

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



ERA23FA219

AIRPLANE INFORMATION AND BRS SYSTEM DESCRIPTION AND EXAMINATION SUMMARY

February 13, 2025

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A. ACCIDENT

Location: Reliance, Tennessee
Date: May 7, 2023
Time: 1849 Eastern Daylight Time
2249 Coordinated Universal Time (UTC)
Airplane: N725AS, Cessna 182Q

B. AIRPLANE INFORMATION AND BRS SYSTEM DESCRIPTION AND EXAMINATION SUMMARY

IIC

Timothy W. Monville
NTSB-OAS/ERA
Washington, DC

Timothy W.
Monville

Digitally signed by Timothy
W. Monville
Date: 2025.03.19 16:22:00
-04'00'

Party Coordinator

Adrian Vina
BRS Aerospace, Chief Engineer
Pinebluff, North Carolina



BRS

Adrian Viña
2025.03.26
14:31:36 -04'00'

C. SUMMARY

On May 7, 2023, about 1849 eastern daylight time, a Cessna 182Q, N725AS was substantially damaged when it was involved in an in-flight breakup near Reliance, TN. The private pilot was fatally injured. The airplane was operated as a Title 14 Code of Federal Regulations Part 91 personal flight.

According to Federal Aviation Administration (FAA) air traffic control audio and radar information¹, after takeoff air traffic control communications with several air traffic control facilities appropriate for the route of flight occurred. At 1844:00, the pilot established contact with the R41 controller of the Atlanta Air Route Traffic Control Center and advised the controller that the flight was at 8,900 ft mean sea level (msl). The controller acknowledged the transmission and provided the altimeter setting of 30.02 inches of Mercury, which the pilot correctly read back. At 1845:04, the controller asked the pilot if he was assigned 8,900 ft msl, to which he promptly replied that he was assigned 9,000 ft msl but was getting "bounced around a little bit." The controller advised the pilot that the flight appeared to be out of the southern edge of the weather and appeared to be "clear of anything I am showing uh although we do show moderate or greater." At about 1847, the flight was at the leading edge of precipitation and building cumuliform clouds with multiple pilot reports reporting moderate to severe turbulence with one pilot reporting extreme turbulence associated with the weather pattern.

¹ ADS-B data was not available for the accident flight.

The flight continued on the southeasterly heading then after 1847:22 started a right turn with altitude deviation. After 1848:18, the airplane again turned right that was not announced by the pilot or instructed by the controller and one second later the controller broadcast the call sign of the airplane which the pilot responded. At 1848:24, the controller informed the pilot, "it looks like you are in a little bit of a descent in a turn is everything alright." The pilot did not reply to that communication or subsequent attempts by the controller and another aircraft.

The radar data reflected that during the second right turn altitude deviations occurred and at the last radar target at 1848:42, the airplane was at 8,920 ft msl on a west-northwest heading. The location was 35.23026° north latitude and -084.4244° west longitude. The controller asked Chattanooga, TN air traffic control tower if they could see the airplane to which the facility controller replied they could not.

An Alert Notice (ALNOT) was immediately issued for the missing airplane, and ground and air searches were performed including the use of drone aircraft. The fuselage was located about .3 nautical mile south-southeast from the last radar target.

The airframe parachute and rocket were not located.

D. DETAILS OF THE INVESTIGATION

1.0. General Airplane Information

1.1 Airplane Type Certification

The Cessna 182 series airplane was type certificated under Type Certificate 3A13 in accordance with Part 3 of the Civil Air Regulations dated November 1, 1949, as amended by 3-1 through 3-12 and Paragraph 3.112 as amended October 1, 1959, for the Model 182E and on. In addition, effective S/N 18266591 through 18268586, FAR 23.1559 effective March 1, 1978. FAR 36 dated December 1, 1969, plus Amendments 36-1 through 36-6 for Model 182Q and on.

