Aviation Investigation Final Report

Location:	Lost Hills, California	**Accident Number:**	WPR10LA260
Date & Time:	May 23, 2010, 16:00 Local	**Registration:**	N750AB
Aircraft:	Socata TBM	**Aircraft Damage:**	Substantial
Defining Event:	Flight control sys malf/fail	**Injuries:**	5 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

During the takeoff initial climb, the pilot reported that the rudder trim became deflected to the left and remained stuck in that position. He stopped the climb, cycled the autopilot, and turned off the yaw damper; however, his efforts did not resolve the rudder trim deflection issue. The pilot input rudder in an attempt to correct the issue, and he thought that the airplane was under control, so he continued the flight to his destination. The avionics failed shortly thereafter, followed by the illumination of the low fuel pressure light. Then the engine lost power. The pilot feathered the propeller and was able to reach an airport for an emergency landing. During the landing, the airplane floated down the runway, touching down about midfield. The pilot was not able to stop the airplane before it exited the runway and collided with terrain.

Postaccident, the rudder trim tab was found deflected two inches to the left. However, the rudder trim indicator showed a full deflection to the right. The circuit breaker was found partially open and was recycled, as indicated in the pilot's operating handbook for rudder trim emergencies, and the anomaly could not be replicated.

Postaccident examination also found 90 gallons of fuel in the right tank and no fuel in the left tank. However, this airplane is equipped with a fuel autobalance system, which should have selected fuel to be fed from the right tank with the left tank empty. The reason for the loss of engine power could not be determined during postaccident testing and examination.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: A loss of engine power for reasons that could not be determined because postaccident examination of the engine did not reveal any anomalies that would have precluded normal operation. Contributing to the accident was the pilot's failure to obtain the proper touchdown point on the runway, which led to the runway overrun.

Findings

Not determined	(general) - Unknown/Not determined
Aircraft	Descent/approach/glide path - Not attained/maintained

Factual Information

History of Flight

Enroute-climb to cruise	Flight control sys malf/fail (Defining event)
Enroute-climb to cruise	Loss of engine power (partial)
Landing-flare/touchdown	Runway excursion
Landing-landing roll	Collision with terr/obj (non-CFIT)

On May 23, 2010, about 1600 Pacific daylight time, a Socata TBM-700, N750AB, lost engine power during cruise flight, and the pilot made an emergency landing on runway 33 at the Lost Hills – Kern County Airport (L84), Lost Hills, California. The airplane overran the runway and the nose landing gear was sheared off. The airplane came to rest on its nose. The owner operated the airplane under the provisions of 14 Code of Federal Regulations Part 91 as a personal flight. The pilot/owner and four passengers were not injured; the airplane sustained substantial damage to the wings and fuselage. Visual meteorological conditions prevailed for the flight that departed San Luis Obispo Airport (SBP), San Luis Obispo, California, about 1530, with a planned destination of Fresno-Yosemite Airport (FAT), Fresno, California. No flight plan had been filed; however, the pilot had been receiving flight-following.

The pilot was interviewed by a National Transportation Safety Board (NTSB) investigator. He stated that earlier on the day of the incident he had topped off with fuel before departing FAT; total fuel on board the airplane was 282 gallons. He and his family landed at SBP about 1100, went to lunch, and visited a local university campus. They returned to the airport for the return flight to SBP. In preparation for takeoff, he set the flaps to 10 degrees, and set the aileron and rudder trim for a normal takeoff. The takeoff was normal and the pilot stated that after takeoff, his intent was to climb the airplane to an altitude of 13,500 feet. However, during the climb, he reported that the rudder deflected all the way to the left, and he discontinued the climb. He maintained an altitude of 9,500 feet, and started to troubleshoot the problem; which included turning off the yaw dampener and manually flying the airplane. He also cycled the auto pilot, but the issue was not resolved. The pilot reported that Oakland Air Traffic Control Center (OAK ATCT) controllers asked him if he needed assistance, which he initially declined. The pilot stated that he initiated a climb to his original altitude of 13,500 feet. He reported that during the climb, the airplane's avionics failed, including the global positioning system (GPS), followed by a loss of engine power and illumination of the low fuel pressure light. The pilot further stated that the low fuel pressure light was illuminated for the left fuel tank. He radioed OAK ATCT and requested vectors to the nearest airport. The pilot stated that during landing, with full flaps, the airplane "floated" down the runway. After touchdown, he applied the brakes; however, the airplane continued off the runway and struck debris, shearing off the nose landing gear.

According to the pilot's written statement, the rudder became stuck about 5 minutes out of

SBP. The full left rudder deflection caused the airplane to turn to the right. He turned off the auto pilot and flew the airplane manually, utilizing the rudder pedals to compensate. He contacted OAK ATCT, and was asked if he needed assistance, as they had noted that he was having problems keeping the airplane straight. The pilot stated that he thought he had the airplane under control and would continue toward FAT. The pilot added that during the initial contact with OAK ATCT, they were not able to read his transponder, and he was asked to recycle it. He complied with the request, and simultaneously lost both of the GARMINS (Garmin 530 and Garmin 430), the red and yellow warning lights came on, and the engine stopped running. The pilot stated that he noted that the red light illuminated indicating low fuel. He asked for vectors to the nearest airport, and then feathered the propeller, while trying to restart the engine.

