National Transportation Safety Board
Aviation Accident Final Report

Location:	ALPINE, TX	**Accident Number:**	FTW99LA241
Date & Time:	08/28/1999, 1021 CDT	**Registration:**	N67JM
Aircraft:	Cessna 414	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	1 Minor, 3 None
Flight Conducted Under:	Part 91: General Aviation - Business		

Analysis

The pilot had the main and auxiliary fuel tanks filled and performed an abbreviated preflight prior to departing the Alpine Airport. The pilot did not perform an engine run-up prior to takeoff. The pilot stated that while the airplane was climbing through 100 feet agl, the left engine 'started to surge.' The pilot reported that he knew the airplane would not be able to climb at field elevation with one engine inoperative. The pilot switched the left engine's boost pump from low to high; however, the left engine continued to surge while the airplane lost altitude. The pilot initiated a forced landing with the landing gear and flaps retracted and the left propeller unfeathered. The airplane impacted the ground left wing tip first and a fire erupted, which damaged the left wing and left side of the fuselage. The left engine's spark plugs were found covered with thick black soot. The left engine's magnetos were rotated using an electric hand-held drill, and the left magneto did not produce any spark and the right magneto produced a spark in three of its six distributor cap posts. The left magneto's primary winding resistance and capacitor leakage were found to be beyond the manufacturer's specified limits. The internal components of both magnetos were covered in a dark oil and debris. The maximum takeoff weight for the accident airplane was 6,350 pounds; however, the takeoff weight at the time of the accident was calculated to be 6,509 pounds. The aircraft's single engine performance charts indicated that the airplane would obtain a 29 fpm climb at maximum gross weight with the inoperative engine feathered. The pilot operating handbook's supplement section indicated that the auxiliary fuel pump should only be used when the engine-driven fuel pump failed. A caution statement states in bold print, 'If the auxiliary fuel pump switches are placed in the HIGH position with the engine-driven fuel pump(s) operating normally, total loss of engine power may occur.'

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's improper use of the emergency fuel boost pump, which resulted in excessive fuel flow to the engine and subsequent total loss of left engine power. Factor's were the high density altitude, the pilot exceeding the airplane's weight and balance, the partial loss of left engine power as a result of the faulty magnetos, and the pilot's inadequate preflight inspection

by not performing an engine run-up.

Findings

Occurrence #1: LOSS OF ENGINE POWER(PARTIAL) - MECH FAILURE/MALF
Phase of Operation: TAKEOFF - INITIAL CLIMB

Findings
1. 1 ENGINE
2. IGNITION SYSTEM,MAGNETO - FOULED
3. (F) IGNITION SYSTEM,MAGNETO - FAILURE,PARTIAL
4. (F) AIRCRAFT PREFLIGHT - INADEQUATE - PILOT IN COMMAND

Occurrence #2: LOSS OF ENGINE POWER(TOTAL) - NONMECHANICAL
Phase of Operation: TAKEOFF - INITIAL CLIMB

Findings
5. 1 ENGINE
6. (C) FUEL SYSTEM,ELECTRIC BOOST PUMP - OUTPUT HIGH
7. (C) EMERGENCY PROCEDURE - IMPROPER - PILOT IN COMMAND

Occurrence #3: FORCED LANDING
Phase of Operation: EMERGENCY LANDING AFTER TAKEOFF

Occurrence #4: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: EMERGENCY LANDING AFTER TAKEOFF

Findings
8. (F) WEATHER CONDITION - HIGH DENSITY ALTITUDE
9. (F) AIRCRAFT WEIGHT AND BALANCE - EXCEEDED - PILOT IN COMMAND

Factual Information

HISTORY OF FLIGHT

On August 28, 1999, at 1021 central daylight time, a Cessna 414 twin-engine airplane, N67JM, was substantially damaged during a forced landing following a loss of engine power while taking off from the Alpine-Casparis Municipal Airport, Alpine, Texas. The airplane was registered to and operated by a private individual. The commercial pilot and two of his passengers were uninjured and one passenger received minor injuries. Visual meteorological conditions prevailed and a flight plan was not filed for the 14 Code of Federal Regulations Part 91 business flight. The flight was originating at the time of the accident and was destined for Lajitas, Texas.

