National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594

ERA23LA121

AIRWORTHINESS FACTUAL REPORT

December 14, 2023

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A. ACCIDENT

Location: Hartford, Connecticut
Date: January 28, 2023
Time: 1542 local
2042 UTC
Airplane: Experimental Lancair 4P, N550LX

B. AIRWORTHINESS FACTUAL REPORT

NTSB IIC	Adam Gerhardt National Transportation Safety Board Washington, DC
Party Member	Brett Sartain Federal Aviation Administration Bradley, Connecticut
Party Member	David Mcrae RDD Enterprises LLC. Redmond, Oregon
Party Member	William Jeffrey Edwards Lancair Owners & Builders Organization McCall, Idaho

C. SUMMARY

On January 28, 2023, about 1542 eastern standard time, an experimental amateur-built Lancair 4P airplane, N550LX, was destroyed when it was involved in an accident at the Hartford-Brainard Airport (HFD), Hartford, Connecticut. The private pilot was seriously injured. The airplane was operated by the pilot as a personal flight conducted under the provisions of Title 14 *Code of Federal Regulations* Part 91.

D. DETAILS OF THE INVESTIGATION

The NTSB investigator-in-charge traveled to the recovery facility on March 13, 2023. The NTSB did not travel to the accident site, however, the FAA did so, and documented the site. The wreckage was located in multiple recovery bags. The wreckage was examined on March 13, 14, 2023. One party member from RDD Enterprises LLC. participated in the examination. This report contains the factual findings related to the examination. Additional relevant airplane systems and maintenance information is also included in this report.

E. AIRPLANE INFORMATION

According to the Federal Aviation Administration (FAA) airworthiness and registration records, the airplane was an experimental amateur built Lancair 4P. It was originally issued an airworthiness certificate in 1999 and at this time the airplane was configured with a Continental Motors TSIO-550 piston engine. Figure 1 shows the overall dimensions of the original airplane.