Subsequent to the accident, the pilot reported to representatives from the Federal Aviation Administration (FAA) that after departure and passing through 9,500 feet, he noticed that the slip/skid indication on the pilot's flight display indicated a full right deflection. The pilot confirmed this from the rudder deflection indicator located on the pedestal. He turned off the auto pilot and yaw damper systems and was able to gain better control of the airplane; however, the airplane remained in a right turn. After the airplane lost engine power, the pilot feathered the propeller to provide a better glide ratio. He declared an emergency with air traffic control (ATC) and asked for vectors to the nearest airport. He informed ATC that he did not have any indications of navigation since both Garmin's, the GNS430 and 530, had both temporarily lost power and were rebooting. The pilot continued to the accident airport and made a left base approach for runway 33. The airplane landed midfield and rolled off the end of the runway about 300 feet causing the nose landing gear to shear off and damaging the left wing and fuselage.

Retrieval personnel noted that the airplane had come to rest in a nose-down attitude. Both wings remained attached to the fuselage. The left flap was extended with no apparent damage to the left aileron and flap. No fuel was recovered from the left fuel tank. The right wing contained about 90 gallons of fuel. The bottom of the fuselage sustained substantial damage. Two of the four propeller blades were folded underneath the nose of the airplane, but the propeller assembly remained attached to the drive flange. Inside the cockpit, retrieval personnel visually noted that all of the circuit breakers were pushed in (closed). They also noted that the fuel sequencer was selected to AUTO.

Prior to recovery of the airplane with an airframe representative, a functional check of the rudder trim and fuel control unit (FCU) was performed. When maintenance personnel turned on the avionics master and autopilot switches, the autopilot tested normally. They noted that the rudder trim indicator showed a full deflection to the right. The rudder trim switch was then activated in the direction to return the rudder trim to the neutral position. Maintenance personnel reported that the rudder trim switch did not move the rudder trim indicator nor was there any noise of a trim motor running. Utilizing the pilot's operating handbook chapter 3.13 titled EMERGENCY SECTION – RUNWAY TRIMS, it directs the pilot to pull the circuit breaker (CB). As maintenance personnel went to pull the rudder trim CB, he noted that it was already

partially out. He then recycled the rudder trim CB and performed the test again with no anomalies noted. Maintenance personnel also reported that the autopilot was retested with no issues, and there were no other avionics failures.

A functional test of fuel delivery to the engine was performed. The fuel line was opened up just past the auxiliary pump. The pump was turned on, and fuel was observed to flow through the pump. The fuel line was reconnected and the procedure was performed again but this time to the FCU. Maintenance personnel reported that there was no fuel flow restriction to the FCU, and the pressure differential indicator (PDI) on the fuel filter was extended. An examination of the fuel filter revealed that the fuel bypass indicator had popped.

Visual inspection of the airframe and engine revealed no mechanical problems. On June 24, 2010, the engine was inspected by a representative from Pratt and Whitney under the auspices of the NTSB, in Madera, California. During the recovery it was noted that the airframe in-line fuel filter bowl and impending bypass indicator was extended. Visual inspection of the engine revealed no mechanical anomalies; all connections and fittings were intact and secured. The compressor and power turbine inlet areas were inspected; they were found to be intact with no evidence of blade rub or blade shift. A more detailed report is attached to the public docket for this accident.

The airframe was inspected on July 21, 2010, by the NTSB investigator-in-charge (IIC) and a representative from Daher-Socata. There were no mechanical anomalies found during the airframe inspection. It was noted in the pilot's statement that during the rudder trim failure, the airplane was flying in a dissymmetric condition (crabbing). According to the manufacturer's representative, fuel starvation in the lower wing would occur if the airplane were in a crab with a roll angle position, which would lead to an engine shutdown. An airframe examination report is attached to the public docket for this accident. Also, the pilot stated that the pilot's operating handbook failed to state cross-control limitations for fuel starvation.

In section 2 titled Limitations of the Pilot's Operating Handbook (POH), the total fuel capacity is 290.6 gallons, with a total usable of 281.6 gallons. The manual also stated that there is a maximum fuel imbalance of 25 gallons. In the Normal Procedures section (section 4) of the POH, it states that in spite of the automatic fuel selector, a non-negligible dissymmetry may be observed at the end of a climb, and that the tolerated maximum dissymmetry is 25 gallons. Section 7, Description, of the POH the Tank Automatic Selector, allows fuel to feed from one tank to the other in predetermined sequences, without pilot intervention. When the selector is operated, it controls the time during which the selected fuel tank will operate; the time varies depending on airplane conditions. Normally in flight, it will change every 10 minutes, as long as the left and right low level warning lights are not illuminated. If a low level warning light does illuminate, the sequencer will automatically select the other tank. If the second low level warning light illuminates, the sequencer will change fuel tanks every minute and 15 seconds.