The Cessna 182Q received type approval in the normal category on July 28, 1976.

1.1.1 Airspeed Limitations

According to the airplanes Pilot's Operating Handbook and FAA Approved Airplane Flight Manual, the published maneuvering speeds at 2,450 pounds were 100 knots indicated airspeed, or 99 knots calibrated airspeed.

1.2 Airplane Manufacturing Information

According to the FAA Airworthiness file, the accident airplane was manufactured in 1978 as model 182Q, serial number 18266640.

1.3 Changes to Airplane Type Design Since Manufacturing Related to Major Systems and Structures

1.3.1 Propeller Installation

In November 2005, a Hartzell BHC-G2YF-1BF/F8468A-2R propeller with Hartzell spinner D-4798P were installed. The FAA 337 Form specified that the installation was in accordance with (IAW) Supplemental Type Certificate (STC) SA3825SW.

1.3.2 Engine Installation

In November 2005, a Continental Aerospace Technologies, Inc², IO-470-F engine was installed IAW STC SA3825SW. The FAA 337 Form specified that the instrument range markings were changed as per the STC.

1.3.3 Installation of Nose Control Surfaces

In November 2005, nose control surfaces (canards) were installed IAW STC SA485SW and installation instructions.

According to Attachment 1 of "STC Data Sheet No. SA4855SW, all conditions and limitations for the Wren 460N, P and Q are identical to those for the Cessna 182N, P and Q respectively, as specified on Data Sheet No. 3A13 except the nose control surface movement relative to the stabilizer was up 2° and down 7° ±1°.

1.3.4 Knots 2U Speed Fairings

In November 2005, Knots 2U speed fairings were installed IAW STC SA2381NM.

1.3.5 BAS Shoulder Harnesses

In November 2005, BAS shoulder harness kit was installed IAW STC SA2067NM.

² Formerly Teledyne Continental Motors.

1.3.6 WingTip Extensions

In May 2006, Air-Research Technology wingtip extensions were installed IAW STC SA00276NY. The FAA 337 Form specified in part that the flight manual was revised with an appropriate supplement.

The maintenance manual supplement specified that for Cessna 182 model, the following placard must be installed:

"Cessna 182 Models
with A.R.T. "*WingExtensions*"
VNE 180 MPH IA (157 KIAS)"

1.3.7 Selkirk Aviation Extended Baggage Compartment

In April 2006, Selkirk Aviation fiberglass extended baggage compartment kit was installed IAW STC SA01364SE. The FAA 337 Form did not specify any Flight Manual Supplement.

1.3.8 Weather Avionics Installation

In April 2006, an Avidyne EX500 MultiFunction display and Heads Up Tech XMD076 were installed IAW STC SA00161BO. The FAA 337 Form specified that the EX500 was interfaced in part to the XMD076.

1.3.9 BRS Ballistic Parachute

In December 2006, a BRS-182 system, serial number 82019 was installed in accordance with installation manuals 9005-IM and 1400-AM. The FAA 337 Form reflected that the weight and balance was updated, and a FAA Approved Flight Manual Supplement was located in the Pilot's Operating Handbook. Instructions for Continued Airworthiness were located, "with [the] aircraft records."

1.3.10 Sandel Electronic Horizontal Situation Indicator

In April 2006, a Sandel SN3500 Electronic Horizontal Situation Indicator was installed IAW STC SA01815LA. The FAA 337 Form associated with the installation specified that with was interfaced with the WX500, EX500, Nos. 1 and 2 GNS. A FAA Approved Flight Manual Supplement dated April 17, 2006 and Sandel SN3500 Pilot's Guide part number (P/N) 82005-PG-B) were required for this approval.