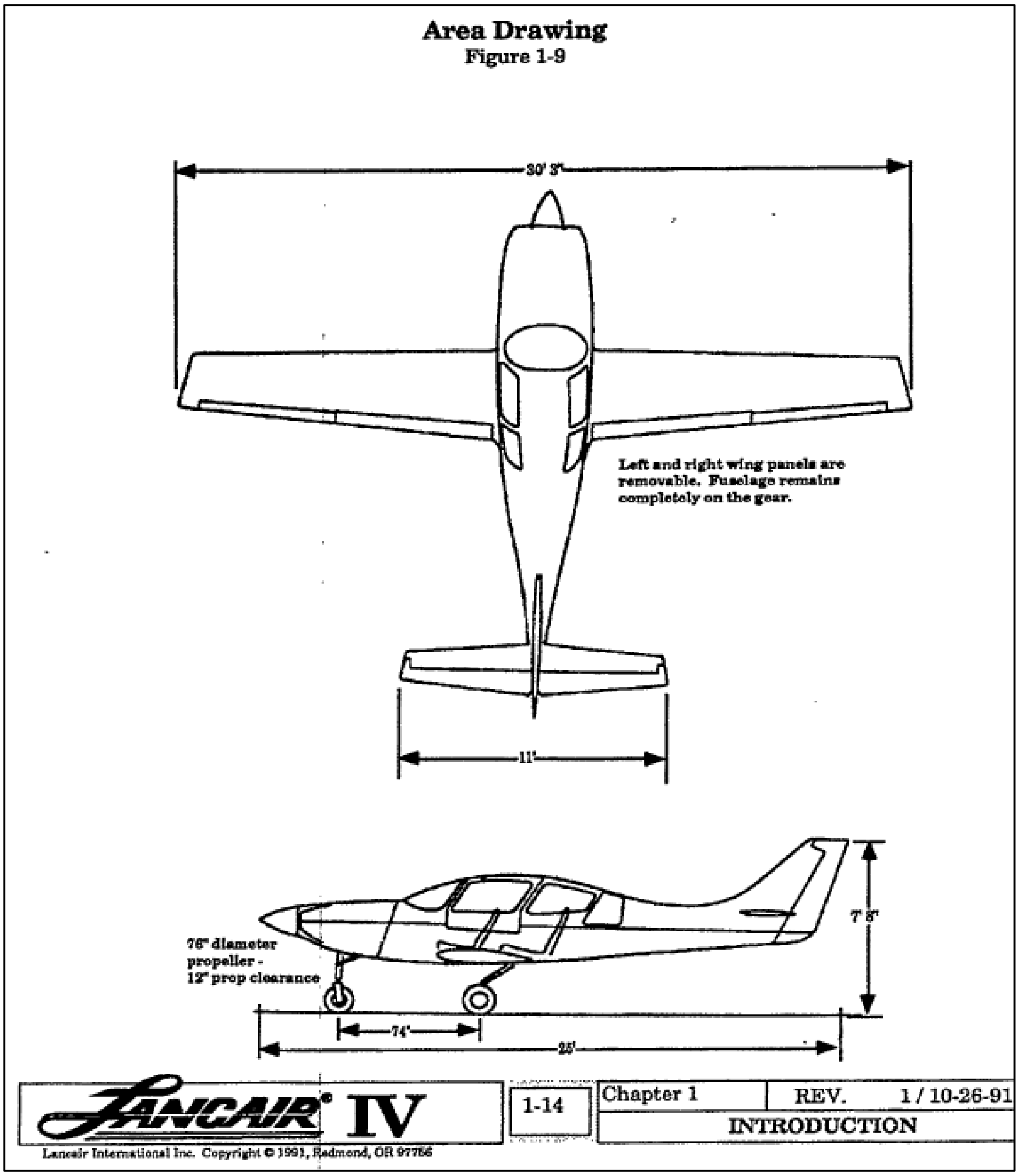

Figure 1: Overview of the original Lancair IV dimensions as noted in the FAA Airworthiness Records.

In August 2019, the airplane was issued a special airworthiness certificate after the owner (the accident pilot) requested an amendment to the certificate to correct the manufacturer/ builder's name listed in the airworthiness and registration records.

According to FAA registration records, the manufacturer name had been changed during a sale of the airplane in 2018, however, the airplane owner requested that the manufacturer name be relisted as the original manufacturer/ builder (RICHARD BRINKMAN). The special airworthiness certificate was issued as an experimental amateur built aircraft, model Lancair 4P, builder RICHARD BRINKMAN.

Also in August 2019, the airplane had been heavily modified into an RDD Enterprises LLC model LX7-20 and equipped with a Pratt & Whitney Canada turboprop engine. The airframe and systems were also heavily modified. The airplane dimension differences include a wingspan that was lengthened from about 30 ft to 33 ft and the nose to tail dimension was about one foot longer. The airplane's tail height sat about 2 ft taller as compared to a Lancair 4P. Figure 2 shows the dimensions of the LX7-20 airplane.