According to the pilot, he had flown the airplane from Galveston, Texas, to Alpine and noticed no anomalies with the airplane or engines. The pilot reported that, at Alpine, he had the main and auxiliary fuel tanks topped off and requested that the nacelle fuel tanks (positioned aft of the engines) not be fueled. The pilot performed an abbreviated preflight inspection prior to his departure from Alpine by checking that the fuel caps were secure on the main and auxiliary fuel tanks. The pilot did not perform an engine run-up prior to takeoff.

In the enclosed Pilot/Operator Aircraft Accident Report (NTSB Form 6120.1/2) the pilot reported that, "everything was normal on take off. The plane was climbing slowly until we got to approximately 100 ft. above ground level when the left engine started to surge." The pilot added that he knew the airplane "wouldn't be able to climb at this altitude (4,500 feet Mean Sea Level) on one engine." The pilot stated that he attempted to make the left engine operate properly by "turning the left boost pump from low to high." He stated that the left engine continued to surge and the airplane was losing altitude. The pilot initiated a forced landing with the landing gear in the retracted position, the flaps retracted, and the left propeller unfeathered. The pilot maneuvered the airplane below power lines prior to landing gear-up in a field adjacent to a residential area.

The passenger in the left rear seat stated that he heard one engine "dying then surging" shortly after takeoff. He reported that he could see the tachometer and noticed "the left engine needle dropping, then gaining." He added that they impacted the ground with the left wing tip first and he noticed a blast of fire and heat from the left. The passenger in the right rear seat thought that the left engine was on fire before the airplane impacted the ground. The right front seat passenger stated that he noticed a fire after the airplane impacted the ground.

A witness, who was located near the accident site, stated that he observed the airplane maneuver to avoid power lines. He reported that the pilot "started to jettison his fuel" prior to impacting the ground.

Examination of the airplane by the FAA inspector who responded to the accident site revealed that the left side of the fuselage and left wing sustained fire damage, and the wing spars were structurally damaged.

PERSONNEL INFORMATION

The commercial multi-engine pilot held an instrument rating and was issued a third class medical certificate on June 30, 1997. According to the pilot, he had accumulated 382.8 total flight hours, of which 144 hours were in multi-engine airplanes and 24.3 hours were in the

same make and model as the accident airplane.

AIRCRAFT INFORMATION

The 1970 model airplane underwent its last annual inspection on June 25, 1999, at an aircraft total time of 5,541.4 hours. At the time of the annual inspection, the Teledyne Continental TSIO-520-N engines had accumulated 956.4 hours since a major overhaul. During the last annual inspection (39.2 hours prior to the accident), Airworthiness Directive AD75-23-08R5 was complied with by "visual inspection and pressure check of the exhaust components" for both engines. The airplane had accumulated 5,580.6 hours at the time of the accident.

According to a work order dated August 27, 1999 (the day before the accident flight), the left engine's mixture control cable was found "broken at cabin end." The work order entry stated that the broken cable and swivel end were removed from the aircraft, and the mechanic replaced the "swivel end with new P/N S2999-1 ball joint due to production change. Installed new cable P/N 9910271-201 in [aircraft]. Rigged cable [in accordance with] C414 airframe [maintenance manual] confirming mixture control travels from rich stop to lean stop...Sealed cable grommet at fuselage for pressurization."

According to a weight and balance record dated May 5, 1997, the aircraft empty weight was 4,599 pounds, and the moment was 744,939 inch-pounds. The maximum gross weight of the airplane was 6,350 pounds. Using pilot and passenger weights, estimated baggage weights, and fuel quantities provided by the FAA inspector, the NTSB investigator-in-charge (IIC) calculated the takeoff weight to be approximately 6,509 pounds.

The NTSB IIC reviewed the aircraft's performance charts and determined that the single engine takeoff distance required to clear a 50-foot obstacle (with inoperative engine propeller feathered and at maximum gross weight) was 6,800 feet. The performance charts indicate that the airplane would obtain a 29-feet/minute climb rate at maximum gross weight with the inoperative engine propeller feathered.

METEOROLOGICAL INFORMATION

At 1021, the weather observation facility at the Marfa Municipal Airport (located 17 miles west of the accident site) reported the wind as calm, visibility 10 statute miles, sky clear, temperature 77 degrees Fahrenheit, dew point 61 degrees Fahrenheit, altimeter setting 30.25 inches of mercury. The density altitude was calculated, by the NTSB IIC, to be 6,458 feet.

