NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Aviation Engineering Division
Washington, D.C. 20594

11-15-2006

AIRWORTHINES GROUP CHAIRMAN'S FACTUAL REPORT

A. ACCIDENT:

NTSB Accident Number:	DCA07MA003
Location:	Manhattan, New York
Date:	October 11, 2006
Time of Accident:	Approximately 1442 Eastern Daylight Time
Aircraft:	Cirrus SR20

B. SYSTEMS GROUP

Chairman:	Mike Hauf National Transportation Safety Board Washington, DC
Member:	Brannon D. Mayer Air Safety Investigator Cirrus Design Corporation Duluth, Minnesota
Member:	David Spangler Air Safety Investigator Ballistic Recovery Systems, Inc.

C. SUMMARY

On October 11, 2006, about 1442 PM eastern daylight time, a Cirrus Design SR20, N929CD, struck an apartment building while maneuvering above Manhattan, New York. The airplane was destroyed by impact forces and a post crash fire. The certificated private pilot, owner of the airplane, and a certificated flight instructor were fatally injured. Visual meteorological conditions prevailed, and no flight plan was filed for the flight that departed Teterboro Airport, Teterboro, New Jersey. The personal sightseeing flight was conducted under the provisions of Title 14 Code of Federal Regulations Part 91.

The on-scene phase of the investigation was conducted at the accident site (Belaire Condominiums located at 524 East 72nd Street, Manhattan, New York) from October 11, 2006 to October 13, 2006. At the accident site, the airplane wreckage was examined in its final resting position; the aircraft's cockpit instruments, primary and secondary flight control systems were identified, photographed and documented.

These field notes summarize the Airworthiness Group findings for all on-site and follow-up activities to date.

D. DETAILS OF THE INVESTIGATION

D.1 AIRCRAFT INFORMATION

The Cirrus Design SR20 (**Figure 1**) is certificated under the requirements of Federal Aviation Regulations (FAR) Part 23 as documented by FAA Type Certificate (TC) data sheet number A00009CH; it was certified on October 23, 1998. As detailed in the TC, Cirrus Design Corporation is the type certificate holder.

The 2002 model Cirrus SR20 Aircraft N929CD, serial number 1230, was manufactured in 2002 and its Standard Airworthiness Certificate was issued on July 25, 2002. The airplane was a four-seat, low-wing, fixed tri-cycle landing gear, primarily composite, and monocoque design airplane. It was powered by a six cylinder, horizontally opposed, fuel injected, air-cooled Teledyne Continental Motors (TCM) IO-360-ES piston engine. The airplane is also equipped with a Cirrus Airplane Parachute System (CAPS).

D.2 WRECKAGE AND IMPACT INFORMATION

D.2.1 General Description

Airplane N929CD impacted into the vicinity of the 32nd and 33rd floor (**Figure 2**, and **Figure 3**) of the North face of the Belaire Condominiums located at 524 East 72nd Street[1]. See attachment 1 for a diagram of the building. The airplane's engine, propeller, right portion of the engine mount and the nose landing gear strut (without wheel assembly) came to rest inside apartment 40 A/B/G[2] (32nd floor) (**Figure 4**).

The primary area of the airplane wreckage was located on the street level of East 72nd street directly under the point of impact along the north building line of #524 (**Figure 5**, and **Figure 6**). The debris field extended out from the primary wreckage and was located on adjacent rooftops, balconies, and appendages.

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[1] The building at 524 East 72nd Street is a 42 story high rise masonry structure with the lower 12 levels occupied by the Hospital for special surgery and the upper floors occupied by Belaire Condominium residences

[2] Multiple condo units were converted into one apartment.

The airplane was destroyed by impact forces and its structure (fuselage, empennage, wing) was consumed by a post crash fire. The remaining airframe material was charred and brittle.

All major components of the airplane were located at the accident site.

D.2.2 Flight Controls – Description

According to the FAA approved Cirrus Design SR20 Pilot's Operating Handbook (POH), the airplane uses conventional flight controls for the ailerons, elevator and rudder. The control surfaces are pilot controlled through either of the two single-handed side control yokes. The flight control system contains a combination of push rods, cables, and bell cranks for the control of the surfaces.

All primary and secondary flight control surfaces were located and found separated from the airplane; they were found scattered around the main wreckage and on the street.

D.2.2.1 Aileron and Roll Trim System

D.2.2.1.1 System Description

The ailerons provide airplane roll control. The ailerons are of conventional design with skin, spar and ribs manufactured of aluminum. Each aileron is attached to the wing shear web at two hinge points (**Figure 7**).

Aileron motion is transferred by the control yoke through a linkage (push/pull rods) to an actuation pulley mounted on the console structure. From the pulley, control motion is passed to a single cable system and is routed through the forward pulley gang at the bottom of the center console, under the cabin floor to the rudder aileron interconnect, and along the fuselage longerons to kick-out pulleys which direct the cables to the wing area between the aft spar and the flap cove. The cables pass through fairleads at each flap location where they attach to the aileron actuation pulley. A cross-over cable returns to the other side of the wing, interconnecting the left and right ailerons.

The roll trim motor changes the neutral position of a captured compression spring cartridge, which is attached to the left aileron actuation pulley. A conical trim button located on top of each control yoke controls the motor. Moving the switch left will initiate left-wing-down trim and moving the switch right will initiate right-wing-down trim. Pressing down on the switch will disconnect the autopilot if the autopilot was engaged. Neutral trim is indicated by the alignment of the line on the control yoke with the centering indication marked on the bolster panel. The aileron trim also provides a secondary means of aircraft roll control in the event of a failure in the primary roll control system not involving jammed ailerons. Aileron trim operates on 28 VDC supplied through the 2-amp ROLL TRIM circuit breaker on Main Bus 1.

D.2.2.1.2 **On-site Activities**

An examination of the aileron control system was conducted at the accident site by the Airworthiness Group. All of the aileron and roll system components were located within the main debris field and the street. Both the left and right control yokes were identified and found disconnected (fractured) from the control linkage; the control yoke carriages were not found. The center console aileron actuation pulley was found with all attachment hardware in place. The aileron cable and ball swage safety was in place. Both the left and right aileron push/pull rods remained connected. Each aileron system cable was examined and continuity was established from the center console aileron actuation pulley to the left and right aileron actuation pulleys.

The right aileron was located on the street approximately 90 feet at 355 degrees from the main wreckage (**Figure 8**). An examination of the aileron revealed that it exhibited buckling and mechanical damage. The right aileron actuation pulley was located within the main debris field. The right aileron actuation rotated freely. It remained attached to a portion of the right aft sheer web. The attachment hardware, cable ball swage, and ball swage safety remained in place.

The left aileron was located on the sidewalk within the main debris field. The left aileron remained attached to the inboard hinge. The left aileron actuation arm remained engaged to the actuation pulley. The left aileron actuation pulley's bearing block was located against its lower aileron stop (**Figure 9**, and **Figure 10**). The roll trim cartridge and roll trim motor remained attached to aileron actuation pulley (**Figure 11**, and **Figure 12**).

On October 23, 2006, the Airworthiness Group conducted an aileron and roll trim system test on an exemplar SR20 aircraft. The test was conducted at a Cirrus Design Corporation hangar in Duluth, Minnesota. The objective of the test was to determine what the aileron and roll trim position was on the accident aircraft. In accordance with the objective, the roll trim motor on the exemplar aircraft was set to the position of the motor from the accident airplane. The result of the test indicated that the left aileron actuation pulley was positioned to command the left aileron to a full up position. The roll trim motor on the accident aircraft was identified in a position that would command approximately full left trim. A photograph was taken of the roll trim actuator on an exemplar SR20 aircraft, it position was not identified (**Figure 13**).

D.2.2.2 Rudder and Yaw Trim System

D.2.2.2.1 System Description

The rudder provides airplane directional (yaw) control. The rudder is of conventional design with skin, spar and ribs manufactured of aluminum. The rudder is attached to the aft vertical stabilizer shear web at three hinge points.

D.2.2.2.2 On-site Activities

The rudder was located near the main debris field on the sidewalk. The rudder exhibited mechanical damage. The rudder was separated from the vertical stabilizer, which was consumed by post crash fire.

D.2.2.3 Elevator and Pitch Trim System

D.2.2.3.1 System Description

The two-piece elevator provides airplane pitch control (**Figure 14**). The elevator is of conventional design with skin, spar and ribs manufactured of aluminum. Each elevator half is attached to the horizontal stabilizer at two hinge points.

Elevator motion is generated through the pilot's control yokes by sliding the yoke tubes forward or aft in a bearing carriage. A push-pull linkage is connected to a cable sector mounted on a torque tube. A single cable system runs from the forward elevator sector under the cabin floor to the aft elevator sector pulley. A push-pull tube connected to the aft elevator sector pulley transmits motion to the elevator bellcrank attached to the elevators.

The pitch-trim system employs a ground adjustable trim tab, and a spring cartridge activated by an electric trim motor to act as the autopilot servo. The spring cartridge, directly connected to the elevator bell crank and the electric trim motor, provides a centering force regardless of the direction of control surface direction.

D.2.2.3.2 On-site Activities and Testing

During the on-site activities of this investigation, October 12, 2006, the Airworthiness Group identified and documented the components of the elevator system.

The left elevator was located on the sidewalk approximately 100 feet to the west of the main wreckage; it exhibited mechanical damage (**Figure 15**). The right elevator was located with in the main debris field; it exhibited thermal and mechanical damage. The outboard section of the right elevator, approximately 2-feet in length, remained attached to the horizontal stabilizer, which was mostly consumed in the post crash fire.

The pitch trim cartridge was not located. The fractured pitch trim rod end remained attached to the pitch trim motor. The pitch-trim motor was found within the main wreckage separated from the pitch trim cartridge and surrounding structure. The pitch trim motor was removed from the wreckage and sent to the National Transportation Safety Board (NTSB) Materials Laboratory for an exterior visual examination. The examination indicated that the position of the actuation arm was positioned approximately full up. (**Figure 17**). The position of the actuation arm was documented and compared to an exemplar pitch-trim electric trim motor (**Figure 18**) and then provided to Cirrus Design for further analysis.

On October 23, 2006, the Airworthiness Group conducted a pitch trim system test on an exemplar SR20 aircraft. The test was conducted at Cirrus Design Corporations hangar in Duluth, Minnesota. The objective of the test was to determine what the pitch trim position was on the accident aircraft. In accordance with the objective, the pitch trim motor on the exemplar aircraft was set to the position of the motor from the accident airplane (**Figure 19, Figure 20**). The result of the test indicated that the pitch trim motor on the accident aircraft was identified in a position that would command approximately full up trim.

