signs of damage to the connector or pins. See Figure 3.

4.0 Disassembly and Inspection

- **Cover:** The 3 screws securing the cover were tight and no damage to screw heads or threads was observed.
- **Inspect housing cover seal:** Seal around the inside of the cover is intact with no signs of damage or leaking.
- **Structural damage to electrical component:** No visual signs of structural damage to the wires or resistor element inside the housing. See Figure 4.
- **Structural damage to mechanical components:** No visual signs of damage to the wiper or any other mechanical components inside the housing. See Figure 4.

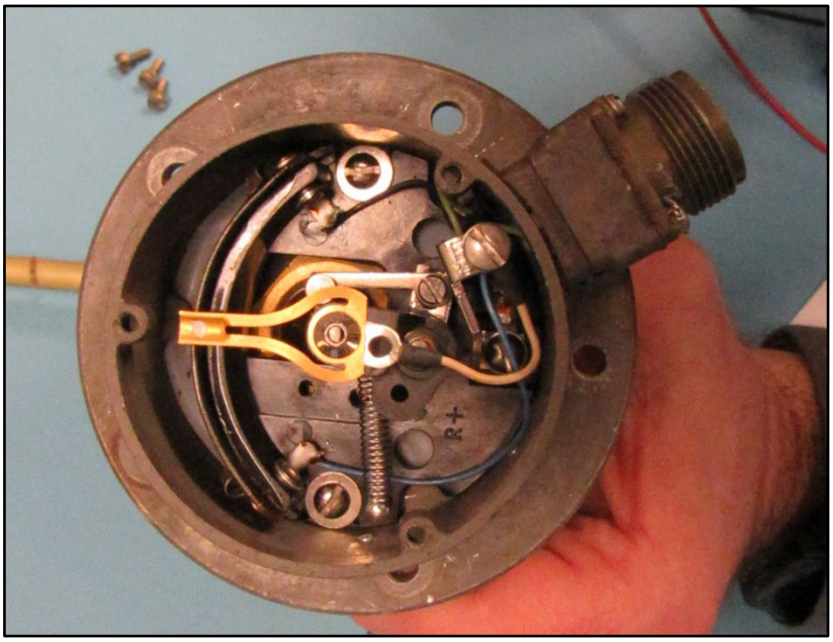


Figure 4: Wiper Assembly

4.1 Wiper Wire Continuity X-ray

- The unit was X-rayed in the Collins Failure Analysis Lab using a Nikon XT V 160 with maximum voltage of 160 kV at 20 W.
- The X ray images showed that there are no broken wires or other anomalies that would cause an intermittent or complete loss of electrical connectivity. See figure 5 for X-ray of the wiper wire.

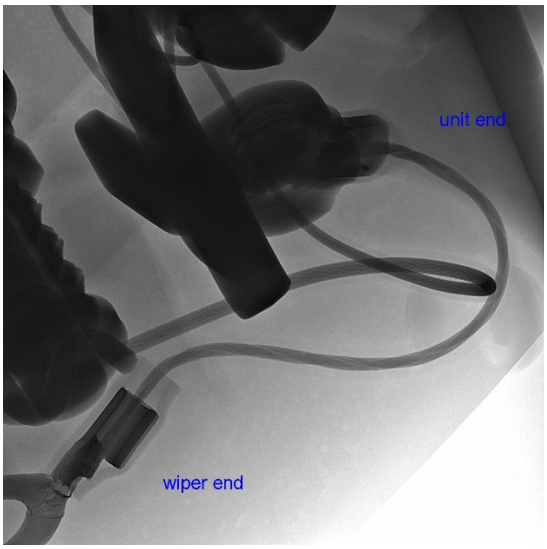


Figure 5: Wiper Wire

5.0 Summary and Results

The testing and inspection done in the investigation show that there was no damage to the internal assembly, wires, wiper, or resistive element that would cause an intermittent or complete loss of continuity of the tank unit. During the investigation, the tank unit part number EA515B-1404M, serial number 968 operated as intended throughout the sweep of the float arm. Additional photos can be found in Appendix A.

5.1 Investigation Support Personnel

Table 1 below lists support Personnel throughout this investigation.