1.3.11 Trolltune Maximum Gross Takeoff Weight Increase

In May 2013, Trolltune STC was incorporated IAW STC SA03608AT which allowed a maximum gross takeoff weight (MGTOW) increase to 3,100 pounds, 3,110 pounds ramp weight. The FAA 337 Form specified that the landing weight remained 2,950 pounds. Supplemental Airplane Flight Manual (SAFM) SFM7501-SW-R was required whenever the airplane was operated at weights exceeding 2,950 pounds. The airplane must be operated within the center of gravity envelope as illustrated in the SAFM or as restricted by other limiting STC's.

The Airplane Flight Manual Supplement for the Maximum Gross Weight Increase specified that the maximum recommended turbulent air penetration speed at 3,100 pounds was 111 knots indicated airspeed (KIAS).

The instrument panel contained a placard documenting the maneuvering speed, but the value was damaged and unreadable (Figure 1).



Figure 1 Placard on Instrument Panel

1.3.12 Registration Change

In October 2006, the registration was changed on the airplane to N725AS.

2.0. BRS Information

2.1 General System Function and Description

The airplane's Ballistic Recovery Systems, Inc. (BRS, Inc.) system intended function was to recover aircraft from catastrophic emergency situations in which normal emergency procedures would be ineffective in saving the occupants lives.

The system consisted of a pressure packed parachute assembly and solid rocket propellant rocket motor stowed in an aluminum canister mounted to the baggage compartment floor just forward of the aft cabin bulkhead. The rocket motor was the primary driver penetrating the rear window extracting the parachute assembly away from the airplane.

The airplane's parachute is attached by a riser to a 3-Pt. shackle assembly (3-Pt. shackle). Also attached to the 3-Pt. shackle were a Kevlar harness assembly that attached structurally to each main spar and also by separate straps attached at the left and right aft cabin bulkhead. The straps that attached to the forward spars were route through a skin cutout near the wing root of each wing, across the top skin of the center portion of the fuselage, and then through a cutout in the rear window.

Activation of the airplane's parachute was accomplished by pulling a handle mounted inside a composite box on the cabin floor just aft of the fuel selector switch. The handle activated the rocket motor through a cable routed through a stainless housing. Two separate actions by the pilot required activation of the airplane parachute. First, the pilot was required to remove the cover and then the activation handle must be pulled with 40 to 70 pounds of force.

Following activation, the rocket would penetrate the rear window and extract the parachute bag away from the airplane, pulling/dragging the harness out. A tethered line connecting the parachute bag to the rear harness would pull the rear harness out which would also by friction drag the front harness out (Figure 2). BRS reports that even if the riser was not attached to the 3-Pt. shackle, the front harness would partially be pulled from under the protective cover on the top skin of the wing center section.

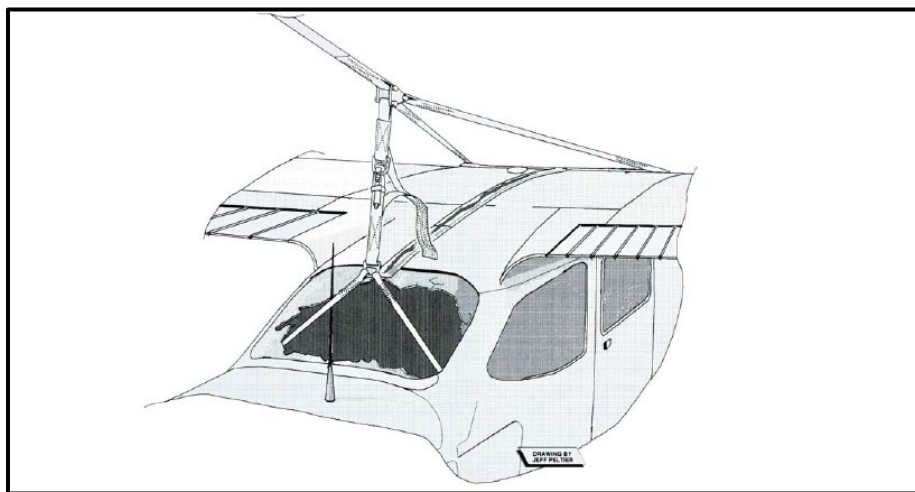


Figure 2 Illustration From BRS of Aircraft Attachment Harness After Parachute Extraction But Before the Rear Harness was Fully Extended