D.2.2.4 **Flaps**

D.2.2.4.1 **System Description**

The electrically controlled, single-slotted flaps provide low-speed lift enhancement (**Figure 21**). Each flap is manufactured of aluminum and connected to the wing structure at three hinge points. The flaps are selectively set to three positions: 0%, 50% (16°) and 100% (32°) by operating the FLAP control switch. The FLAP control switch positions the flaps through a motorized linear actuator mechanically connected to both flaps by a torque tube. Proximity switches in the actuator limit flap travel to the selected position and provide position indication. The wing flaps and control circuits are powered by 28 VDC through the 15-amp FLAPS circuit breaker on the Non-Essential Bus.

D.2.2.4.2 **On-site Activities**

During the on-site activities of this investigation, October 12, 2006, the Airworthiness Group identified and documented the components of the flap system.

The left flap was located within the main wreckage debris field; it exhibited mechanical damage. The right flap was located within the main wreckage debris field. The right flap exhibited leading edge impact damage. The right flap was buckled upward approximately 90 degrees, at a point 3-feet in from the outboard end (**Figure 22**).

The linear flap actuator was located within the main wreckage debris field. The actuator was found separated into three sections (**Figure 23**). These sections were removed from the main wreckage and placed on a piece of paper, aligned and

photographed (**Figure 24**). An examination of the three pieces revealed that the actuator position was consistent with the flaps at the zero or "full up" position.

D.2.2.5 Wing:

D.2.2.5.1 Description

The wing structure is constructed of composite materials producing wing surfaces that are smooth and seamless. The wing cross section is a blend of several high performance airfoils. A high aspect ratio results in low drag. The wing provides the attachment structure for the main landing gear and contains a 30.25-gallon fuel tank on each side. The wing is constructed in a conventional spar, rib, and shear section arrangement. The upper and lower wing skins are bonded to the spar, ribs, and shear sections (rear spars) forming a torsion box that carries all of the wing bending and torsion loads. The wing spar is manufactured in one piece and is continuous from wing tip to wing tip. The wing spar passes under the fuselage below the two front seats and is attached to the fuselage in two locations. The aft shear webs are similar in construction but do not carry through the fuselage. The aft shear webs are attached to the fuselage sidewalls just aft of the rear seats.

D.2.2.5.2 On-site Activities

During the on-site activities of this investigation, October 12, 2006, the Airworthiness Group identified and documented the wing spar.

The main wing spar was located within the main debris field on the sidewalk (**Figure 25**). The wing spar was removed from the wreckage and placed in the street for examination (**Figure 26**). A visual examination revealed that the spar face was fractured from the right tip, inboard approximately 9 feet (**Figure 27**). The right tip of the spar was not thermally damaged. The center section and the left wing side of the spar were thermally damaged but remained intact.

D.2.2.6 Fuselage Station 222 Bulkhead:

The bulkhead was located in the main wreckage debris field. It exhibited thermal damage. The CAPS access panel, rocket launch tube, launch tube base, igniter, and cable remained attached to the bulkhead. Two CAPS access panel screw holes exhibited evidence of tearing. Transfer of nylon material in a molten state was noted on the rear of the access panel.

D.2.2.7 Cockpit Area

D.2.2.7.1 **Description**

The instrument panel is arranged primarily for use by the pilot in the left seat; however, it can be viewed from either seat. Flight instruments and annunciators are located on the left side of the panel and engine instruments are located on the right side of the instrument panel. A large color multifunction display is located between the flight instruments and the engine instruments. Temperature controls are located on the right side below the engine instruments. The SR20 uses standard flight instruments arranged in the 'basic-six' pattern.

A switch panel located in the "dash board" bolster below the flight instruments contains the MASTER and ignition switches, AVIONICS power switch, PITOT HEAT switch, and lighting switches.

A center console contains the avionics, flap control and position lights, power lever and mixture controls, fuel system indicator and controls, and audio controls. System circuit breakers, the alternate static source valve, alternate induction air control, and ELT panel switch are located on the left side of the console for easy access by the pilot. A parking brake knob is mounted below the flight instruments inboard of the pilot at knee level.

On October 23, 2006, the Airworthiness Group photographed the cockpit on an exemplar SR20 aircraft (**Figure 29**).

D.2.2.7.2 **On-site Activities**

The cockpit area was destroyed by impact forces and its structure was consumed by a post crash fire. The majority of the cockpit was located within the main debris field; however, the instrument panel and several flight instruments were located on the third floor terrace[3]

The Airworthiness Group performed a detailed visual inspection of the third floor terrace. The inspection was conducted to identify and document all airplane components remaining on the terrace. The components identified were:

1. Instrument Panel:

   The multifunction display, all the right side indicators were separated from the panel. The only instruments that remained in the panel were the airspeed indicator, turn rate coordinator, and the HSI. The faceplate of the turn coordinator remained in the display panel and indicated approximately one (1) needle width past a standard rate left turn. The HSI/RMI navigational display was found

[3] The third floor terrace was located directly beneath the impact area on the 32nd and 33rd floor.

mechanically damaged; its faceplate was missing and was not located. The unit exhibited impact damage. (**Figure 30**)

2. Multifunction Display:

   The multifunction display (MFD) was located resting on the third floor terrace; it exhibited mechanical damage. The flash memory module was located inside the case, but separated from its port (**Figure 31**). The module exhibited mechanical and thermal damage. It was removed from the accident site and shipped to the NTSB for examination.

3. Attitude Indicator:

   The attitude indicator was separated from the instrument panel; it exhibited mechanical damage. As initially found, the majority of the components (Yoke assembly, Rotor, housing, mask assembly, and indice ring) remained inside the can (**Figure 32**). Upon picking the unit up, all components fell out of the can assembly. The internal components were placed on a cement block and photographed (**Figure 33**, and **Figure 34**). The bezel assembly and airplane indicator remained within the instrument panel (**Figure 36**).

   The rotor was not retained within the housing assembly. A visual examination of housing assembly revealed rotational scoring. The indicator and associated components were packaged and removed from the accident site and shipped to the NTSB for examination.

   On November 8, 2006, the NTSB and two representatives from Cirrus Design Corporation conducted an examination of the attitude indicator. The objective of the examination was to determine the flight attitude and if the indicator was operational at the time of impact. The examination of the attitude indicator confirmed the rotational scoring within the rotor housing. Due to the impact damage, the attitude at the time of impact could not be determined.

4. Airspeed Indicator:

   The airspeed indicator was separated from the instrument panel; it indicated 0.0 knots. The unit sustained impact damage and exhibited mechanical damage (**Figure 35**).

5. The switch panel, located in the “dash board” bolster below the flight instruments, was found attached to the instrument panel. The switch positions were as follows:
   a. Master ALT2 - Positioned to ON
   b. Master ALT - Positioned to OFF
   c. Master BAT - Positioned to OFF
   d. Avionics - Positioned to OFF

e. Pitot Heat Positioned to OFF
f. Exterior Lights NAV - Undetermined
g. Exterior Lights Strobe - Positioned to ON
h. Exterior Lights Landing - Positioned to ON
i. Interior Lights - Undetermined

The center console was consumed by the post crash fire and the majority of the gauges and switches were destroyed. Throttle and mixture positions could not be determined.

The left and right front seats were located within the main debris field. The left front seat was destroyed by the post crash fire. The right front seat was separated from the fuselage. The right front seat exhibited impact damage. The right front seat's inboard seat track remained attached to the seat frame (**Figure 37**). The right front seat's energy absorption module exhibited impact damage and was separated from the right seat frame. Approximately 75 percent of the right front seat's energy absorption module was measured at less then 0.5 inches in thickness.

D.2.3 Landing Gear

Airplane N929CD had a fixed tri-cycle landing gear. The left and right main landing gear assemblies are bolted to the composite wing structure between the wing spar and shear web. The nose gear is attached to the engine mount and it utilizes a free castering nose wheel.

The nose landing gear strut assembly was located inside apartment 40 A/B/G; the wheel assembly (fork, wheel and tire) was not attached to the strut. An examination of the strut assembly indicates that the wheel assembly had separated from the nose landing gear strut at the "fishmouth" weld. The wheel assembly was located in the debris field.

Both the left and right main landing gear assemblies were separated from their respective attachment points and were located in the debris field. A visual examination of the tire and wheel assembly from the left main landing gear revealed that the wheel was mechanically damaged (flat spot) (**Figure 38**).

Left main gear fairing was located on the 3rd floor terrace; it exhibited mechanical damage.

D.2.4 Electrical System

The standard airplane is equipped with 28-volt direct current (VDC) dual alternator electrical system. The system provides uninterrupted power for avionics, flight instruments (directional Gyro), lighting and other electrically operated and controlled systems during normal operation. The system also allows load shedding in the event of an electrical system failure.

Primary power for the SR20 is supplied by a 28-VDC negative-ground electrical system. The electrical power generation system consists of a 24-volt, 10-amp-hour battery, two alternators and a Master Control Unit. To protect sensitive instruments, the over-voltage protection system monitors the primary power bus and automatically limits the peak voltage to 28.5 volts. During sustained over-voltage and under-voltage periods, the over-voltage system provides a warning to the pilot.

The circuit breaker panel was located within the main debris field, it was found crushed (folded) with the majority of the circuit breakers open (**Figure 39**).

The directional gyro was found on the third floor terrace. The directional gyro was packaged and removed from the accident site and shipped to the NTSB for examination. This electrically driven gyro provides information to the Horizontal situation Indicator HSI.

On November 8, 2006, the NTSB and two representatives from Cirrus Design Corporation convened at the NTSB Materials Laboratory to conduct an examination of the directional gyro. A visual examination was accomplished on the part number 4305-150, serial number 04222470. The examination revealed rotational score marks on the rotor housing.

D.2.5 Vacuum System

The airplane vacuum system provides the vacuum necessary to operate the attitude gyro. The system consists of an engine-driven vacuum pump, an electric vacuum pump for backup, two vacuum switches, two annunciators, a vacuum manifold, a vacuum regulator, vacuum system air filter, and the vacuum-driven instruments (including a suction gauge). The backup portion of the system operates automatically to provide vacuum for the instruments should the engine-driven vacuum pump fail. The back-up function is fully automatic and requires no pilot action. The electric vacuum pump operates on 28 VDC.

D.3 Cirrus Airplane Parachute System

D.3.1 Description

The airplane was equipped with a Cirrus Airplane Parachute System (CAPS) designed to recover the aircraft from catastrophic emergencies in which normal emergency procedures are ineffective.

The CAPS consists of a parachute, a solid-propellant rocket to deploy the parachute, a [manually-activated] rocket activation handle, and a harness imbedded within the fuselage structure. A composite parachute enclosure, approximately 16 inches long, 14 inches wide and 24 inches deep, is mounted in the fuselage just aft of the rear window on fuselage station 222 bulkhead. The enclosure contains the packed parachute assembly, solid propellant rocket motor, and related system components. A composite cover bonded the perimeter of the enclosure provides a watertight seal around the enclosure opening to protect all of the components from the elements.