The Rudder Trim Actuator was examined by Precilec, under the supervision of the Bureau

d'Enquêtes et d 'Analyses (BEA). A Visual examination of the actuator showed no obvious mechanical malfunctions. Precilec personnel noted that it was near the retract position. Functionality tests with and without a load were performed with no fault found, and the actuator was able to retract and extend correctly. It was noted during the acceptance test that two values did not conform to the tolerance limits; however, it did not affect the operation of the actuator. The acceptance test was used to test new actuators off the production line.

The pitch, roll, and yaw servos were bench tested at Executive AutoPilots, Sacramento, California, under the supervision of a National Transportation Safety Board (NTSB) investigator. A detailed report is attached to the docket. The inspection revealed that the servos operated normally and no runaway anomalies were noted.

The pitch trim circuit breaker was submitted to the NTSB Materials Laboratory for further examination. Visual examination showed no signs of damage or arcing; it was found to be in the "closed" position. An x-ray of the interior circuit contacts was performed to determine status of position and possible internal damage. The NTSB specialist confirmed that the circuit breaker was in the "closed" position and there was no sign of obvious internal damage. Electrical continuity of the circuit breaker was performed with no discrepancies noted.

The global positioning system (GPS) units were shipped to Washington, D.C., for additional examination and download by the vehicle recorders division of the NTSB. The units were the Garmin GMX-200; Garmin GDU-620, and the Bendix/King KCP-220; there was no accident related data recovered from any of the units. The Garmin GMX-200 is a panel mounted multi-function color display, which displays data from stored data cards inserted into the front panel, including: custom maps, IFR and VFR charts, terrain, traffic information, lighting, weather radar, and Jeppessen Chartview products. This unit only retains configuration data such as user settings, and does not retain ground track or last displayed information such as radar. The Garmin GDU-620 is a panel mounted primary flight/multi-function (PFD/MFD) with two side-by-side color displays. The PFD function displays flight performance data (airspeed, altitude, vertical speed, attitude, and navigation data). The MFD displays stored data from data cards inserted into the front panel, similar to the GMX-200 display. The Bendix/King flight computer performs flight director and autopilot command computations.

A review of the airplane's airworthiness records revealed that in December 2008, the instrument panel was modified to a -701 pilot panel in accordance with Socata data. On November 26, 2008, the Garmin GMX-200 MFD was installed in accordance with STC# SA01692SE, and a Garmin G600 PFD/MFD was installed in accordance with STC# SA02153LA, with the POH at Revision as per service bulletin 70-120-34 Amdt.

In the Garmin manual under Airworthiness Limitations, it says that there are no additional airworthiness limitations as defined in 14 CFR Part 23, Appendix G. G23.4 that result from the modification. It also states that it is FAA approved and specifies maintenance required under Part 43.16 and 91.403 of the Federal Aviation Regulations unless an alternative program has been approved by the FAA.

Pilot Information

Certificate:	Private	**Age:**	55,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	October 1, 2009
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	1100 hours (Total, all aircraft), 50 hours (Last 90 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Socata	**Registration:**	N750AB
Model/Series:	TBM 700	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	4
Landing Gear Type:	Retractable - Tricycle	**Seats:**	
Date/Type of Last Inspection:	February 18, 2010 100 hour	**Certified Max Gross Wt.:**	
Time Since Last Inspection:		**Engines:**	1 Turbo prop
Airframe Total Time:	2397 Hrs	**Engine Manufacturer:**	Pratt and Whitney
ELT:	Installed, not activated	**Engine Model/Series:**	PT6A
Registered Owner:	On file	**Rated Power:**	
Operator:	On file	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	BFL,510 ft msl	**Distance from Accident Site:**	33 Nautical Miles
Observation Time:	15:54 Local	**Direction from Accident Site:**	110°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	Broken / 6000 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	7 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.93 inches Hg	**Temperature/Dew Point:**	18°C / 2°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	San Luis Obispo, CA (SBP)	**Type of Flight Plan Filed:**	None
Destination:	Fresno, CA (FAT)	**Type of Clearance:**	VFR flight following
Departure Time:	15:30 Local	**Type of Airspace:**	

Airport Information

Airport:	Lost Hills-Kern Co Airport L84	**Runway Surface Type:**	Asphalt
Airport Elevation:	274 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	33	**IFR Approach:**	None
Runway Length/Width:	3020 ft / 60 ft	**VFR Approach/Landing:**	Full stop;Precautionary landing;Straight-in

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	4 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	5 None	**Latitude, Longitude:**	37.624721,-119.686111(est)

Administrative Information

Investigator In Charge (IIC):	Cornejo, Tealeye
Additional Participating Persons:	John Jensen; Federal Aviation Administration; Fresno, CA
Original Publish Date:	June 4, 2013
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=76102