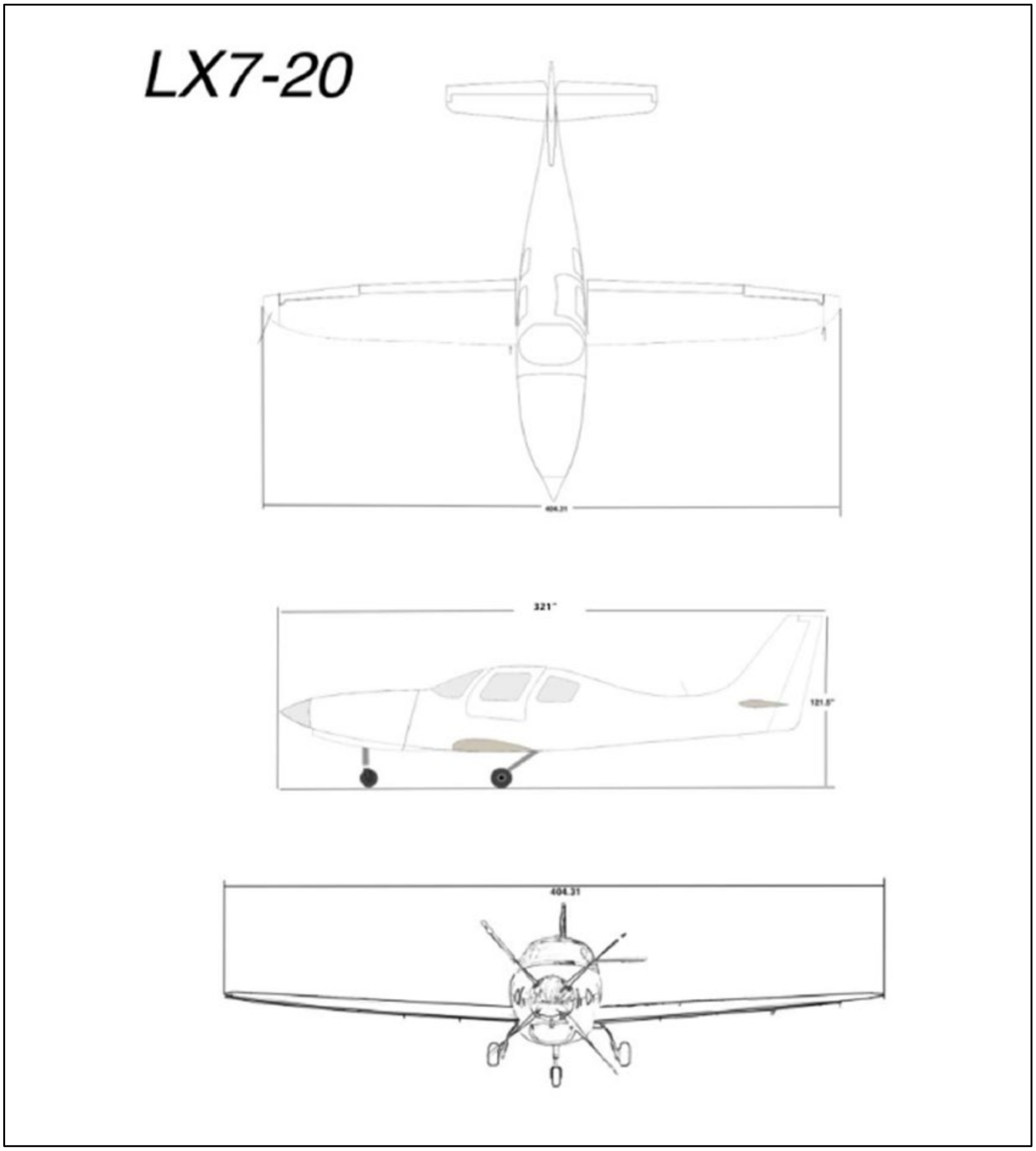

Figure 2: Overview of the LX7-20 dimensions (LX7-20 Pilot's Operating Handbook)

According to the RDD Enterprise LLC. website, the LX7-20 is a pressurized, retractable landing gear, turboprop, 4 seat airplane. Figure 3 provides a photograph of an exemplar LX7.

Figure 3: View of an exemplar LX7 in-air as viewed on RDD Enterprises website.

Airplane Limitations

According to the pilot's operating handbook, the rotation speed (Vr) was 65 knots. The maximum demonstrated crosswind component was 25 knots.

Cockpit Layout

The cockpit and panel layout are noted in Figure 4. The fuel quantity between the left and right tank can be displayed on multiple screens.

Figure 4: View of the cockpit layout.

Ballistic Recovery System (BRS)

The airplane was equipped with a BRS Whole Aircraft Recovery system. The POH noted that the BRS system was approved for deployment below 160 knots and above an altitude of 600 ft above ground level.

Fuel System

According to the POH, the following information details are provided pertaining to the fuel system.

A 180- gallon total fuel capacity is incorporated in two wet- wing fuel tanks. The system is positive pressure that is supplied by an engine driven mechanical pump along with two electric boost pumps. The boost pumps are located on each side of the fuselage where the fuel supply exits the fuel tank. Fuel balance is maintained through electronic fuel level sensing that varies the output of each individual fuel boost pump.

When oil pressure is present, a pressure switch activates the fuel boost pumps. Fuel moves from the fuel tanks through the boost pumps into a gascolator filter and then into the engine driven fuel pump. The fuel is then delivered to the Fuel Control Unit which determines the fuel schedule for the engine to provide the power required as established by the power lever.