The parachute is enclosed within a deployment bag that stages the deployment and inflation sequence. The deployment bag creates an orderly deployment process by allowing the canopy to inflate only after the rocket motor has pulled the parachute lines taut. The parachute itself is a 2400-square-foot round canopy equipped with a slider, an annular-shaped fabric panel with a diameter significantly less than the open diameter of the canopy. A three-point harness connects the airplane fuselage structure to the parachute.

The system is deployed by pulling the CAPS activation handle, which is mounted in a recessed enclosure in the cabin ceiling on the airplane centerline just above the pilot's right shoulder. A placarded cover, held in place with hook and loop fasteners, covers the activation handle and prevents tampering with the control. The cover is removed by pulling the black tab at the forward edge of the cover. The activation handle is connected to the rocket motor igniter with a flexible, stainless steel aircraft grade cable routed through a cable housing above the cabin ceiling headliner.

Two separate and deliberate pilot actions are required to deploy the CAPS parachute. The first action requires that the pilot remove the cover from the activation handle enclosure. The second action requires the pilot to pull the activation handle out and down several inches. The first few inches of motion take up system slack, which has been built into the system to prevent inadvertent activation due to flexing of the system. Once this slack is removed, further motion of the handle arms and releases a firing pin, igniting the solid-propellant rocket fuel in the rocket motor.

D.3.2 On-site Activities

The parachute components were mainly located on the sidewalk in front of the building with the majority of the wreckage.

D.3.2.1 Rocket Motor and Hardware Inspection

The rocket was removed and relocated to a bomb disposal unit for safe storage. Inspection of the rocket motor showed that the fuel had been burned. The rocket lanyards were located and had been cut by the bomb squad. The incremental bridle had been consumed by fire.

The igniter assembly was taken apart and inspected. The cable attachment to the firing pin had been pulled free and the two ball bearings were missing and not located. The primers were indented showing mechanical activation had occurred.

D.3.2.2 Deployment bag inspection

The deployment bag was located within the main debris field. It was charred, burned and melted. It still contained the packed parachute assembly. Portions of the riser and release pins remained intact, and were in a normal stowed state.

D.3.2.3 Parachute Inspection

The parachute remained packed in the deployment bag. Extensive melting and fire damage of the canopy had occurred. The Kevlar vent lines were partially visible. The suspension lines remained stowed.

D.3.2.4 Slider Inspection

The slider was still contained in the packed parachute assembly and could not be inspected.

D.3.2.5 Riser inspection

Portions of the burned and charred riser were found contained in the debris field. The part number and serial number were not visible.

D.3.2.6 Front Harness inspection

The left and right front harness part numbers and serial number were not visible.

Front harness bridles were burned, charred, and located in the debris field. Front attach points were not located.

D.3.2.7 Rear attachment harness inspection

A portion of the rear harness remained attached to the rear bulkhead. The 3-ring release was still in a normal stowed state. The rear harness assembly was not located. The line cutters were not located.

D.4 Maintenance, General

The Airworthiness group performed a review of the owner's Cirrus SR20 maintenance programs, aircraft maintenance history, airworthiness directives, service bulletins, weight and balance, supplemental type certificates, service difficulty reports, major repairs, and alterations.

D.4.1 Type Certificate Data Sheet

Federal Aviation Administration (FAA) "Type Certificate Data Sheet" number A00009CH, revision 9, for Cirrus Design Corporation SR20 and SR22, dated August 7, 2006 was reviewed for compliance conditions and limitations. No discrepancies were noted.

D.4.2 Airframe Information

Cirrus SR20 airplane N929CD, serial number 1230, was manufactured by Cirrus Design Corporation, 4515 Taylor Circle, Duluth MN in 2002. The Federal Aviation Administration issued the Standard Airworthiness Certificate on July 25, 2002.

Airplane N929CD was equipped with one Teledyne Continental Motors (TCM) Model IO-360-ES engine, driving a Hartzell Model PHC-J3YF-1RF propeller.

Due to the impact damage and the post crash fire, the Hobbs meter was not located and therefore, the total number of flight hours could not be determined. However, at the last annual inspection on June 20, 2006, the aircraft N929CD had 383.7 hours on the Hobbs meter.

D.4.3 Airplane Ownership

Federal Aviation Administration forms 8050-1 and 8050-2 were reviewed to determine the history of ownership of airplane N929CD, serial number 1230. According to these forms, the airplane was sold three times during its four-year lifetime. The following information is per the Federal Aviation Administration:

Owner	Location	Date Acquired
Infinity Data Corporation	Brockton, MA	08/02/2002
Cirrus 2002 Associates, LLC	Brockton, MA	12/23/2005
Cory Lidle	Glendora, CA	06/06/2006

D.4.4 Annual Inspection

Aircraft N929CD underwent a complete annual inspection every 12 calendar months as required by FAR part 91.409. The inspection is to be performed by an authorized maintenance person as described in Title 14 CFR 43.3. The inspection interval to the next annual inspection may not exceed twelve calendar months.

A review of aircraft N929CD maintenance records found that the airplane was inspected in accordance the manufacturers maintenance manual annually. The following indicates the last two annual inspections performed on the airplane.

- On June 20, 2006, the last annual inspection was accomplished by Mass Aviation Services, LLC via the manufacturers checklist. Mass Aviation Services, LLC is an FAA certificated repair station[4] located in Worcester, MA. At the time of the annual inspection, aircraft N929CD had 383.7 hours on the Hobbs meter.
- On June 20, 2005 an annual inspection was accomplished by Keyson Airways via the manufacturers checklist contained in the SR20 Maintenance Manual, Reference Keyson Airways work order 10131, dated July 8, 2006. Keyson Airways is an FAA certificated repair station located in Nashua NH.

D.4.5 Federal Aviation Administration (FAA) Airworthiness Directives (AD[5])

Cirrus Design Corporation and Mass Aviation Services provided the NTSB with documents showing the record of accomplishment for all ADs that were applicable for aircraft N929CD. The documents provided the following: AD number, effective date, subject, applicable service bulletins, and the method of compliance. A review of the document showed that all AD requirements were addressed.

According to the Airworthiness Directive/Factory Compliance record, on 07-25-02, Cirrus Design Corporation searched ADs through bi-weekly issue 2002-14. All ADs were found to be in compliance at this time.

D.4.5.1 AD Compliance Record – Airframe

1. AD 2001-25-03 – Not Applicable
2. AD 2002-21-02 - Roll and Yaw Trim Cartridge Retaining Nut Replacement
   a) Keyson Airways accomplished this AD in accordance with Cirrus Service Bulletin A20-27-06 on October 30, 2002. They removed the left aileron and wing tip, the pilot's seat, copilot's seat and center console side panels. Accessed and removed the yaw and roll trim cartridges and changed the lock nuts in accordance with AD 2002-21-02. Reinstalled the cartridges, seats, panels, left aileron and wing tip. This completes compliance with Cirrus SB A20-27-6 and AD 2002-

[4] The repair stations were certificated under the authority of Title 14 of the Code of Federal Regulations (14 CFR) part 145

[5] Airworthiness Directives (AD) is a regulatory notice sent out by the FAA informing the operator of an action that must be taken for the aircraft to maintain its airworthiness status.

21-02. Reference Keyson Airways work order 11867.1 dated 11/4/2002

3. AD 2002-24-08 – Not Applicable
4. AD 2005-17-19 –Crew Seat Break-Overbolt and Recline Lock
   a) Keyson Airways complied with this AD in accordance with Service Bulletin A2X-25-08 on July 7, 2005. They complied with the AD by inspecting both front seat break-over pins and noted that the co-pilots seat was out of tolerance. They adjusted the co-pilots seat to specifications prior to compliance with Service Bulletin 2X-25-06 R4. Complied with Service Bulletin 2X-25-06 R4, Crew Seat Recline Lock Installation per the accomplishment instructions. Removed and replaced the recline locks on the pilot and co-pilot seats. Reference Keyson Airways shop order 10131 dated 7/08/2005.
5. AD 2006-07-06 Fuel Line and Wiring Harness in Console
   a) Mass Aviation Services, LLC complied with this AD on 6/20/2006. They complied with the AD by visual inspection of fuel line and installation kit P/N 70133-001. All work was done in accordance with Cirrus Service Bulletin 2X-28-06R4

D.4.5.2 AD Compliance Record – Engine, Propeller, and Appliances

No engine, propeller, or appliance airworthiness directives were found to be applicable

D.4.6 Major Repair and Alteration

Two FAA form 337 records were reviewed for major repairs or alterations to airplane N929CD.

On 6-19-2006, the Garmin GTX-327 transponder was removed and replaced with a Garmin GTX-330 transponder P/N 011-00455-00. The transponder was previously approved under STC number STO1125WI. The aircraft weight and balance was updated and the equipment list revised.

On June 21, 2006, Mass Aviation Services, LLC installed Rosen sun visors under STC certificate number SA01285SE[6]. The installation was done in accordance with Rosen document 9050-0174-001, Rev A, dated August 5, 2003. The FAA "Supplemental Type Certificate" number SA01285SE, was reviewed for compliance conditions and limitations. No discrepancies were noted.

[6] The certificate was issued to Rosen Sunvisor Systems, LLC,

D.4.7 Weight and Balance

On 7-23-2002 the weight and balance of airplane N929CD was measured by Cirrus Design Corporation: The recorded measurements were:

- Empty Weight 2,144.2 Pounds
- Empty Weight Arm 141.45 Inches
- Empty Weight Moment 303,298.91 Inch-pounds
- Center of gravity was F.S. 141.4 / 17.7 percent MAC

On 6-19-2006, the radio shop, Inc revised the weight and balance of the accident airplane due to the installation of the Garmin GTX-330 transponder. The following indicates the revised weight and balance.

- Previous aircraft data as of 04/29/04
  - Empty Weight 2145.8 Pounds
  - Empty Weight Arm 154.7 Inches
  - Empty Weight Moment 331955.26 Inch-pounds
- Revised aircraft data as of 06/19/06
  - Empty Weight 2147.0 Pounds
  - Empty Weight Arm 154.68 Inches
  - Empty Weight Moment 332102.86 Inch-pounds

D.4.8 Optional Equipment

According to Cirrus drawing 11000-1230, Rev A, dated 7/17/02 the following optional equipment, modifications, kits, installations and assemblies were included with the completed airplane as-delivered from the factory.