The BRS-182 harness system is designed to control the pitch dynamics of the airplane during the deployment cycle by limiting the length of the rear harness strap until the deployment cycle is complete. The rear harness assembly has two sections of different length. The shorter section has

a mechanical release mechanism that is activated through the tether connected to the bag activating a fused pyrotechnic reefing line cutter (Figure 3).

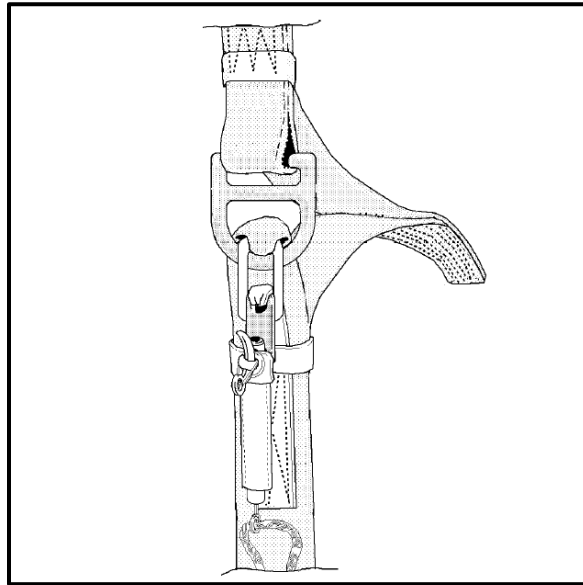


Figure 3 Rear Harness Release Mechanism Illustration From BRS

2.2 BRS-182 Certification Requirements

The BRS-182 received FAA approval for change to Type Design on June 25, 2004 and Ballistic Recovery Systems, Inc., was issued Supplemental Type Certificate SA01999CH. The certification basis for the BRS-182 installation is 14 *CFR* Part 23, effective February 1, 1965, with Amendments 23-1 through 23-43.

The Canopy Strength Test for BRS-182 including the parachute and riser were tested at a gross weight of 4,250 pounds, and a maximum deployment speed of 170+ knots. The inflation load data measured during the tests demonstrated that the structural integrity of the SR22 Parachute Assembly will meet the deployment requirements of the Cessna -182 model aircraft with a gross weight of 3,100 pounds, a maximum deployment speed of 156 knots, and a safety factor of 1.25.

The BRS-182 deployment limit load conditions for an aircraft weight of 3040 lb and a maximum deployment speed of 156 knots were extrapolated from the Cirrus Design SR20 Flight Deployment Test data and are presented in BRS Engineering Report 3141, BRS-1 82 Loads Determination. Those limit loads are compared with the Canopy Strength Loads in Table III (Figure 4). The Parachute Assembly structural safety factor for each condition meets or exceeds the requirement of 1.25.

Table III. BRS-182 Loading Conditions			
Condition	Limit load (lbs)	C.S. Test load (lbs)	Safety Factor
Reefed	15,640	19,550	1.25
Disreef	12,087	24,778	2.05

Figure 4 BRS-182 Loading Conditions Chart

2.3 BRS Testing After Certification Results

Testing was performed of 3 test articles of exemplar 3-Pt. shackle, part number 015006-01 with a Kevlar loop equivalent to a riser loop³. The testing determined that the Kevlar loop did not fail; however, one bolt and bushing that secured the Kevlar loop to the 3-Pt. shackle exhibited bending, while the bolt was fractured due to shear at a minimum 24,750 lb, which was 681 lb greater than the 24,069 lb average canopy strength tested value in a disreef state.