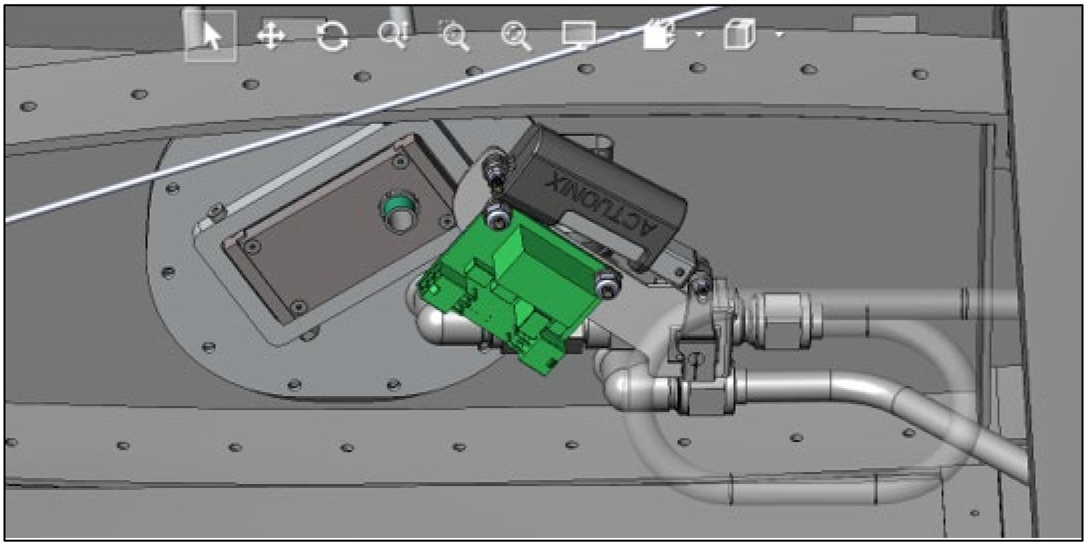

Figure 5: Drawing view of the cross flow prevention valve located inside the leftwing. Actuonix P16-S actuator (50mm Stroke).

The fuel tanks have a filler cap in the upper surface of each wing tank for fuel servicing. Each tank incorporates a flush sump drain that allows each of the tanks to be sampled. Fuel system venting is essential to the operation of the system. Fuel tanks are vented on the underside of the wing outboard near the wing tip. These vents must remain unobstructed to ensure proper fuel flow to the engine.

Figure 6: Photo of a fuel controller located in POH.

The fuel controller allows the pilot to switch between the Auto mode and manual mode by which each tank can be selected individually. There is also a fault light that will indicate a failure in the fuel boost pump system.

Fuel Filling

Fuel filler access is located on the outboard of each wing and holds a maximum of 90 US gallons. If tanks are not filled to capacity, each tank should be refilled so that each tank quantity is as equal as possible. It is important that the aircraft be properly grounded to reduce the chance of any static electricity discharge. The electrical system should not be energized during the refueling operation. Once fueling is complete ensure that the filler cap is replaced and latched in the correct orientation and verify that the grounding source is removed from the aircraft. After servicing, the fuel sumps should be sampled for the possibility of any contamination. If contamination is present in the sample, additional samples need to be taken until the source of contamination is removed.

Fuel Management

The automatic fuel leveling feature in the LX7 typically ensures that fuel levels remain equal in each wing tank. In the case of a fault in the system indicating a fuel pump failure in one tank, it is important to open the cross-feed valve to monitor the imbalance. The cross feed valve is located aft of the forward spar between the front seats. This valve may be used in the case of a single fuel boost pump failure to allow fuel to cross feed between tanks. If the fuel imbalance increases beyond 10 gallons make a precautionary landing.