Table 1: Support Personnel

Name	Role	Organization
Brian Crossman	Engineering Technical Lead	Collins
Jordan Leckey	Manufacturing Engineer	Collins
Lance Nichols	Aftermarket Value stream Manager	Collins
Sean Postlewaite	MIS Product Safety Manager	Collins
Rollin Brown	F&SS PCE	Collins
Tomomi Ueda	Product Support Engineering Manager	Collins
Shawn Tenney	Product Support Engineer	Collins
Daniel Boggs	Lead Investigator	NTSB

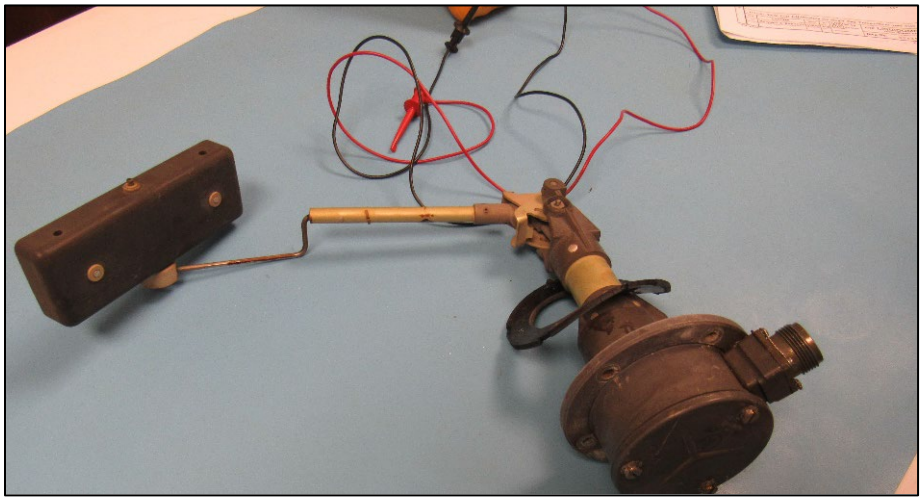
6.0 Appendix A

Additional photos taken during inspection and disassembly of the tank unit.

