

NATIONAL TRANSPORTATIONS SAFETY BOARD
Office of Aviation Safety
Washington, DC 20594

SUMMARY OF EXAMINATION

-- CEN22FA021 --

A. ACCIDENT

Location: Lena, Wisconsin
Date: October 27, 2021
Time: 1817 central daylight time
Aircraft: Beech B36TC (s/n EA-402), N75RM

B. PARTICIPANTS

Timothy Sorensen
Senior Aviation Accident Investigator
National Transportation Safety Board
Denver, Colorado

Joe Contino
Vice President Quality and Certification
Safran Aerosystems / Avox Systems
Lancaster, New York

Mark Zafron
Test Engineer
Safran Aerosystems / Avox Systems
Lancaster, New York

C. ACCIDENT SUMMARY

On October 27, 2021, about 1817 central daylight time, a Beech B36TC airplane, N75RM, was substantially damaged when it was involved in an accident near Lena, Wisconsin. The pilot was fatally injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

D. DETAILS OF EXAMINATION

The oxygen cylinder with the installed valve, cylinder regulator, and altitude compensating regulator were retained by the NTSB investigator-in-charge during the follow-up examination at Myers Aviation on January 12, 2022. Examinations of the

Summary of Examination

D. DETAILS OF EXAMINATION *(continued)*

valve, cylinder regulator, and altitude compensating regulator were conducted at Safran Aerosystems/Avox Systems on March 2, 2022. The cylinder, valve, and regulators were returned to Myers Aviation following the examinations.

E. SUMMARY OF EXAMINATION

Oxygen Cylinder Assy: Part No. 801977-14 (s/n M14373)

The oxygen cylinder with the valve, cylinder regulator, and altitude compensating regulator were received for examination in the as-shipped condition.¹ The valve/cylinder regulator assembly was securely attached to the cylinder. It was disassembled from the cylinder to facilitate further examination. Visual examination of the cylinder revealed no deformation or evidence of emergent/unrepaired cracking. Areas appeared to have been touched up with paint. No other anomalies were observed.

Cylinder Valve/Regulator Assy: Part No. 801896-01 (s/n UKN)

The cylinder valve and regulator housing appeared intact. The cylinder valve rotated freely.² Several fittings were fractured and partially separated. The low-pressure relief valve threaded attachment fitting was fractured. The relief valve appeared otherwise intact. The high-pressure relief line attachment fitting was fractured.³ The high-pressure relief valve assembly appeared otherwise undamaged. The valve assembly was removed, and the burst disc was intact. The altitude compensating regulator was partially separated at the threaded attachment fitting. It was disassembled from the cylinder valve housing to facilitate further examination. The tank fill port fitting was secure and the valve intact. Fitting threads exhibited PTFE tape consistent with current assembly procedures. The fittings also exhibited an unknown green compound not in use by the manufacturer.

The low-pressure relief valve was removed and replaced with an exemplar valve for testing. The high-pressure port common to the high-pressure relief valve was capped for testing. The assembly was placed into the testing apparatus with supply pressure provided at the valve inlet as specified by the test procedure. Pressure and airflow were measured at the low-pressure outlet common to the altitude compensating regulator inlet port. The cylinder valve was positioned as observed during the on-scene examination. Testing revealed that the cylinder regulator outlet pressures were within the specified range at each data point.⁴ The cylinder valve functioned properly with downstream pressure reduced to zero within 30 seconds of moving the valve to the OFF position as required.

Altitude Compensating Regulator: Part No. 801765-00 (s/n 1528)

The altitude compensating regulator housing appeared intact. However, the threaded inlet fitting and the low-pressure relief valve were damaged consistent with impact forces. Fitting threads exhibited PTFE tape consistent with current assembly procedures.

¹ The damage to the assembly appeared to be consistent with the damage observe during the aircraft examination. No additional damage due to shipping was observed.

² The cylinder valve was observed near the ON position at the accident site. The position of the valve lever was marked at the time of the airframe examination.

³ The high-pressure relief line was separated from the valve assembly at the time of the on-scene examination.

⁴ Functional test data sheet is appended to this report.

Summary of Examination

E. SUMMARY OF EXAMINATION *(continued)*

However, the fittings also exhibited an unknown green compound not in use by the manufacturer. The fittings were replaced to facilitate testing.

