Aviation Investigation Final Report

Location:	Kewanee, Illinois	**Accident Number:**	CEN15FA388
Date & Time:	August 30, 2015, 09:18 Local	**Registration:**	N765CD
Aircraft:	CIRRUS DESIGN CORP SR22	**Aircraft Damage:**	Substantial
Defining Event:	Loss of control in flight	**Injuries:**	2 Fatal, 1 Serious
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The instrument-rated private pilot and two passengers departed on an instrument flight rules flight plan in low instrument meteorological conditions (IMC), including fog and cloud ceilings at 200 ft above ground level. Before takeoff, the pilot announced on the airport's common traffic advisory frequency that the airplane was departing runway 19; however, the airplane departed runway 27. Radar data indicated that the airplane made 3 nearly 360° left turns in close succession just before ground impact. The airplane's altitude during the turns varied between 1,200 ft and 1,800 ft msl. Examination of the airframe and engine did not reveal any anomalies that would have precluded normal operation, and data retrieved from onboard engine monitoring equipment indicated that the engine was operating normally throughout the flight.

Conditions conducive to the development of spatial disorientation existed at the time of the accident, including restricted visibility, entry into IMC, and maneuvering for an assigned course after takeoff. It could not be determined whether the pilot recognized his error in departing from the incorrect runway, but it is possible that this error presented the pilot with an operational distraction about the time the airplane was entering IMC, and could have precipitated the pilot's spatial disorientation. Additionally, the pilot had reported to the airplane's co-owner the day before the accident that the airplane's autopilot was inoperative and that he did not plan to use it. Thus, the pilot did not have the autopilot available to help manage his workload during the flight. The radar depiction of the accident flight path was consistent with the known effects of spatial disorientation, and it is likely that the pilot became disoriented shortly after entering IMC after takeoff.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's loss of control due to spatial disorientation shortly after takeoff into low instrument meteorological conditions.

Findings

Personnel issues	Spatial disorientation - Pilot
Aircraft	(general) - Not attained/maintained
Environmental issues	Below VFR minima - Effect on operation

Factual Information

History of Flight

Initial climb	Loss of control in flight (Defining event)

On August 30, 2015, about 0918 central standard time, a Cirrus SR22 airplane, N765CD, was destroyed when it collided with terrain shortly after takeoff from Kewanee Municipal Airport (EZI), Kewanee, Illinois. The private pilot and one passenger were fatally injured; the second passenger sustained serious injuries. The airplane was privately owned, and the personal flight was operated under the provisions of 14 *Code of Federal Regulations* Part 91. Instrument meteorological conditions prevailed throughout the area, and an instrument flight rules (IFR) flight plan was filed for the cross-country flight, with an intended destination of Hot Springs, Arkansas.

A family member drove the pilot and passengers to EZI at 0745. During the short drive, the pilot discussed the fact that the airplane's autopilot had stopped working during the flight to EZI a few days before. The pilot thought that this would make the trip a little harder but that it was not a critical system preventing his departure. The pilot said that he initially planned to fly under the clouds then climb above the clouds to his desired cruise altitude of 11,000 ft. Upon arriving at the airport, the pilot decided to delay the flight due to the amount of fog in the area. The pilot and passengers subsequently returned to the airport about 0900 for departure.

There were no witnesses to the accident and no distress calls were broadcast via radio. According to Flight Service, the pilot called before takeoff to file an IFR flight plan. He was given clearance to take off with a void time of ten minutes to activate the flight plan. The airport manager reported that the pilot taxied for takeoff on runway 27; however, the pilot's radio calls indicated that he thought he was using runway 19. After an aborted takeoff, the pilot completed a back-taxi on runway 27, but again his radio calls were for runway 19. The airplane subsequently departed runway 27.