Table II. SR22 Canopy Strength Test Data					358-2. 3- POINT LINKS (15508)				
Run	Speed (knots)	Reefed load (lbs)	Disreef load (lbs)	V descent (fps)	Run	Yield (lbs)	Ult. (lbs)	Rockwell Hardness	Comment
20	170+	18,700	24,480	NA	358-2.1	20,000	23,150	HRC 41	Harness slipped to side- test stopped.
21	170+	19,550	24,778	28.90	358-2.2	21,000	24,750	-	Catastrophic fracture of bolt head.
22	170+	17,850	22,950	27.96	358-2.3	20,200	24,970	-	Catastrophic fracture of threaded end.
Avg	170+	18,700	24,069	28.43					

2.4 Flight Manual Supplement Information for BRS-182

2.4.1 Airspeed and Attitude Limitation

According to the airplane Flight Manual Supplement, BRS-182 activation was approved for deployment by the FAA up to 135 knots. Deployment in inverted flight was not demonstrated and could result in a complete or partial failure of inflation. All efforts to right the airplane should be made if time and altitude permitted. However, if those actions could not be made in a timely manner, the BRS-182 should be activated.

2.4.2 Altitude Limitations

The BRS-182 was designed to decelerate and stabilize the airplane with an altitude loss of 300 to 800 ft. However, the actual altitude loss during

³ The testing was performed to determine the structural integrity of critical metal components due to improper heat treatment.

deployment would be dependent on the airplane's speed and attitude at activation.

2.5 BRS Instructions for Continued Airworthiness (ICA) at Annual and 100-Hour Inspections

2.5.1 External Inspection

The external inspection called to examine the seal around the entire perimeter of the front harness fairings on top of the wing center section, and to remove the wing root access panels on both sides to inspect the front harness attachment brackets. It also specified to check for evidence of leakage through the harness slots in the cabin top skin.

2.5.2 Internal Inspection

The internal inspection required to check the parachute cover, look for leakage around the rear window cutout, wear cuts, tears and abrasion of textile components, dents, breaks and/or corrosion of metal components, security of the parachute canister to the cabin floor, rocket cover for excessive UV damage or cracking, security of the rocket motor to its mounting plate, verifying that the presence and security of the screw retaining the activation cable into the igniter, and security of the activation handle box assembly⁴.

2.6 BRS Maintenance Since December 2006 Installation

On February 12, 2016, the BRS parachute was removed for repacking in accordance with BRS-182 ICA Documents 009005ic-02 Rev. D and 009005-CR Rev. B (Figure 5).

Date	2/12/2016	A/C Reg.	N725AS
Eng. TT	1113.6	Eng. Model	Cont IO 470-F33
Hobbs	1097.7	Eng. S/N	090000-R
Eng. TSMO	271.5		
Maintenance Performed			
1 Removed the BRS parachute for repacking IAW the BRS-182 ICA Documents 009005ic-02 Rev. D and 009005-CR Rev. B			
2 Computed a temporary weight and balance.			
Charles Baize _____			
A&P _____			

Figure 5 View of BRS Parachute Removal

Records from BRS associated with the parachute repacking indicated that during the Retaining Strap/Rear Harness Assembly checklist, the rear harness and the end of the riser were attached to the "3-Pt. shackle assembly

⁴ According to BRS, the 3-Pt. shackle was not specifically mentioned and would not be visible during the internal inspection of the BRS system components specified in the ICA's.

(Figure 6). Both entries required a quality assurance inspection by another inspector. The final quality assurance inspection of the parachute repacking was signed off as being completed on August 17, 2017. BRS did not receive the installation checklists part number (P/N) 9005CL-02 or P/N 0140CL-02, Rev. E, or photo documentation following installation of the re-packed parachute stipulated in the installation manual.