- 2nd alternator, standard sensor configuration, SR20A – Cirrus drawing number 10794-006.
- Propeller installation - Cirrus drawing number 11577-002
- Fly away kit - Cirrus drawing number 12058-001.
- Exterior design and finishing installation - Cirrus drawing number 12057-001
- Cowl assembly and installation, H.I.D. light - Cirrus drawing number 14528-002
- Power generator electrical and dual alternator installation - Cirrus drawing number 15002-002.
- Avionics installation collector - Cirrus drawing number 15003-003
- Autopilot collector system 55X - Cirrus drawing number 15006-004
- MFD installation collector, Avidyne - Cirrus drawing number 15005-002
- Instrument panel collector, Sandel HIS & Avidyne - Cirrus drawing number 15001-008
- Navigation installation collector - Cirrus drawing number15004-006

D.5 Figures:

Figure 1

Three views of the SR20 Airplane

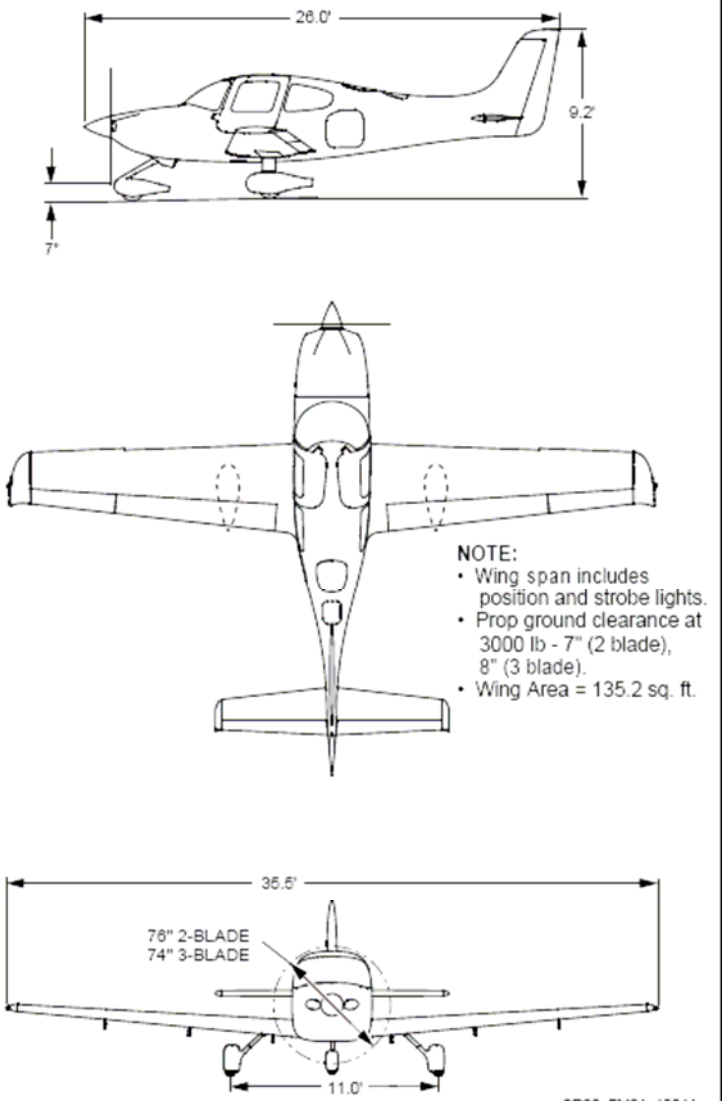


Figure 2

View of the North face of the Belaire Condominiums located at 524 East 72nd Street Manhattan, New York.

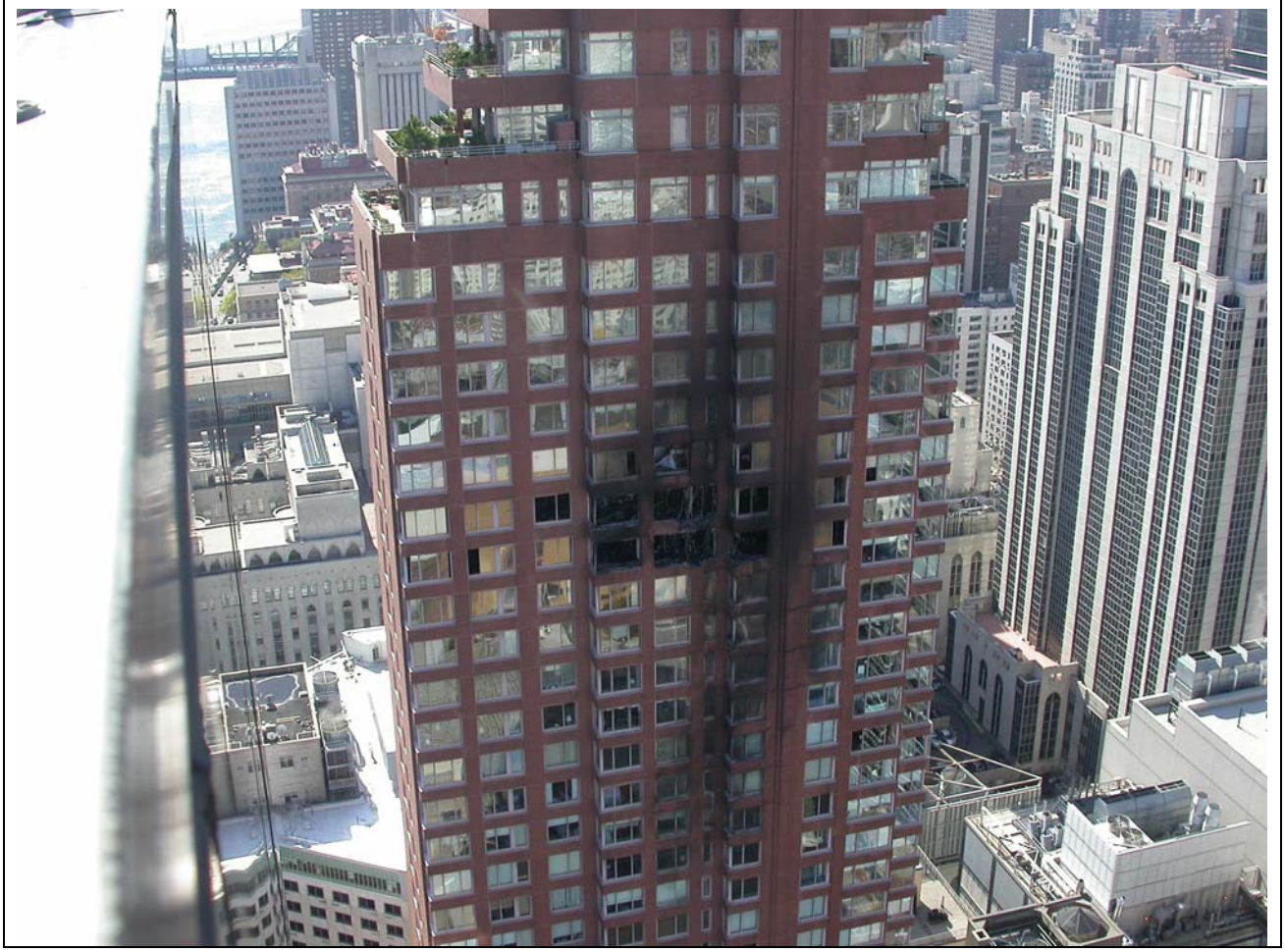


Figure 3

View of the 32nd and 33 floor on the North face of the Belaire Condominiums located at 524 East 72nd Street Manhattan, New York.

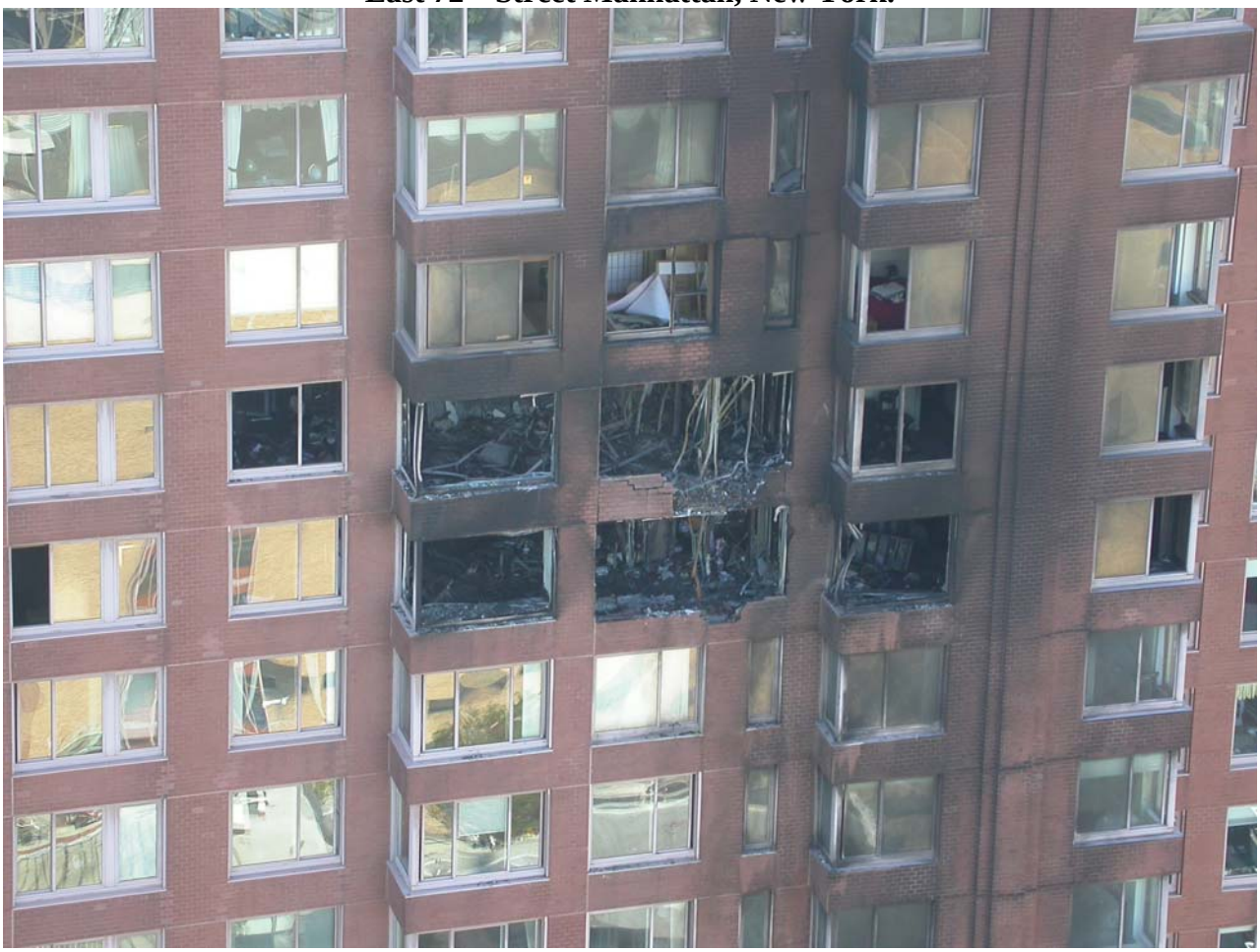


Figure 4

View of the inside of apartment 40 A/B/G in the Belaire Condominiums located at 524 East 72nd Street Manhattan, New York.