The surviving passenger, who was seated in the left rear seat, stated that the aborted takeoff was due to an open door. After securing the door, the airplane subsequently departed. She stated that when the airplane took off, it went quickly into the clouds. She stated that it did not feel as if the airplane was "going up." She stated that she heard a discussion between the pilot and then passenger seated in the front seat: the front seat passenger had reached for the activation handle for the airframe parachute system, and the pilot stated that the airplane was "too low." She then saw the ground approaching, and the impact occurred.

According to radar data obtained from the Federal Aviation Administration (FAA) Quad City Terminal Radar Approach Control facility, identified targets corresponded with the accident airplane's assigned transponder code. Additionally, five subsequent primary targets were consistent with the track of the accident airplane. There were no other aircraft operating in the immediate vicinity. The radar data corresponding to the airplane's transponder code began at 0914:53 at a Mode C reported altitude of 1,500 ft after the airplane departed EZI. The target continued in a left turn to the west and south and climbed to an altitude of 1,800 ft before beginning a descent to 1,200 ft. That data ended, and the

primary radar returns consistent with the accident airplane begin at 0915:37 and continued until the last associated target at 0916:35 and an altitude of 1,600 ft. EZI airport elevation was 858 ft. A flight path superimposed between the primary targets suggested that the pilot made three nearly 360° left turns in close succession before impacting the ground. See figure 1.

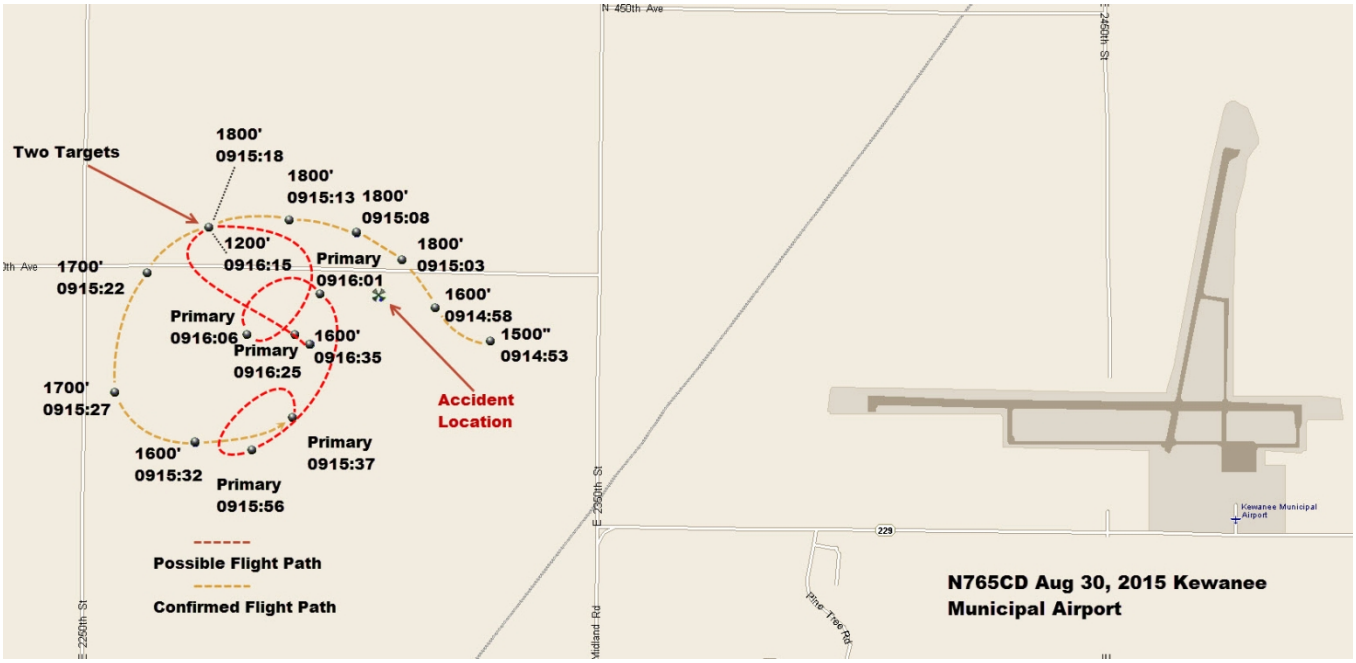

Figure 1. Flight track after takeoff

Pilot Information

Certificate:	Private	**Age:**	67,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	4-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	August 14, 2014
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	(Estimated) 920 hours (Total, all aircraft), 40 hours (Total, this make and model), 4 hours (Last 30 days, all aircraft), 0.5 hours (Last 24 hours, all aircraft)		