Retaining Strap / Rear Harness Assembly
 By: [Redacted] Date: 8-16-17

Ensure correct hardware.
 Verify Shackle Bushings of equal length (line up on flat surface.)
 Visually inspect all components. Check rear harness continuity.
 Install Reefing Line Cutter, locking loop, straight pin, # 3.5 link, and lanyard onto rear harness.
 Tack as necessary.
 Turn D-bag on its side and attach 3-Pt. shackle assy. to the end of the riser.
 Place and attach rear harness to 3-Pt. shackle, positioned at top of D-bag.
 Attach the Retaining Strap.
 Secure the Retaining Strap with D-bag curved release pins. Secure pins with #5 break cord.
 Route lanyard through large opening in D-ring and attach line cutter lanyard to curved release pin

Tack excess lanyard to rear harness.
 Attach the Incremental Bridle to the Rocket Lanyards with #5 Rapide link. Ensure gate is closed,
 with threadlocker.
 Attach the Incremental Bridle to the D-bag Lanyards with #5 Rapide link. Ensure gate is closed,
 with threadlocker.
 Stow the Incremental Bridle in the Incremental Bridle Sheath. Secure top w/ Kevlar 5 cord.
 Stow the Incremental Bridle and Rocket Lanyards.
 QA check. Assembly weighed: 52.8 lbs.

8-17-17

Figure 6 View of RePack Entry Showing Riser and Rear Harness Attachment to 3-Pt. Shackle

On August 24, 2017, the BRS parachute was installed after 10-year repacking by BRS. In addition, the rocket and igniter were replaced. The line cutter was due to be replaced August 2022 (Figure 7)⁵.

Date	8/24/2017	A/C Reg.	N725AS
Total time	2950.5	A/C Model	182 Q
Hobbs	1253.5	A/C S/N	18266640

Maintenance Performed

- 1 Reinstalled the BRS parachute system after 10 year repacking by BRS
 Work done IAW BRS Doc. 009005ic-02 rev D; and 9005IM-03 rev. J
 Repacking next due 8/2027 Line cutter replacement due: 8/2022
- 2 Replaced rocket and igniter IAW BRS Doc 0140AM-02 rev. E
 Replacement next due 8/2027
- 3 Removed the temporary W&B revision
- 4 Treated aircraft with ACF-50 corrosion protection

Charles Balze
 A&P [Redacted]

Figure 7 Parachute Installation After Repacking

Although there were no direct entries related to BRS Instructions for Continued Airworthiness (ICA) after the repacked parachute was installed through the last entry, the owner of the repair facility that signed off the airplane's last annual inspection on September 1, 2022 (Figure 8), provided NTSB a two-page document. That document was reportedly provided to him by the airplane owner which indicated that the BRS parachute inspection should focus on checking the activation handle, activation cable, parachute container, launch tube, and rocket motor assembly for an signs of

⁵ There was no entry in the maintenance records that the line cutter was replaced.

damage, corrosion, or improper securing, ensuring the system is properly armed and ready for deployment in an emergency. The document also mentioned periodic inspections and advised to follow the recommended inspection schedule as outlined in the BRS manual, which includes annual maintenance inspections (Attachment 1). He reported that he did not find any discrepancies with the BRS system components during his inspection⁶.