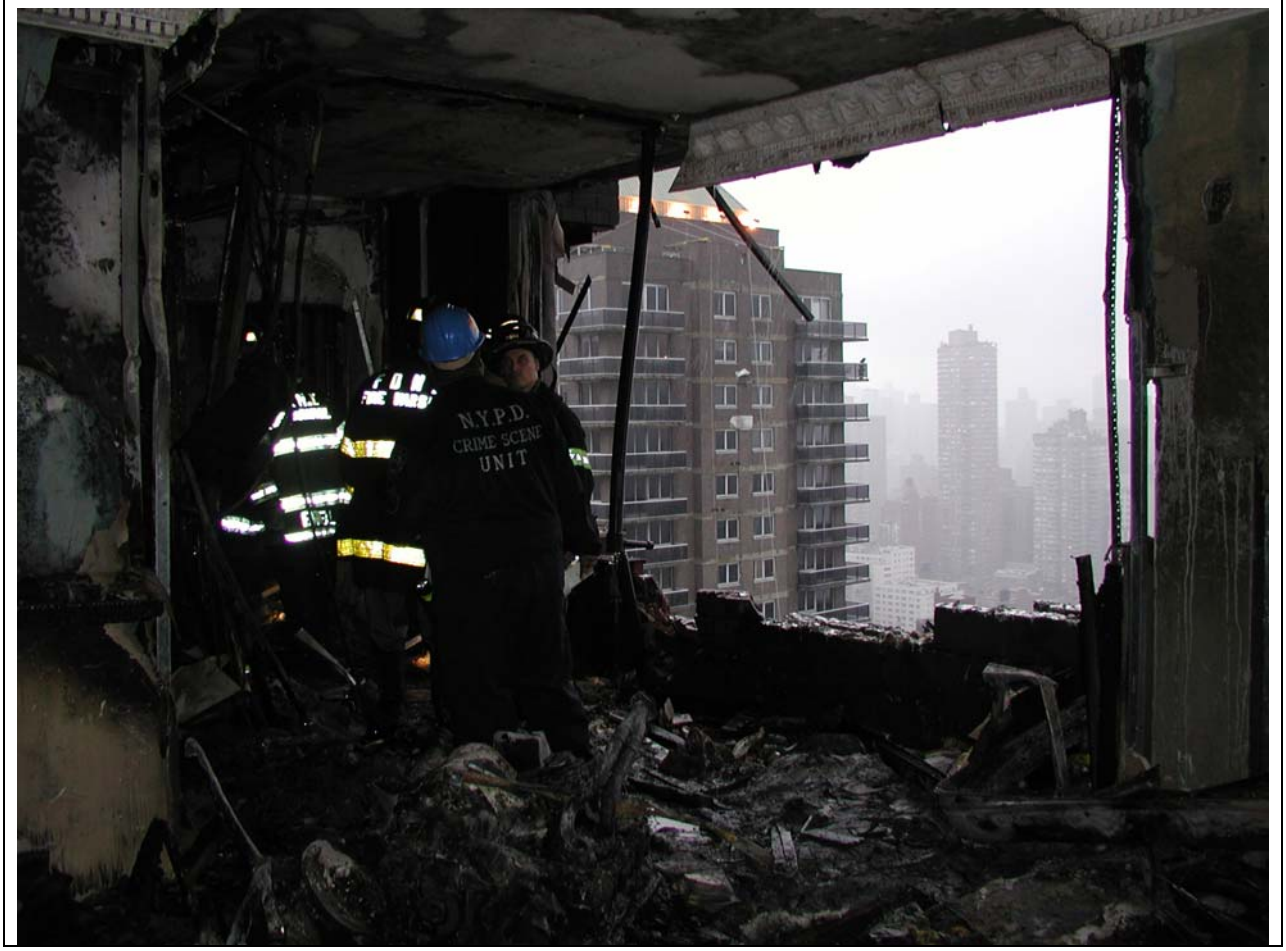


Figure 5

View looking down from apartment 40 A/B/G in the Belaire Condominiums located at 524 East 72nd Street Manhattan, New York.

Figure 6

View of the main debris field located on the sidewalk directly in front of the North face of the Belaire Condominiums located at 524 East 72nd Street Manhattan, New York.