The pilot held a private pilot certificate with ratings for airplane single-engine land and instrument airplane. His most recent FAA third-class medical certificate was issued on August 14, 2014. Review of the pilot's logbooks indicated a total flight experience of 922 hours of which 37 hours were in the

accident airplane make and model. The pilot completed a Cirrus Advanced Transitional Instrument Training Course in May 2015. The pilot had logged 130 hours of actual instrument flight experience and 94.1 hours of simulated instrument experience. In the 90 days before the accident, the pilot logged 3.1 hours simulated instrument experience and 4.8 hours actual instrument experience, all of which were in the accident airplane make and model.

Aircraft and Owner/Operator Information

Aircraft Make:	CIRRUS DESIGN CORP	**Registration:**	N765CD
Model/Series:	SR22 NO SERIES	**Aircraft Category:**	Airplane
Year of Manufacture:	2001	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	0065
Landing Gear Type:	Tricycle	**Seats:**	4
Date/Type of Last Inspection:	March 5, 2015 Annual	**Certified Max Gross Wt.:**	3400 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	1635.1 Hrs as of last inspection	**Engine Manufacturer:**	CONT MOTOR
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	IO-550 SERIES
Registered Owner:	On file	**Rated Power:**	300 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

The airplane's most recent annual inspection was completed on March 5, 2015, at a Hobbs meter time of 1,635.1 hours. On June 25, 2015, at a Hobbs time of 1,635.2 hours, a new Engine Data Management System was installed. The aircraft logbook included an entry stating that the Cirrus Airframe Parachute System (CAPS) was replaced on October 4, 2011, at a Hobbs time of 1,134.2 hours. At the time of the accident, the Hobbs time was 1,734.8 hours.

The co-owner of the airplane reported that he had flown the airplane 9 days before the accident. He reported that there were no problems with the aileron trim or the autopilot. He flew using GPS navigation and with the autopilot engaged for the entire flight. The 5.4-hour flight had 3 occupants onboard with 50 pounds of baggage. He also stated that he had talked to the accident pilot the morning before the accident. The pilot told him that the autopilot would hold altitude, but it would not hold the horizontal situation indicator (HSI) heading bug or the GPS. The pilot also told him that the trim on the sidestick was not working and that he could hold straight and level flight with a bit of right aileron. The co-owner and pilot agreed to have the trim looked at upon his return flight.

A family member reported that he and the pilot had flown the airplane on a local flight from EZI for about 15-20 minutes on the morning before the accident. He reported that the flight was normal and that they did not experience any problems.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	GBG,764 ft msl	**Distance from Accident Site:**	28 Nautical Miles
Observation Time:	09:15 Local	**Direction from Accident Site:**	230°
Lowest Cloud Condition:	200 ft AGL	**Visibility**	1 miles
Lowest Ceiling:	Overcast / 200 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.09 inches Hg	**Temperature/Dew Point:**	19°C / 19°C
Precipitation and Obscuration:			
Departure Point:	Kewanee, IL (EZI)	**Type of Flight Plan Filed:**	IFR
Destination:	Hot Spings, AR (HOT)	**Type of Clearance:**	IFR
Departure Time:	09:17 Local	**Type of Airspace:**	Class E

First responders reported foggy conditions and low cloud ceilings about the time of the accident.

EZI listed no official weather reporting capability; however, an unofficial weather station was collocated at EZI and reported the following conditions at 0910: wind from 090° at 1 knot, temperature 18.9°C, dew point 18°C, relative humidity 99%, altimeter 30.11 inches of mercury (Hg). Visibility and sky conditions were not reported.