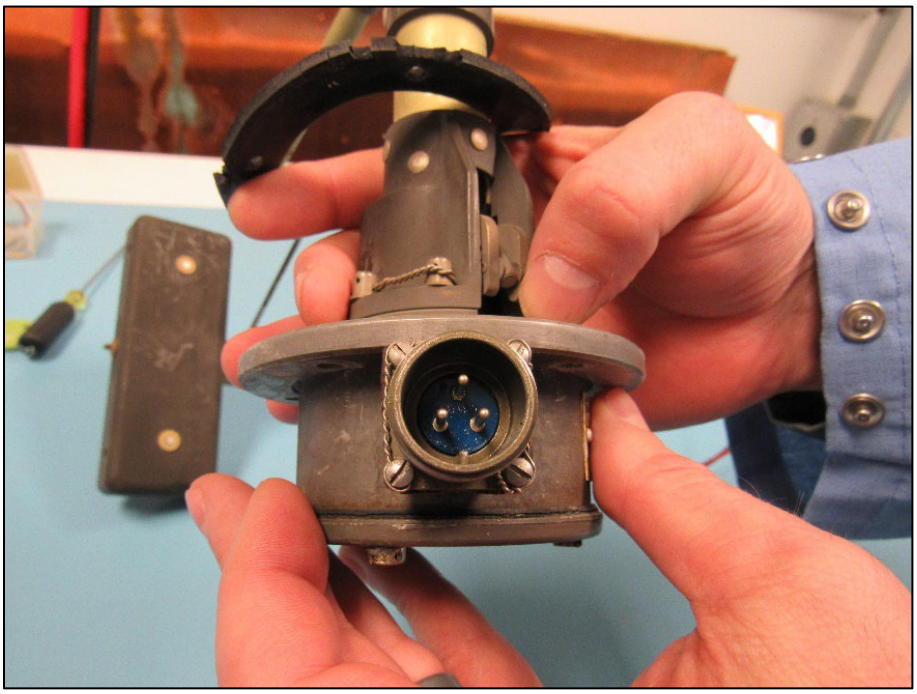
- **Unboxing**

- **Packaging**

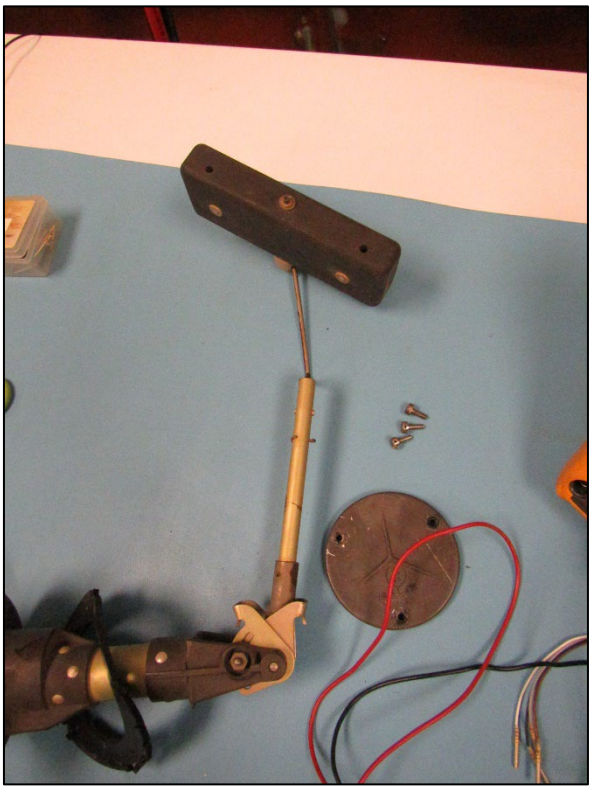
- **Tank Unit - Serial Number 968**



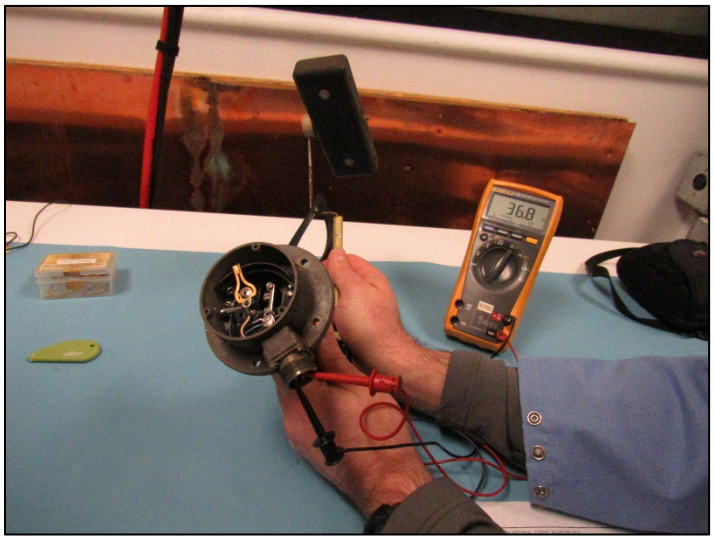
- **Connector Pins**



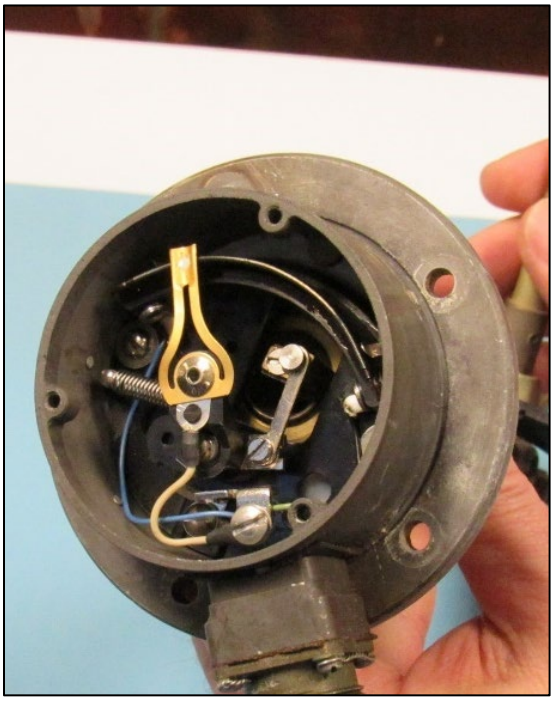
- **Float arm assembly**