Figure 7

Cirrus SR20 Aileron Control System

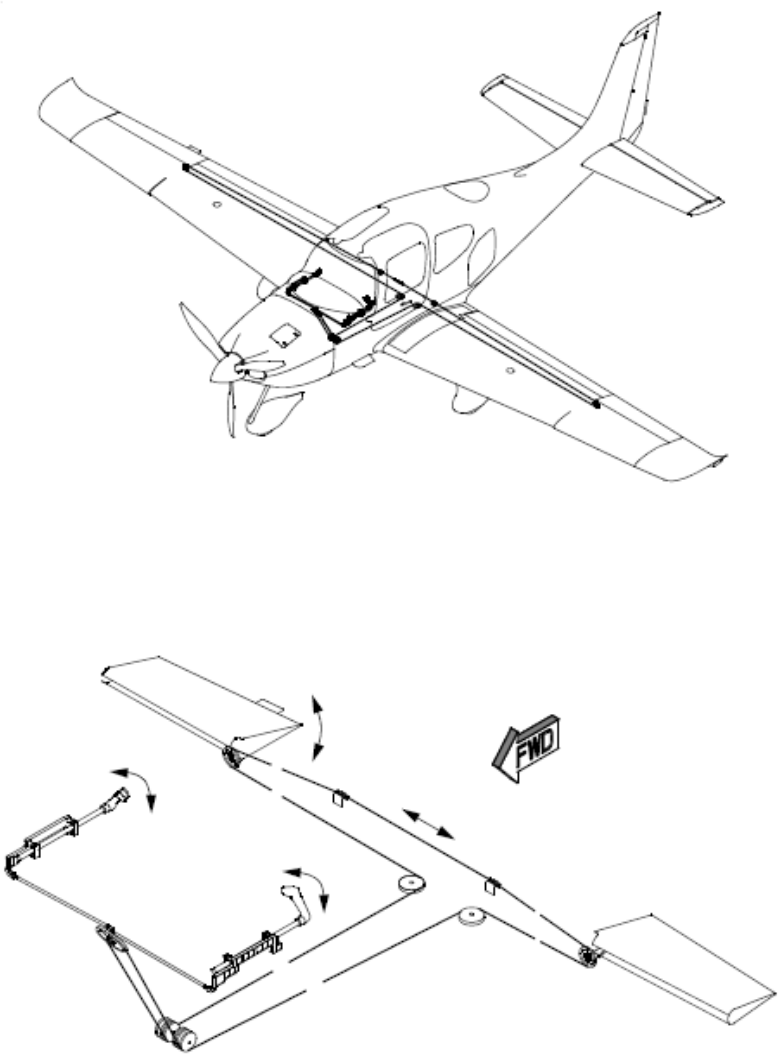


Figure 8

Aircraft N929CD right aileron

Figure 9

Aircraft N929CD - Left aileron showing position of actuation pulley

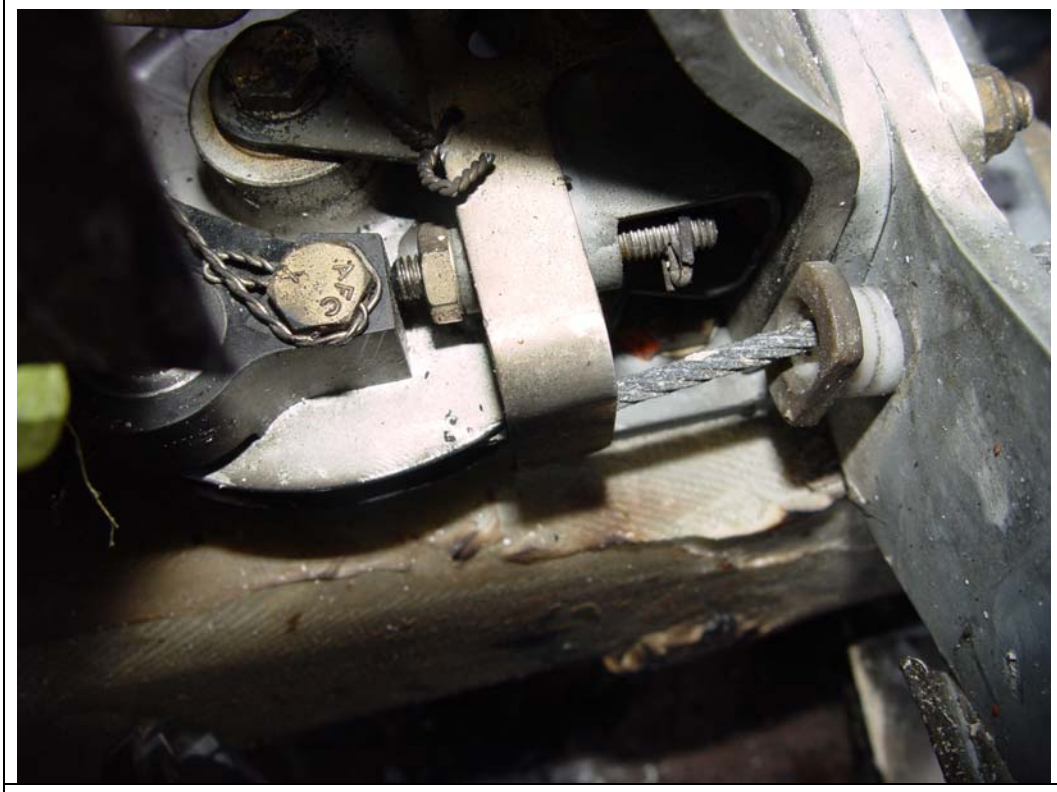


Figure 10

Left Aileron showing position of actuation pulley

Figure 11

Aircraft N929CD - Left aileron showing position of roll trim motor

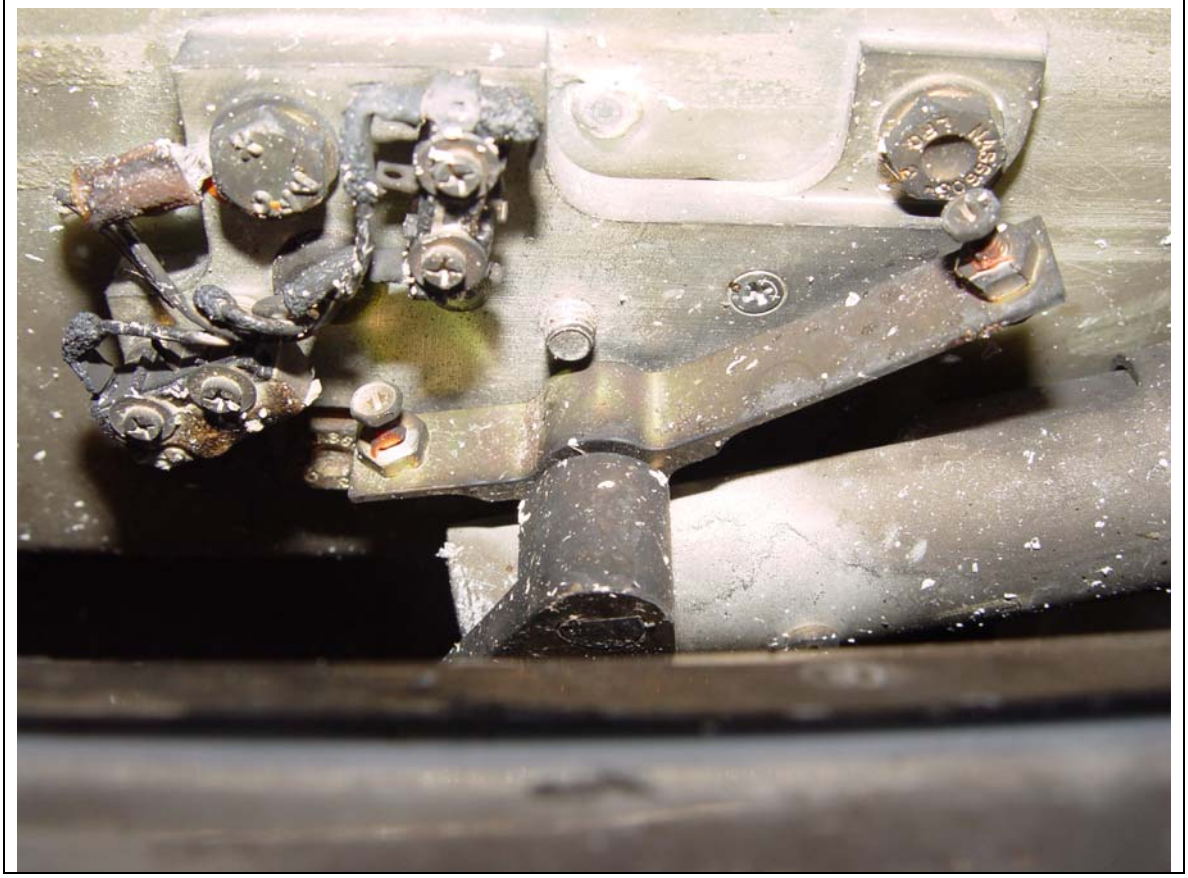


Figure 12

Aircraft N929CD - Left Aileron showing position of roll trim motor

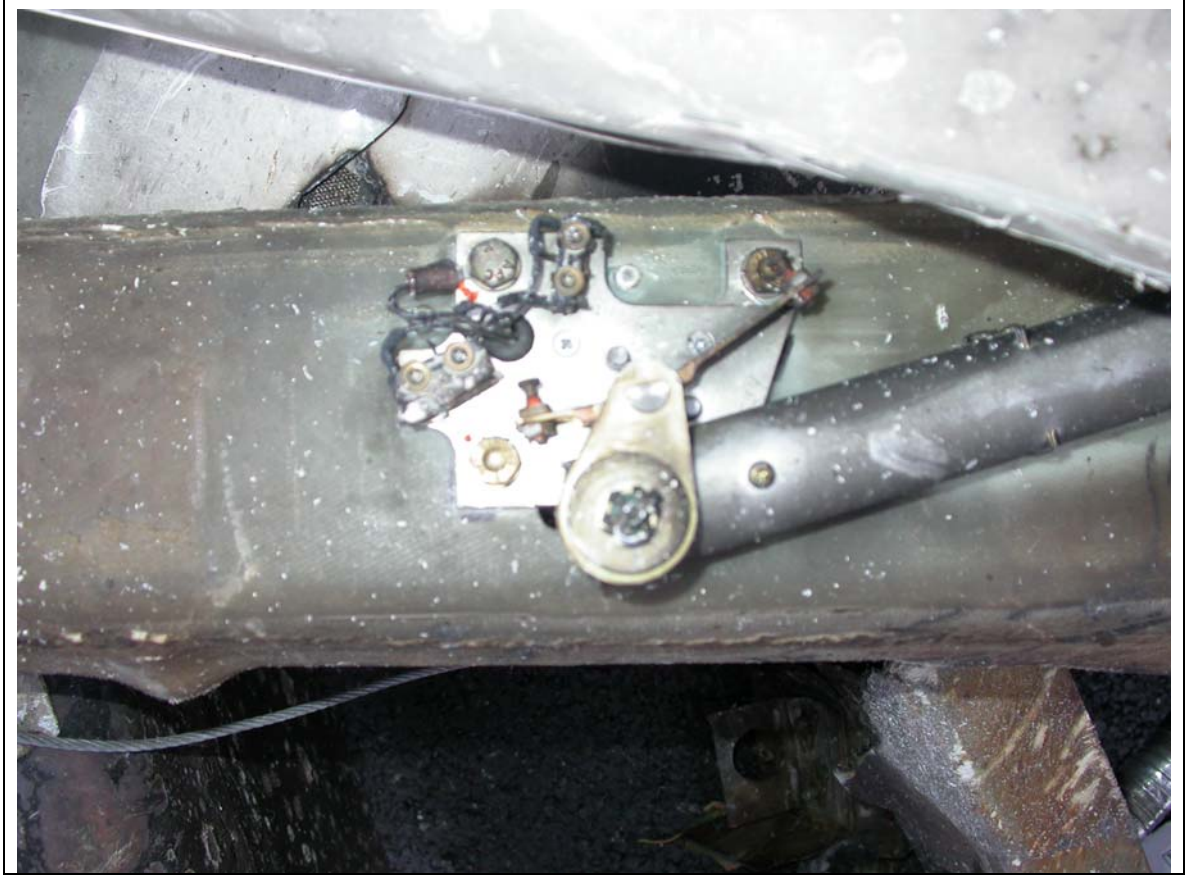


Figure 13

Exemplar Aircraft - Left aileron showing actuation pulley and roll trim cartridge.

Figure 14

Cirrus SR20 Elevator Control System

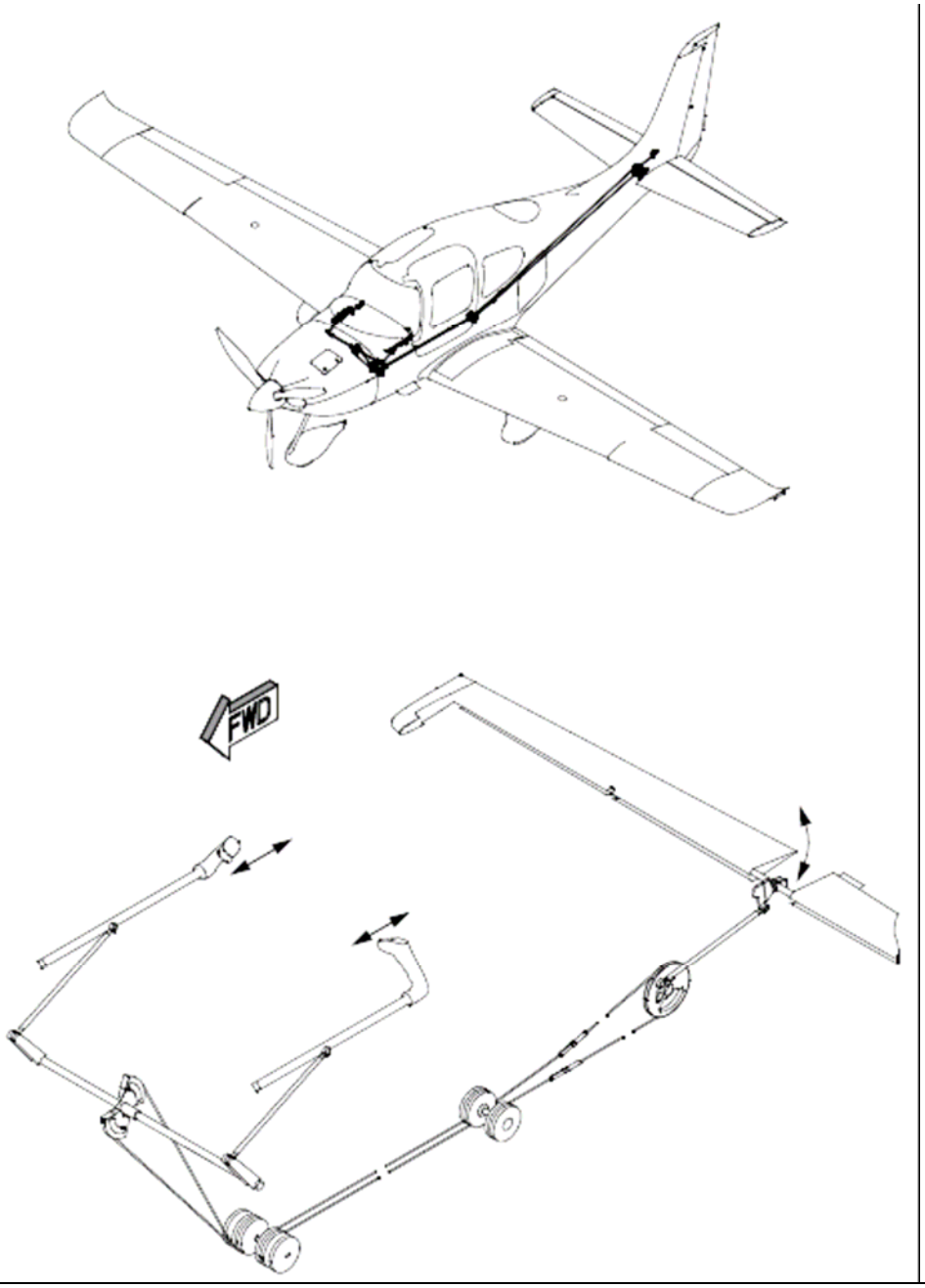


Figure 15

Aircraft N929CD left elevator

Figure 16

Aircraft N929CD right elevator

Figure 17

Pitch Trim Motor removed from airplane N929CD and photographed at the National Transportation Safety Board.

Figure 18

Exemplar Pitch Trim Motor supplied by Cirrus Design Corporation and photographed at Cirrus Design in Duluth Minnesota.