The closest reporting station to the accident site was from Galesburg Municipal Airport (GBG), Galesburg, Illinois, located 28 miles southwest of the accident site at an elevation of 764 ft. The airport had an Automated Weather Observation System (AWOS), which issued observations every 20 minutes. The 0915 observation included: calm wind, visibility 1 miles in mist, ceiling overcast at 200 ft, temperature and dew point 19°C, altimeter 30.09 inches of Hg.

A review of the observations for the day indicated that IFR conditions were reported as early as 2215 the previous evening, with low ceilings and visibility in fog and mist continuing through the time of the accident, and clearing by 1115. A weather study was completed by a NTSB staff meteorologist and is referenced in the public docket to this report.

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Fatal, 1 Serious	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Fatal, 1 Serious	**Latitude, Longitude:**	41.240062,-89.920982(est)

Examinations of the airframe and engine were accomplished at the accident site and a secured hangar located at the Kewanee Airport.

The accident occurred in a planted soybean field, about 1.5 miles west of the Kewanee airport. The airplane impacted terrain in an approximate 45° nose-down, right-wing-low attitude on a heading of about 130-140°. The debris field extended to the east about 260 ft from the initial point of impact on a headings from 080 to 110°. The main wreckage came to rest on a heading about 190°.

An examination of the ground impact scars and debris path showed that the tip of the right wing struck the ground at the western end of the debris field. The scar from the right wing tip was the initial point of impact. Propeller cuts, dirt clumps, and an impact depression were noted in the soft soil about 38 to 45 ft from the initial impact point. The separated propeller was located at 55 ft, and the right cabin door was located at 65 ft. The tip of the right wing and aileron were at 67 ft. The upper engine cowling was at 72 ft and the lower engine cowling was at 78 ft. The CAPS enclosure cover was at 75 ft. The left cabin door was at 120 ft, the main wreckage was at 160 ft, and the engine was at 185 ft. The parachute was stretched out on a heading of 110° to about 240 ft. The CAPS D-Bag and rocket motor were at 260 ft.

Fuselage

The fuselage was mostly destroyed by impact forces. The lower forward fuselage was crushed up and aft. The firewall was separated from the fuselage and the upper engine cowling was separated from the fuselage. The right forward corner of the upper engine cowling was crushed aft about 25°. The lower left and right engine cowlings were fractured into several pieces. The forward fuselage was fractured and crushed aft. The spar cover was separated from the fuselage. Both front seats remained attached to the spar cover. The rear section of the cabin floor was separated from the fuselage and the rear seats remained attached to it.

Wing

The wing was mostly destroyed by impact forces, and the wing spar was fractured in multiple places. All upper and lower wing skins were separated from the wing spar. The left and right flaps were separated from the wing. The right aileron was separated from the wing, and the left aileron remained attached to the wing. Aileron control cable continuity was confirmed. The roll trim motor shaft was found fractured. The fractured end of the roll trim motor shaft remained attached to the roll trim cartridge. The roll trim cartridge remained attached to the left aileron actuation pulley. Two rub marks were located adjacent to the roll trim motor mounting location. One rub mark was on the roll trim motor access panel, and one rub mark was on the lower wing skin. It could not be determined when the rub

marks occurred. The flap actuator was separated from the flap torque tube. The flap actuator shaft was located in a position extending approximately 2 inches, consistent with a "Flaps 50" position.

Empennage/Stabilizers

The empennage was separated from the fuselage about 1 ft forward of the leading edge of the horizontal stabilizer. The rudder remained attached to the vertical stabilizer and rudder control cable continuity was confirmed. The right elevator remained attached to the horizontal stabilizer and the right elevator tip exhibited impact damage. The left elevator remained attached to the horizontal stabilizer and the left elevator tip was separated from the elevator. Elevator control cable continuity was confirmed. The pitch trim motor was in an approximate neutral position.