The regulator was placed in the testing apparatus with supply pressure provided to the regulator inlet as specified by the test procedure. Ambient pressures corresponding to the discrete testing set points corresponding to altitudes of 1,000 ft to 35,000 ft. were applied to the regulator. At the specified flow rate, the outlet pressure at the 1,000 ft. and 8,000 ft. set points were within the specified test range. At 12,500 ft., the outlet pressure was about 2.5% below the specification. At 20,000 ft., the outlet pressure was within 0.14% of the specification. At 35,000 ft., the outlet pressure was within 1.2% of the specification.⁵



Figure 1 – Cylinder Assembly (As Received for Testing)

⁵ Functional test record data sheet is appended to this report.

Summary of Examination

E. SUMMARY OF EXAMINATION *(continued)*



*Figure 2 – Cylinder Valve/Regulator Assy
(As Removed from Cylinder)*



*Figure 3 – Cylinder Valve/Regulator Assy
(As Prepared for Testing)*

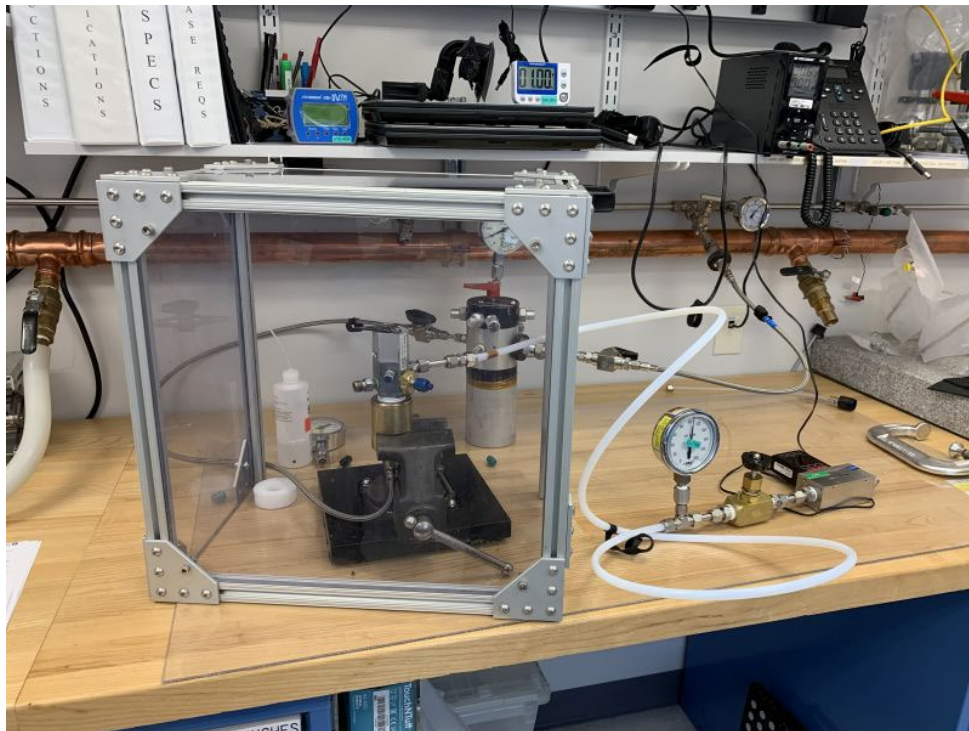


Figure 4 – Cylinder Valve/Regulator Assy Test Set-up

Summary of Examination

E. SUMMARY OF EXAMINATION *(continued)*



Figure 5 – Altitude Compensating Regulator
(As Removed from Valve Assy)



Figure 6 – Altitude Compensating Regulator
(As Removed from Valve Assy)



Figure 7 – Altitude Compensating Regulator
(As Prepared for Testing)