2022		
DATE: September 1, 2022	AIRCRAFT AVIATION SERVICES	HOBBS TIME: 1,570.29
REGR: N 725AS	JACKSON COUNTY AIRPORT	TOTAL TIME: 3,265.29
SERIAL: 1826640		ELT DUE DATE: 2020 July 2027
100 HOUR INSPECTION / ANNUAL INSPECTION		
100 HOUR INSPECTION COMPLETED I/A/W INSPECTION GUIDE THAT MEETS THE REQUIREMENTS OF THE FAR 43 & 91.409. ALL INSPECTION PANELS REMOVE CONTROL CABLES AND PULLEYS INSPECTED. BLUCK HEAD CHECKED FOR CRACKS AND CORRISION. AIRCRAFT PLAGE ON JACKS WHEELS REMOVED, TIRES CHECK FOR WEAR AND WHEEL ASSAY. CHECK FOR CRACKS. WHEEL BEARINGS CLEANED AND REPACKED, BRAKE PADS CHECKED FOR WEAR. LANDING GEAR SYSTEM CHECK. SHIMMY DAMPER CHECK AND SERVICED. BATTERY BOX CHECKED FOR CORRISION. FUEL SYSTEM CHECKED FOR LEAKS. FUEL CAP VENTS CHECK. FUEL BOWL REMOVE CLEANED AND REINSTALL. ALL LIGHTS AND ELECTRIC WIRING CHECKED. ELT BATTERY DUE DATED: 9-20-20 CHECKED / C/W FAR 91.207D. INSTALL NEW BRACKET AIR FILTER BA-8301. INSTALL NEW GYRO FILTER: D9-18-1 & INSTR. FOAM FILTER: B3-5-1. TWO NEW LOWER COWLING MOUNTS VAC PUMP TEMPEST TORNADO 3000 DRY AIR PUMP (IFR REQUIREMENT 5 YEARS OR 300 HOURS NEXT DUE.) (AT THIS TIME 258.0 HRS AND 3 YR OLD DUE NEXT YEAR) AD: C/W: AD-2020-18-01 / SEB93-5R2 DATED MAY 29, 2019. INSPECTION OF THE LOWER FORWARD DOORPOST BULKHEAD AND WING STRUT FITTING. INSPECTION WAS VISIBLE INSPECTED BY USE OF A BORO SCOOP NO CRACKS FOUND AT THIS TIME NEXT INSPECTION 36 MONTHS THIS DATE: September 24, 2021 ARE 1000 HOURS. C/W: AD-2011-10-09 TO PREVENT SEAT SLIPPAGE OR THE SEAT ROLLER HOUSING FROM THE SEAT RAIL. C/W: AD-87-20-03R2 SEAT TRACK INSPECTION C/W: AD-71-22-02R1 CRACKS IN NOSE GEAR FORK C/W: AD-76-07-12 MAGENTO SWITCH INSPECTION C/W: AD-99-05-09 DAMAGED INDUCTION AIR FILTER. NEW ELEMENT INSTALL. ALL AD'S CHECKED THRU BY-WEEKLY 2022-18 I CERTIFY THAT THIS AIRCRAFT HAS BEEN INSPECTED IN ACCORDANCE WITH ANNUAL INSPECTION GUIDE THAT MEET FAR 43 & 91.409 (A)(1) AND WAS DETERMINED TO BE IN AIRWORTHY CONDITION. I/A		

Figure 8 Last Annual Airframe Logbook Entry

3.0. BRS Factual Observations

3.1 Parachute and Rocket

The parachute and rocket were never located.

3.2 Instrument Panel Placard

The instrument panel was marked with "Maximum Parachute Deployment Speed - 135 KIAS" (Figure 9).

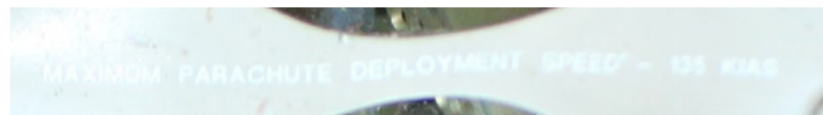


Figure 9 Placard on Instrument Panel in Front of Pilot

⁶ Refer to NTSB Record of Conversation contained in the NTSB public docket.

3.3 BRS Activation Handle

The safety pin was not in position, the handle was outside the handle housing and the cable had a slight kink near the handle (Figure 10).



Figure 10 View of the BRS Activation Handle

3.4 Parachute Canister

The parachute canister and rocket support and the rocket fairing exhibited extensive impact damage (Figure 11).