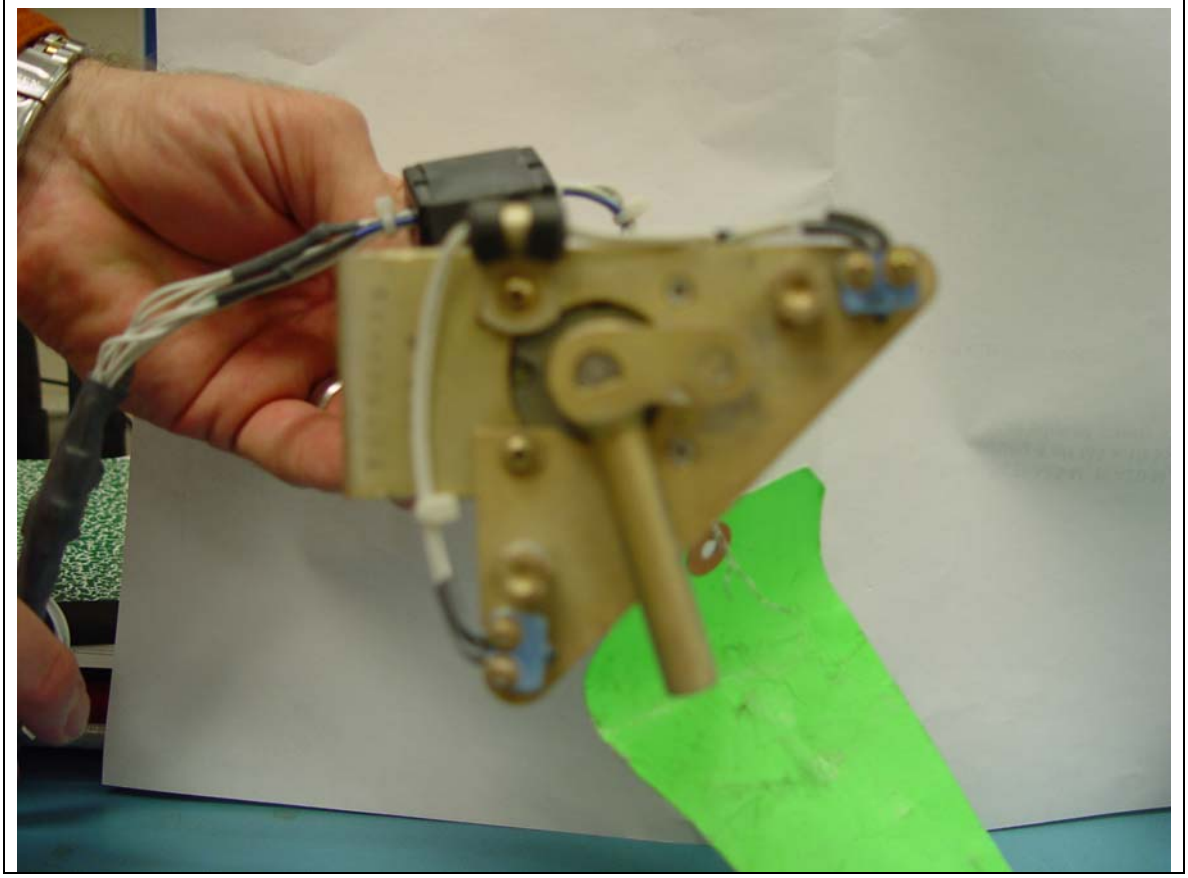


Figure 19

Photograph of an exemplar SR20 airplane showing the Pitch Trim Motor installation. This photographed was taken at Cirrus Design in Duluth Minnesota.

Figure 20

Photograph of an exemplar SR20 airplane showing the Pitch Trim Motor installation with the pitch trim in the full airplane nose up position. This photographed was taken at Cirrus Design in Duluth Minnesota.

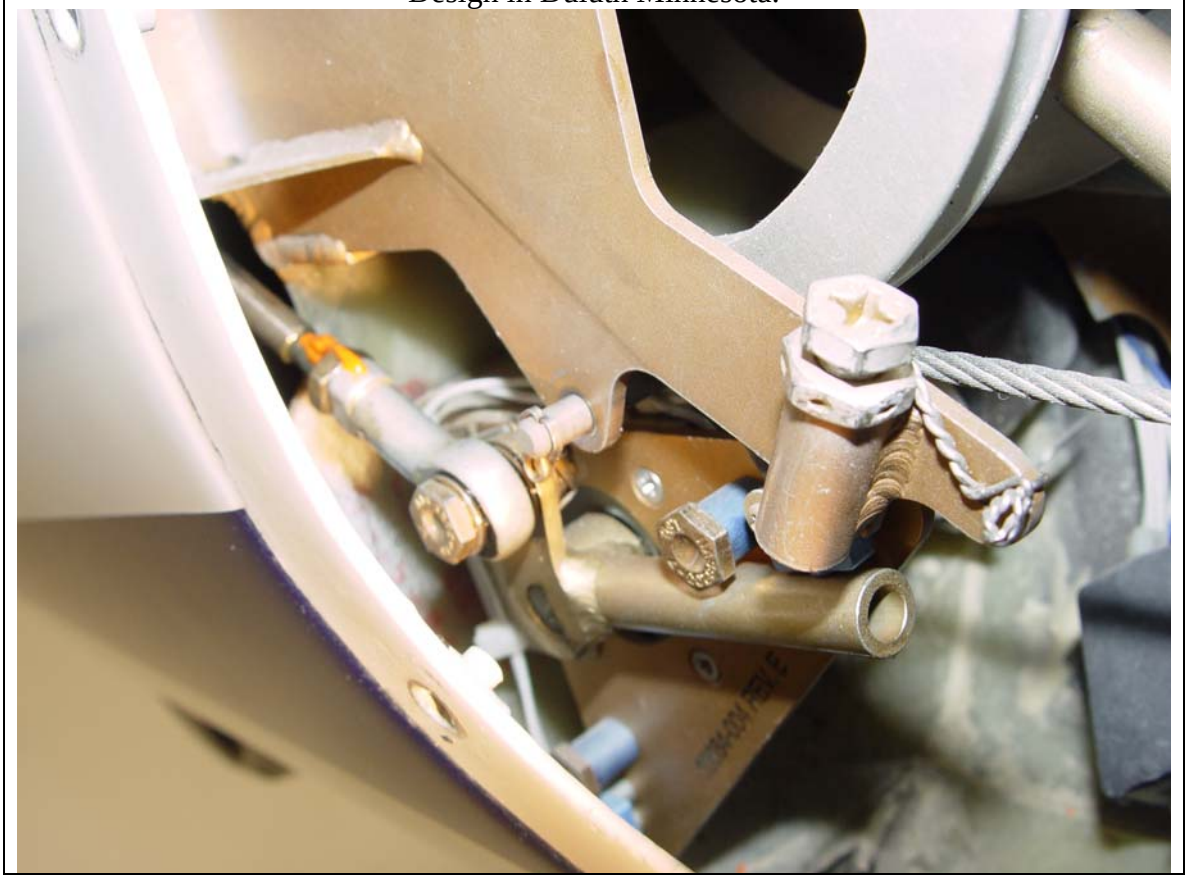


Figure 21

Cirrus SR20 Flap Control System

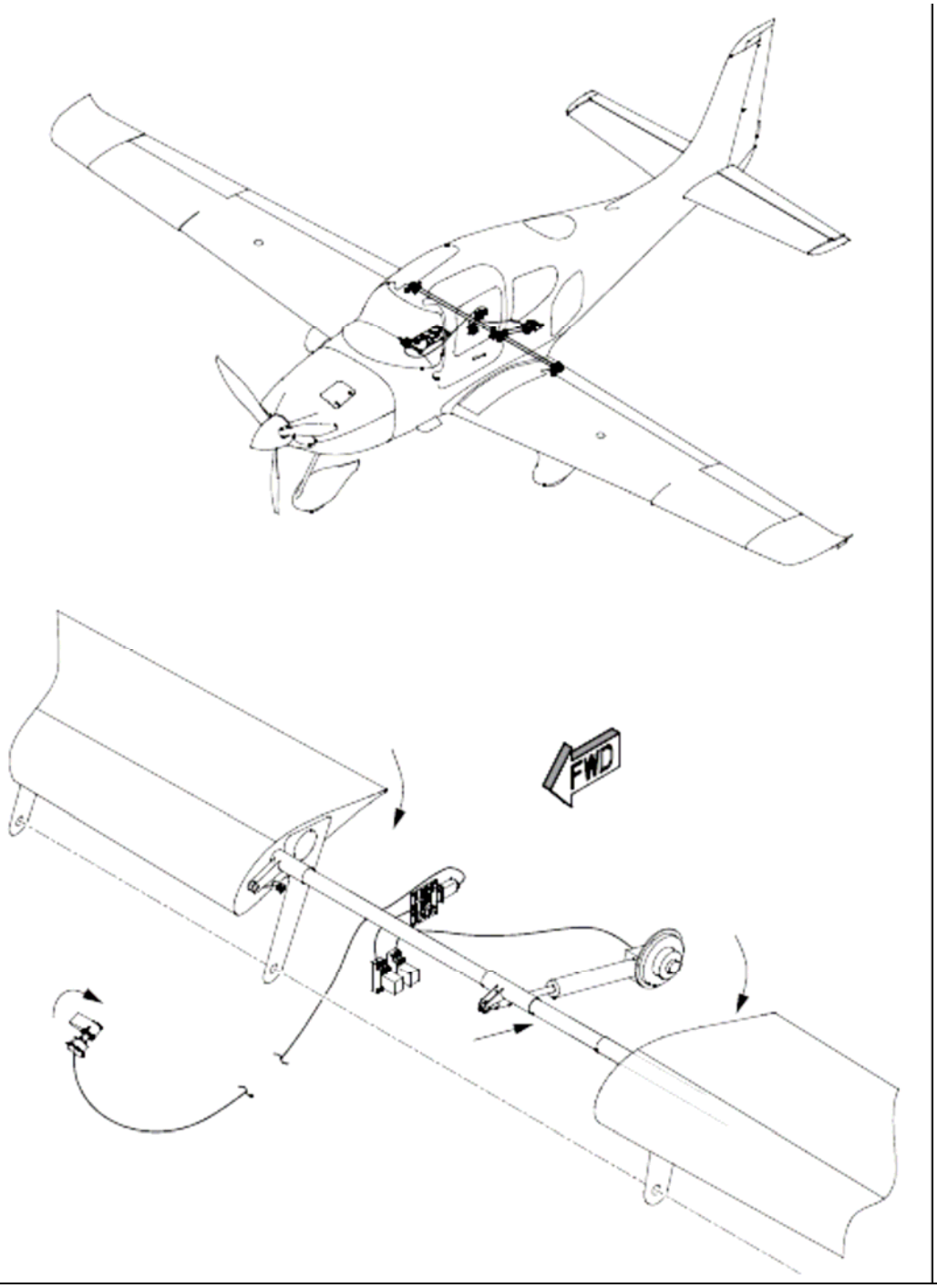


Figure 22

Aircraft N929CD View of right flap

Figure 23

Linear flap actuator as found at the accident site

Figure 24

Three sections of the linear flap actuator placed adjacent to each other at the accident site.