Landing Gear

The nose landing gear assembly was buckled aft under the engine. The nose landing gear upper weldment remained attached to the engine mount. The nose landing gear leg, tire and wheel assembly was separated from the nose landing gear upper weldment. Both the left and right main landing gear assemblies exhibited impact damage. Both main landing gear assemblies remained attached to the wing.

Doors

The right and left cabin doors were separated from the fuselage. Both door's upper and lower pins exhibited impact damage. The baggage door remained attached to the fuselage.

Cockpit

The instrument panel exhibited impact damage and was separated into two sections. The center console exhibited impact damage. The center console was equipped with a Garmin GMA 340 Nav/Com, dual Garmin GNS 430's, S-TEC 55X autopilot, and a Garmin GTX 327 transponder. The ignition key remained in the ignition switch and the ignition switch was in the "Both" position. The bolster panel in front of the left crew seat was modified with a JPI Engine Data Management System. The instrument panel in front of the right crew seat was modified to accept a Garmin GPS map 696, which was installed.

The following settings, indications and switch positions were noted:

- Hobbs meter indicated 1,734.8 hours.
- Altimeter's Kollsman window indicated a setting of 30.01.
- Flap switch was in the flaps "100" position.
- GPS #2 circuit breaker was in the "open" position.
- Encoder/transponder circuit breaker was in the open position.
- MFD circuit breaker was "zip-tied" in the "open" position.
- Strobe and landing light switches were in the "on" position.

- Strobe lights circuit breaker was in the "open" position.
- Battery #2 circuit breaker was in the open position.
- Battery #1, Alternator #1 and Alternator #2 master switches were in the "on" position.

Seats and Restraints

Both front seats remained attached to the spar cover. First responders cut the left seat belt webbing to aid in the extraction of the left seat occupant. The separated left seat belt remained buckled together. The right seat belt was found unbuckled. The right seat belt webbing exhibited load damage. The right seat belt webbing was torn and partially pulled through the load bar. The left rear seat belt remained buckled together. The left rear seat belt webbing exhibited load damage and was crushed and gathered against the load bar.

Cirrus Airframe Parachute System (CAPS)

The forward section of the roof and the windscreen were separated from the fuselage. Impact damage was noted on the roof structure directly above and adjacent to the mounting location of the CAPS activation handle and holder. The CAPS activation handle was found out of the activation handle holder. The activation handle holder bracket was bent aft. Impact damage was noted on the activation handle and on the exposed activation cable. The CAPS safety pin was located on the ground under the main wreckage.

The CAPS was found deployed and the CAPS rocket motor propellant was expended. The CAPS rocket motor, rocket lanyards, incremental bridle, D-Bag, suspension lines, riser, rear harnesses and both front harnesses had been extracted from the airplane. The rear harness remained snubbed. Both reefing line cutters remained in place and both had been activated. The parachute was separated from the D-Bag and was found stretched out from the main wreckage on a heading about 110°. The slider was at the base of the canopy. Packing folds were present on the canopy.

The rocket motor, lanyards, incremental bridle and D-Bag were located approximately 20 ft beyond the end the parachute. The CAPS launch tube, rocket igniter, exhaust shield, and base remained attached to the bulkhead. The retention straps for the D-Bag remained in the enclosure compartment. The CAPS access panel (#CB7) exhibited impact transfer marks from the left front harness 3-point link. The CAPS enclosure cover was located approximately 20 ft south of the debris path at a point about 75 ft from the right wing tip ground scar. An impact transfer mark, consistent in size and dimension with the top of the CAPS rocket motor, was noted on the inside surface of the cover, on the "strike plate."

On-site observations of the CAPS system showed that the system was not activated in flight. All evidence correlated to a CAPS deployment as the result of impact forces.

Engine

The crankshaft propeller flange was fractured and remained attached to the propeller hub. All of the cylinders remained attached to the crankcase and exhibited impact damage. All damage observed was consistent with impact. The fractured crankshaft propeller flange and radii exhibited 45° shear lips and

spiral cracking. The exhaust and induction systems exhibited impact damage.