Figure 11 View of the BRS-182 Canister and the remaining parts of the activated rocket

3.5 Main Spar BRS Attach and Front Harness Information

3.5.1 Separation Of Front Harness Protective Cover

Inspection of the upper skin aft of the aft spar revealed the fiberglass protective cover which would normally cover the front harness was separated (Figure 12).



Figure 12 Upper Skin Aft of Aft Spar Arrow Points to Area of Separated Fiberglass Cover For Front Harness

3.5.2 Left Forward Spar Attachment and Harness

The attachment bracket, securing hardware, and harness remained attached to the attachment bracket but the left wing forward spar main attach fitting (spar block) was structurally separated. The harness was continuous to the 3 Pt. shackle but exhibited fraying near the attachment bracket (Figure 13).



Figure 13 View of the Left Main Spar With Attached BRS Harness

3.5.3 Right Forward Spar Attachment and Harness

The attachment bracket, securing hardware, and harness remained attached to the attachment bracket but the right wing forward spar main attach fitting (spar block) was structurally separated (Figure 14). The harness was fractured about 54 inches from the spar attach point (Figure 15).



Figure 14 Figure 10 Right Main Spar With Attached BRS Harness



Figure 15 Figure 12 View Depicting Length of Fractured Right Forward Harness

3.6 Rear BRS Attach and Rear Harness

3.6.1 Left Rear BRS Attachment and Harness

The left rear attach plate remained structurally attached and the tang remained attached to the rear attach plate. The harness remained attached to the tang (Figure 16) and was continuous to the 3-Pt. shackle.



Figure 16 View of Left Rear BRS Strap Structural Attach

3.6.2 Right Rear BRS Attachment and Harness

The left rear attach plate remained structurally attached and the tang remained attached to the rear attach plate. The harness remained attached to the tang (Figure 17) and was continuous to the 3-Pt. shackle.



Figure 17 View of Right Rear BRS Strap Structural Attach

3.7 3-Pt. Shackle

The 3-Pt. shackle still had the front and rear harnesses attached but the parachute riser was not attached (Figure 18). The bolt/bushing for the riser attachment was not visibly deformed or damaged. Additionally, the bolts/bushings of the front and rear harness attachments were not visibly deformed or damaged.



Figure 18 View of the 3 Pt. Shackle The bolt/bushing on top is Where the Parachute Riser Would Attach

3.8 Front and Rear Harness Entanglement

Exiting the aft portion of the fuselage were black (front) and yellow webbing (rear) associated with the front harnesses connecting through the 3-Pt. shackle to the rear harness of the airframe ballistic parachute (Figure 21). The webbing of the front harness was wrapped tightly several times to the left. Entrapped with the twisted webbing were the elevator and rudder primary control cables, trim cables, and red rope which was the same kind of rope found in the cabin section of the wreckage.

Examination of the front harness revealed it exhibited entanglement and tightening (Figure 19).



Figure 19 View of the Entanglement of the Front Harness and Fractured Right Forward Harness

3.9 Rear Harness Length

Examination of the rear harness revealed that the shock absorption stitching pattern was not peeling/torn indicating that there was no force applied to the rear harness at the 3-point shackle level. Forces which would occur during parachute opening and steady state phases would peel/tear the stitching which would lengthen the rear harness, provide shock absorption and adjust the aircraft attitude (Figures 20 and 21).



Figure 20 View of Harnesses and 3-Pt. Shackle of BRS System Arrow Points to Section of Rear Harness Still Sewed Together



Figure 21 View of the Tangled Front and Rear Harnesses. Arrow Points to Still Sewn Together Portion of Rear Harness

3.10 Rocket Cone/Pin Actuator

The fire pin actuator was found inside the rocket cone with the activation cable still attached consistent with normal activation (Figure 22).



Figure 22 View of the Rocket Cone and Fire Pin Actuator Inside Rocket Cone

4.0. BRS PARACHUTE STATUS

The missing parachute and rocket motor if located will need to be examined.

Submitted by:

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