Figure 25

Aircraft N929CD Wing Spar

Figure 26

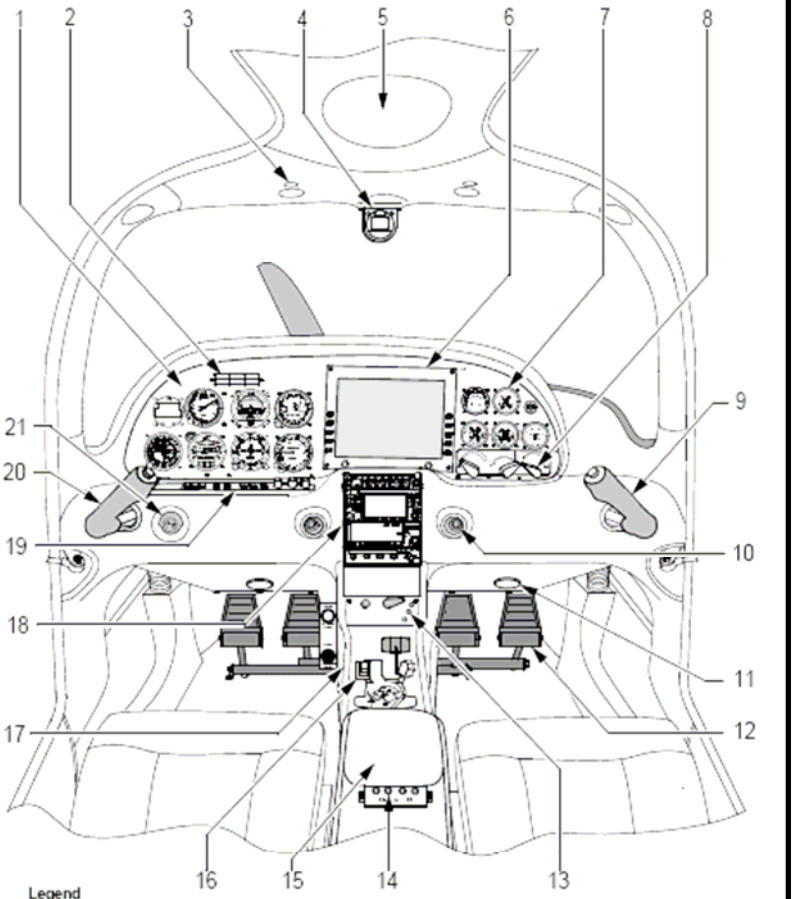
Wing Spar in street

Figure 27

Photograph of Wing Spar showing split

Figure 28

Cirrus SR20 Instrument panel and console



Legend

1. Flight Instrument Panel
2. Annunciator Panel
3. Overhead Light & Switch
4. Magnetic Compass
5. Cirrus Airframe Parachute System (CAPS) Activation T-Handle Cover
6. Multifunction Display
7. Engine Instruments
8. Temperature/Ventilation Controls
9. Control Yoke
10. Fresh Air "Eyeball" Outlet
11. Conditioned Air Outlet
12. Rudder Pedals
13. Flap Control & Position Indicators
14. Passenger Audio Jacks
15. Armrest
16. Engine & Fuel System Controls
17. Left Side Console
    - Circuit Breaker Panel
    - Alternate Engine Air
    - Parking Brake
    - Alternate Static Source
18. Avionics Panel
19. Bolster Switch Panel
20. Control Yoke
21. Start/Ignition Key Switch

Figure 29

Exemplar SR20 Aircraft showing the cockpit

Figure 30

Aircraft N929CD instrument panel

Figure 31

Flash Memory module from MFD

Figure 32

Attitude Indicator shown in its case.

Figure 33

Front View of Attitude Indicator

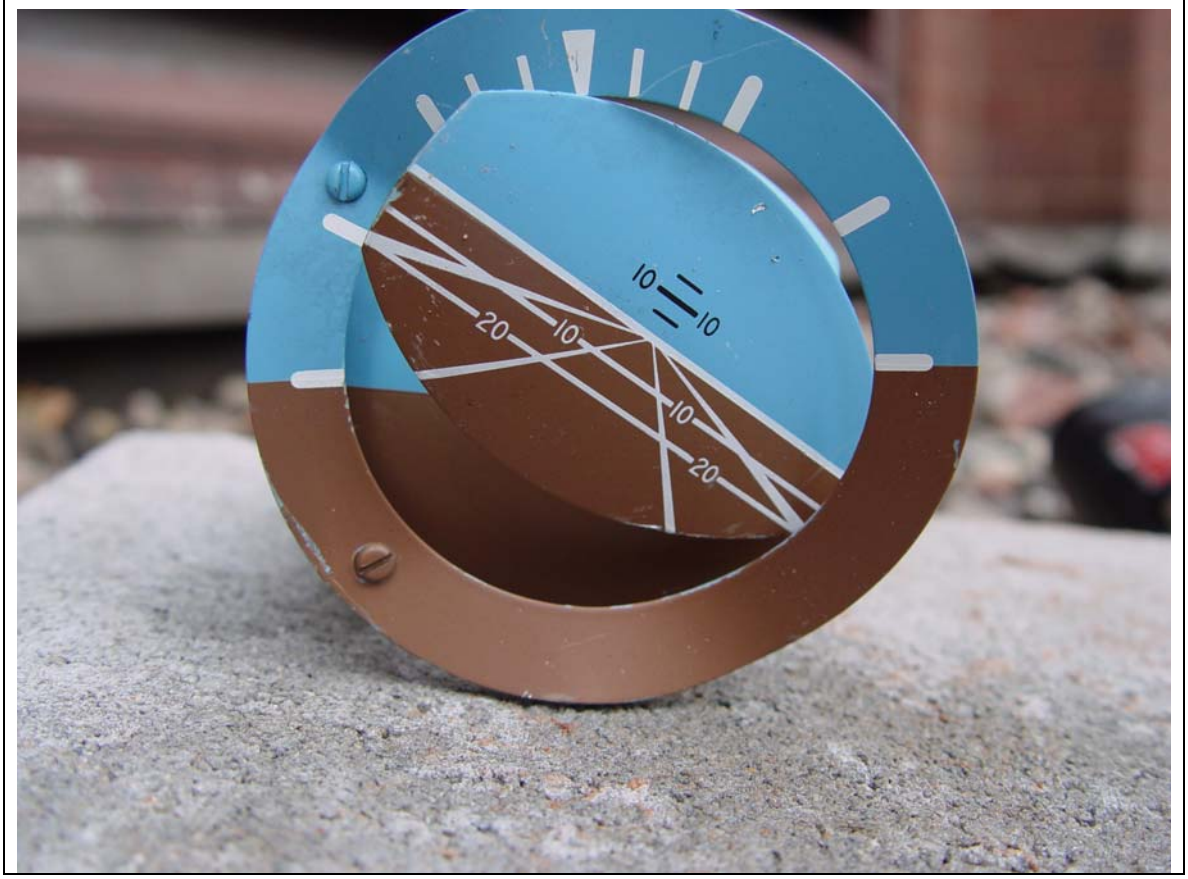


Figure 34

Side View of Attitude Indicator

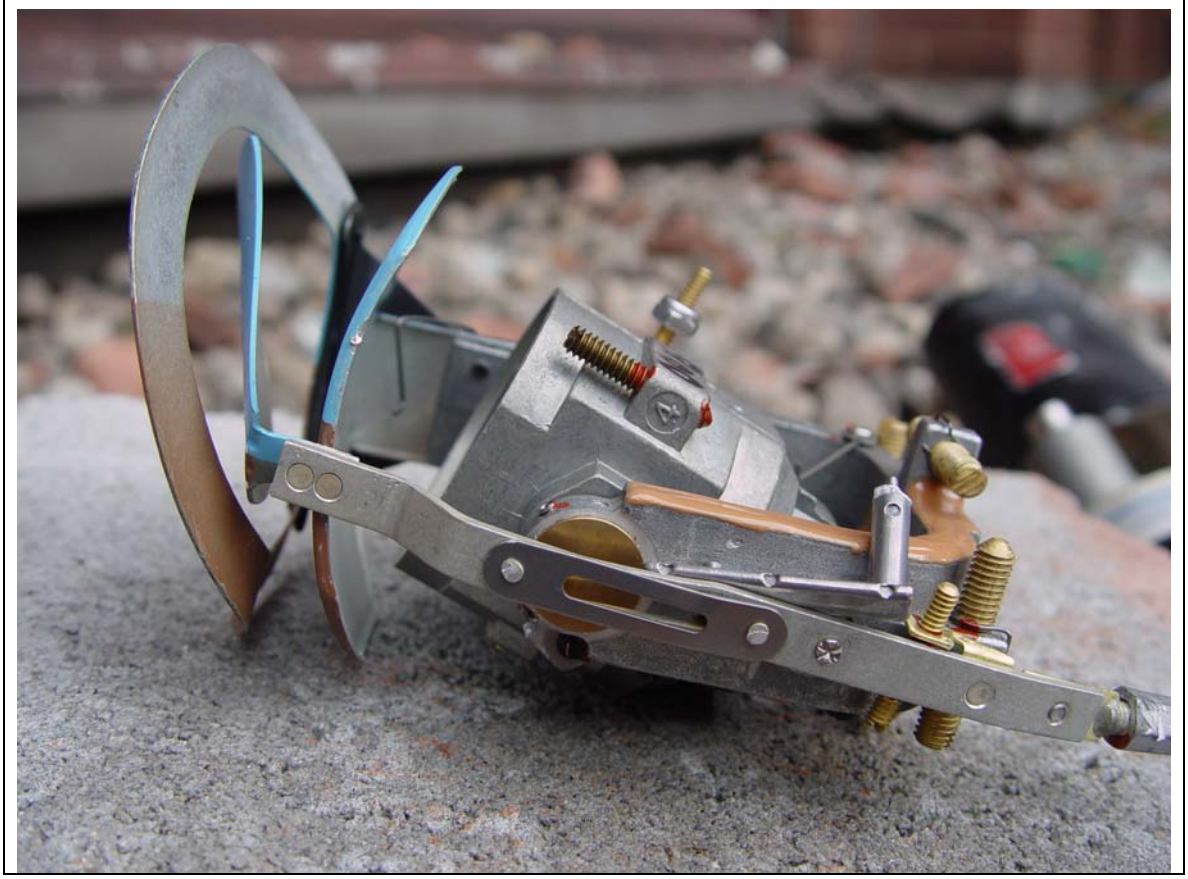


Figure 35

Airspeed Indicator

Figure 36

Attitude Indicator within instrument panel

Figure 37

Right Front Seat

Figure 38

Left Main Gear Wheel Showing Flat Spot

Figure 39

Airplane N929CD circuit breaker panel