Both magnetos remained attached to the engine. Rotation of the engine by hand through the accessory drive produced impulse coupling engagement from both magnetos. The magnetos produced spark on the top spark plug leads for cylinder Nos. 2, 4, 5 and 6. The ignition harness was severed at the magneto due to impact damage, which contributed to the lack of spark from the top leads of cylinder Nos. 1 and 3. The ignition harness exhibited impact and thermal damage, and some leads were found cut and severed. The top spark plugs exhibited light- and dark-colored combustion deposits and the electrodes exhibited normal wear. The bottom spark plugs were inspected using a lighted borescope and exhibited normal operating signatures.

The fuel pump remained attached to the engine and was removed. The drive coupling was intact and the pump turned freely by hand. The mixture control arm moved freely by hand from stop to stop. The fuel pump was disassembled with no anomalies noted. The fuel manifold valve was removed from the engine and disassembled. The screen was free of debris. A small amount of fuel was observed in the manifold valve cavity. The diaphragm and plunger were intact and the retaining nut was tight. The fuel injector lines exhibited impact damage. The fuel injector nozzles from all cylinders except cylinder No. 2 were removed and free of obstructions. The No. 1 cylinder fuel nozzle was slightly bent. The fuel nozzle for cylinder No. 2 could not be removed due to impact damage.

The throttle body remained attached to the engine and exhibited impact damage. The control arm moved freely by hand from stop to stop.

The oil sump was crushed upward into the crankcase and breached. The oil pump was disassembled and the drive and driven gears showed no anomalies and were coated with oil. The oil pump cavity contained oil and exhibited no hard particle passage. The oil cooler remained attached to the engine and exhibited impact damage.

The cylinders exhibited impact damage to their respective fins and some valve covers. The top spark plugs were removed and the cylinders were examined with a lighted borescope. The combustion chambers contained light-colored combustion deposits. The engine was rotated by hand through the accessory drive, and thumb compression was obtained on all cylinders except cylinder No. 1. A second borescope inspection of cylinder No. 1 revealed dirt and debris from impact located around the exhaust valve seat, preventing full closure of the exhaust valve. The engine was rotated again and proper operation of the No. 1 cylinder valve was visually observed with the borescope. The starter was found in the debris field, fractured and free of the starter adaptor.

Propeller Assembly

The three-blade propeller was separated from the engine and located in the wreckage debris field. The spinner exhibited rotational crushing. Two blades were relatively straight and displayed chordwise scratching. The third blade was bent aft approximately midway from the hub to the tip and exhibited chordwise scratches and nicks in the leading edge. Several propeller slash marks were noted in the debris field. The propeller governor remained attached and was removed for inspection. The control arm moved freely by hand from stop to stop. The drive rotated freely by hand and oil discharged from the governor. The governor's gasket screen was free of debris.

Medical and Pathological Information

The Henry County Coroner Office, Cambridge, Illinois, performed an autopsy of the pilot. The cause of death was listed as "Multiple Blunt Injuries."

Toxicological testing on specimens of the pilot was performed by the FAA Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma. Testing for carbon monoxide, ethanol, and drugs were all negative.

Tests and Research

Recorded Data

The airplane was equipped with a Garmin 696 GPS MAP and a JPI EDM 900 Engine Monitoring System. The Garmin 696 was impact damaged and no data was extracted.

The JPI EDM 900 was viable and data were downloaded. The data extracted included 71 logs from June 26, 2015 through August 30, 2015. The log for the accident flight began at 09:12:38 CDT and ended at 09:14:43 CDT. Additionally, data from four previous flights were reviewed. All recorded logs showed normal engine operation.

Administrative Information

Investigator In Charge (IIC):	Lemishko, Alexander
Additional Participating Persons:	Alan Pattenaude; FAA FSDO ; Dupage, IL Chris Lang; Continental Motors; Mobile, AL Brannon Mayer; Cirrus Aircraft; Duluth, MN
Original Publish Date:	September 18, 2017
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=91884