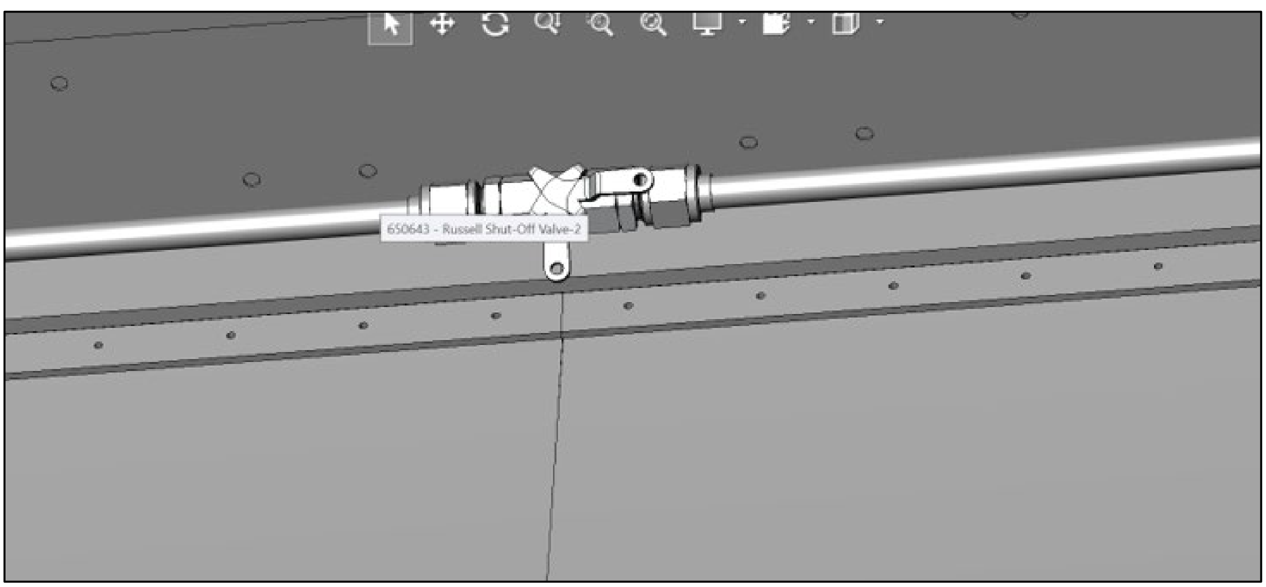

Figure 7: RDD Enterprises LLC. drawing of the cross-feed shut off valve.

The POH provided an abnormal checklist procedure for a fuel imbalance that developed in-flight.

LX7

FUEL IMBALANCE

Fuel Imbalance	CONFIRM FUELLEVELS
Fuel Control	CHECK FOR FAULTINDICATION
Emergency Fuel Balance Valve	OPEN
Fuel Level	MONITOR

IF- Fuel Imbalance increases above a 10-gallon differential, LAND AS SOON AS POSSIBLE

Figure 8: Fuel imbalance abnormal procedure

Normal Checklist Procedures

The LX7-20 normal checklist procedures note that the fuel quantity and fuel level should be checked inside the cockpit on the fuel level displays in addition to at both wing filler cap locations.

Fuel Pump System

During engine start, both boost pumps are to be tested, in which the pilot should see an ON light and see fuel pressure rise, before returning the fuel system to auto mode.

F. ENGINE EXAMINATION

The engine was a Pratt & Whitney Canada T74-CP-700 turboprop engine (Serial Number PCE 30037A). The propeller was a four-bladed Hartzell Propeller, model HC-E4N-3NX.

The engine remained partially attached to its engine mounts but had separated from the fuselage. It sustained significant thermal and impact damage. The exhausts were removed. When the forward area air compressor was observed, evidence of leading edge turbine blade damage was observed. The propellers exhibited s-bending, torsional twisting, and chordwise scratches. One propeller blade had fragmented.

G. AIRFRAME EXAMINATION

The majority of the composite airframe was thermally damaged by fire. The cockpit was largely consumed by fire. The flight controls had been cut during recovery operations or exhibited evidence on tension overload.

The majority of the cockpit controls and switches were thermally destroyed or displayed heavy impact related damage. The fuel controller (as seen in the exemplar figure 6) was thermally damaged, and the face of the unit and switch position were no longer readable.