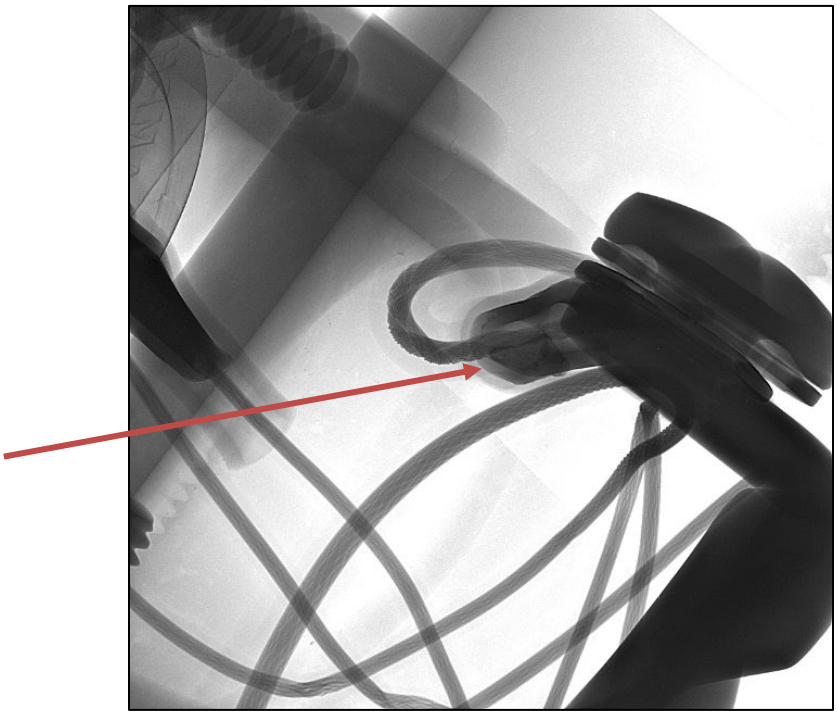
- **Continuity – Wiper to Resistance Element**



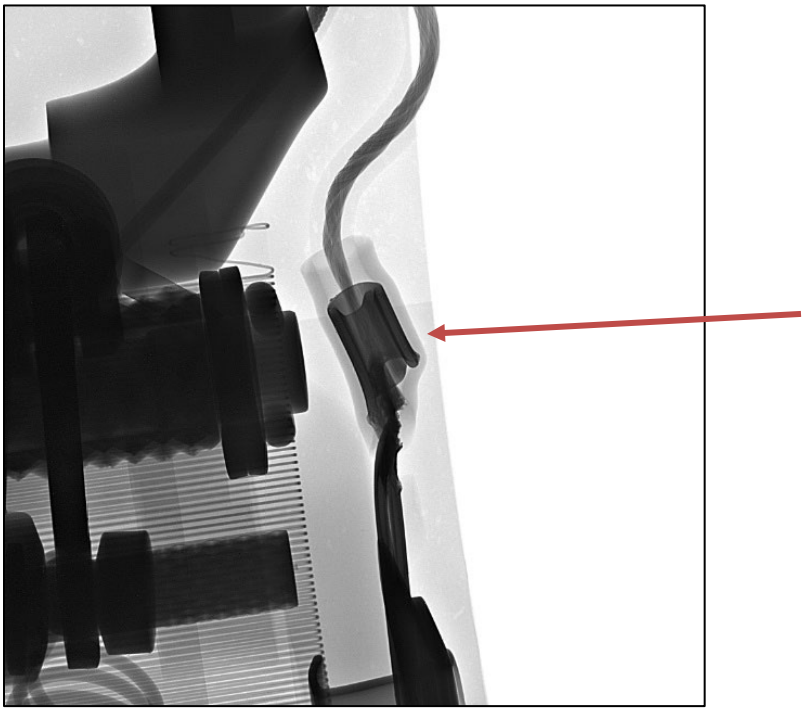
- **Wiper Assembly (white wire)**



- **Lug Connection – multi-stranded wiper wire**



- **Crimp Connection of Wiper Wire**



- **Wiper Wire**