Summary of Examination

E. SUMMARY OF EXAMINATION *(continued)*

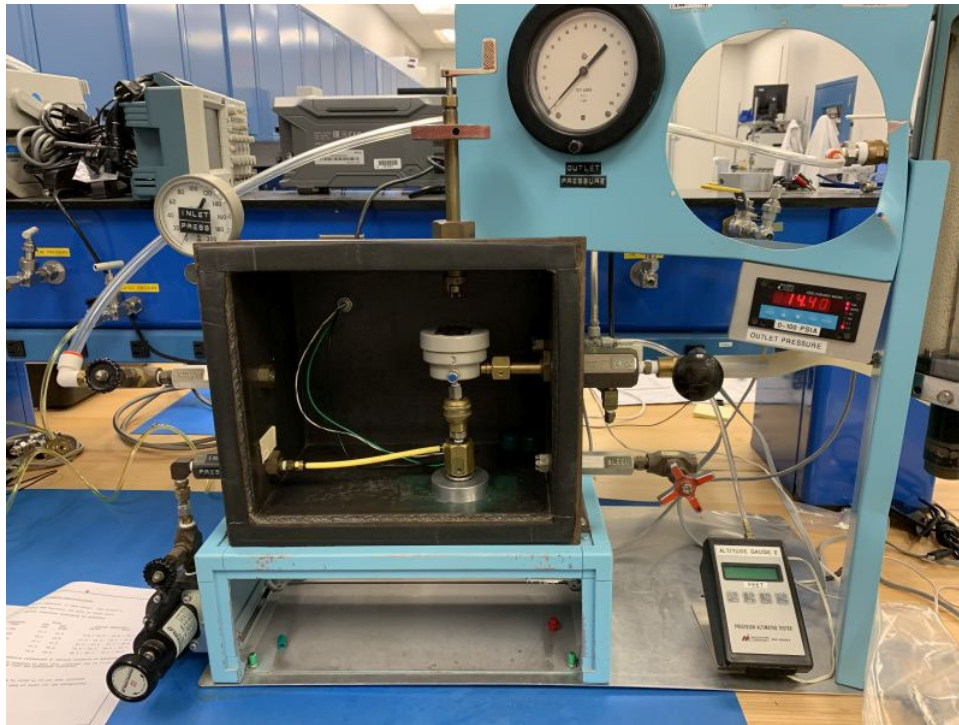


Figure 8 – Altitude Compensating Regulator Assy Test Set-up

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-- ADDENDUM --

- 1. Cylinder Valve / Regulator – Functional Test Data Sheet**
- 2. Altitude Compensating Regulator – Functional Test Record**

TESTED BY: M ZAFRON DATE: 02 MAR 2022 PART NO. 801896-01

INSPECTED BY: _____ DATE: _____ SERIAL NO. UNK

1. **EXAMINATION OF PRODUCT**

N/A Check for workmanship, finish, dimensions, construction, surface conditions, markings and cleanliness for oxygen usage. ACCEPT _____ REJECT _____

2. **PROOF PRESSURE TEST**

N/A Inlet pressure 2800 PSIG for 2 minutes ACCEPT _____ REJECT _____

3. **INTERNAL LEAKAGE**

4. **EXTERNAL LEAKAGE**

Inlet Pressure (PSIG)	Leakage (Zero Leakage in 2 minutes)
1900	

Inlet Pressure (PSIG)	Leakage (10 cc/min. allowable)
1900	
200	

5. **FLOW/PRESSURE**

Inlet Pressure of 200 and 1900 PSI

Flow (LPM)	Allowable Outlet Pressure (PSIG)	Actual Outlet Pressure (PSIG) With	
		200 PSI Inlet	1900 PSI Inlet
10	100-135	108	118
100	100-135	102	115
0	140 Max.	105	112

6. **DOWNSTREAM VENT VALVE (Zero pressure indication within 30 seconds)**

ACCEPT ✓ REJECT _____

7. **LEVER ACTUATING FORCE**

N/A Inlet Pressure of 200 and 2000 PSI

Mode/Allowable Force	Force at 200 PSI	Force at 2000 PSI
Turn on - 3 lbs Max.		
Turn off - 6 lbs. Max.		

REMARKS:

INSPECTION: ACCEPT _____

REJECT _____

F-311 0-250 7-15-2021 CAL DU 7-15-2022
G-758 0-200 11-3-2021 11-3-2022
G 638 0-200C 6-21-2021 6-21-2022

FUNCTIONAL TEST RECORD

CUSTOMER: NTSB

TEST DESCRIPTION: —

TEST UNIT NO.: —

PART NUMBER: 801765 ALTITUDE COMPENSATED REGULATOR

REGULATOR S/N: 1528

INLET 100 PSIG

Set Points			Target Range / Data					
Altitude	Flow		Outlet Pressure					
Feet	LPM NTP		PSIG		PSIG	PSIA		PSIA
-	High	Low	High	Low	Record	High	Low	Record
1,000 1,014	12.0	12.0	2.6 - 12.1		8.5	16.8 - 26.3		22.28
8,000 7,998	15.0	15.0	13.2 - 21.2		17.5	24.1 - 32.1		28.36
12,500 12,524	18.0	24.0	23.1 - 30.6		22.5	32.3 - 39.8		31.52 *
20,000 20,035	40.0 44	48.0	42.5 - 52.0		42.5	49.2 - 58.78		49.13 *
35,000 35,032	76.0	85.0	69.3 - 86.3		68.5	72.8 - 89.8		72.06 *

Success Criteria: Outlet pressures are within listed ranges

Pass ☒ Fail ☐

Tested By

MZ

Date

02 MAR 2022

Sign