The left fuel pump assembly, cross flow prevention valve, was found in a closed position, with the valve was seized. The unit sustained thermal damage. The actuator arm and motor were not present with the system. The control board and brackets were present. After applying force to the valve, it would move. As found, the distance from the actuator to the valve arm as found was 5” inches, 13/16th. This position corresponded to a closed position. When moved to an open valve position, the measurement from the actuator was 3” 13/16ths.

The on/off cross feed valve was found in its normal installation area and displayed thermal damage and melting. The valve was found mostly closed and it had seized, however, it displayed a slight angle towards the open position.

The right fuel pump assembly was found partially separated from its attach point and was thermally damaged and severely deformed.

The Garmin G3X Touch (GDU 460) left PFD, and MFD remained partially in position. The right PFD was no longer in its installation area. They all sustained significant thermal damage. The right MFD was located in a recovery bag. It sustained significant impact and thermal damage and fragmented into several pieces. A Garmin GTN 750 was also located partially in its normal installation area. It displayed thermal damage. Refer to the Cockpit Displays - Specialist's Factual Report in the public docket for an overview of the data extracted from the units.

H. MAINTENANCE INFORMATION

<u>Maintenance Records</u>

The maintenance records were located in the debris and were destroyed during the impact with terrain and post-crash fire.

RDD Enterprises LLC. provided a copy of maintenance endorsements from April 21, 2022. The maintenance endorsement was for a condition inspection. During the inspection the left and right fuel pump and fuel filter assemblies were replaced. The endorsement noted, "Right pump assembly modified by extending, pump to filter fitting and adding a fitting from the Y fitting to check valve, all for purposes of pump assembly fitting for reinstall and clearance of the sump drain. Reinstalled left and right fuel pump assemblies." At the time of inspection, the engine meter had 190 hours.

According to the pilot/ owner, sometime during the summer of 2022 he had a mechanic (not affiliated with RDD Enterprises LLC.) troubleshoot a fuel migration problem that was occurring on the ground while the airplane was in the hangar. A significant amount of fuel was migrating from the right wing to the left wing when the tanks were not full, to a degree that on occasion if that airplane sat for several days, the left wing would need to be jacked on its underside to prevent the airplane from tipping over.

The mechanic who troubleshooted the issue in the summer of 2022 was located at Simsbury Airport, Simsbury, Connecticut. According to RDD Enterprises LLC., they provided the mechanic a replacement on/off cross-feed valve. In addition, they provided a kit to put on the emergency gear down system to reduce the effort when needing to pull the emergency gear down control cable.

The mechanic that was sent the cross-feed valve located in Connecticut did not have any copies of his maintenance endorsement from work performed on the accident airplane. The mechanic stated in an email that they installed rotors and brake pads, a gear down pressure switch, an emergency gear down spring kit, and replaced the on/off fuel transfer valve.

Fuel Migration and Fuel Imbalance

According to RDD Enterprises LLC., there had been reports of fuel migration with the accident make and model airplane while parked with the original design of the fuel system. According to RDD, the migration issue was resolved when the fuel system was updated in 2021, which according to RDD, the accident airplane had the 2021 fuel system revision.

According to RDD, the fuel system design incorporates check valves to prevent the migration of fuel from one wing to another, even in temperature changes as well as sloped parking conditions. However, if a check valve develops a seep or the cross-feed on/off valve is cracked open (or develops a leak) it is possible for fuel to migrate on the ground from one wing tank, to the other.

According to RDD, during the original design and testing of the LX7, they determined that any speed below 100 knots, a roll control deficiency would occur at an imbalance of 30 gallons between the left and right tanks. The maximum imbalance of fuel that had ever been flight tested during takeoff was 10 gallons.

I. PHOTOGRAPHS AND FIGURES

Photo 1: View of the wreckage as found in recovery bags at the recovery facility.

Photo 2: View of the engine and propellers

Photo 3: View of the left fuel pump assembly.

Photo 4: View of the right fuel pump assembly

Photo 5: View of the cross flow prevention valve installed to a fragment of left wing.

Photo 6: View of the cross feed valve recovered in the wreckage.

Photo 7: View of the cross feed valve as found mostly closed and seized, but with a partial opening.


Photo 8: Additional view of the cross feed valve as found mostly closed and seized, but with a partial opening.


Photo 9: View of the recovered cockpit panel.

Submitted by:

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