AERODROME INFORMATION

The Alpine-Casparis Municipal airport elevation is 4,515 feet msl. Runway 19 is 6,003 feet long and 75 feet wide.

TESTS AND RESEARCH

On September 15, 1999, the left wing and left engine were examined by the NTSB IIC, the FAA inspector who responded to the accident site, and representatives from Cessna Aircraft Company and Teledyne Continental Motors. The engine was attached to the engine mounts and support track. The accessory area aft of the engine and forward of the turbocharger sustained fire damage.

The exhaust clamp from the left engine's turbocharger was found cracked and was sent to the NTSB Materials Laboratory in Washington, D.C. The elbow pipe upstream of the wastegate was found cracked and was also sent to the NTSB Materials Laboratory. The wye pipe

adjoining the left and right exhaust manifolds had a small crack in the weld that did not appear to penetrate through the piping. The wastegate valve was found in the full open position. The wastegate controller was removed and compressed air was applied to it to check its operation, and it was found to operate properly. The left engine's turbocharger compressor shroud and impeller displayed no rotational scarring. The turbocharger's oil passage to the bearings was clear and the turbocharger rotated freely. The turbocharger's inlet tubing was destroyed by the fire.

The fuel pressure regulator was destroyed by the fire. The variable pressure controller was still attached to the throttle linkage, but was melted and fire damaged. The fuel line filter leading into the throttle body was removed, examined, and found to be clean. The throttle cable was connected to the throttle body, and the throttle arm was found in the full open position. The mixture cable leading to the throttle body was disconnected at the ball fitting. The ball end was out of the swaged fitting, and both appeared to have no damage except from rust and heat. The mixture arm was found in the rich position. The fuel manifold was disassembled in the field by the FAA inspector. No fuel was found in the manifold, and the seal was in place. The engine driven fuel pump was removed, disassembled, and examined. The vanes were intact and showed even wear with some light deposits of debris in between the vanes and in the inlet and outlet ports. The engine driven fuel pump operated when rotated manually.

The spark plugs were removed and examined. All spark plugs were coated with thick black soot similar to a rich mixture condition. All fuel injector lines were secured along with their upper deck pressure reference lines leading to the inlet side of the cylinders. The oil filter was cut open and was found charred, but clean. The engine crankshaft was rotated by hand and crankshaft continuity was established from the prop flange to the accessory case. Thumb compression was obtained on all cylinders, and all of the valves and rocker arms moved.

The pressurized magnetos were examined on the engine. Magneto timing was checked and found to be within limits (both at 20 degrees before top dead center). The magnetos (Left Magneto: Bendix S6RN-1251 s/n 8219215; Right Magneto: Bendix S6RN-1255 s/n 8219216) were removed from the engine and their shafts were rotated using an electric hand-held drill. The left magneto would not produce any spark. The right magneto would only produce a spark in three of the six distributor cap posts (skipping every other terminal).

The magnetos were tested in accordance with the Continental Maintenance Overhaul and Parts List Manual (Manual Number x42001-1 Jan 1990) for S-1200 series high tension magnetos. A Primary Condenser Tester (11-1767-3) was used to check leakage, series resistance, and capacitance, and an ohmmeter was used to test the resistance of the windings.

The left magneto's primary winding resistance measured 5.61 ohms. The limit is 1.0-1.5 ohms. The secondary winding for the left magneto measured 22,400 ohms and was within the 20,000-26,000 ohm limit. The left magneto's capacitor was inspected and found to be out of its leakage limits, borderline for its series resistance limits, and within its capacitance limits. The distributor cap for the left magneto was coated with a dark brown oily substance. The points were covered with debris and oil. The underside of the distributor cap was sprayed and coated with oil. The primary and secondary winding cover and internal housing were also covered with dark brown oil.

The right magneto's primary winding resistance measured 1.11 ohms and was within the specified limits. The secondary winding was measured at 21,500 ohms and was within its

limits. The capacitor's capacitance, leakage and series resistance were all found within the specified limits. The distributor cap on the right magneto was also coated with an oily substance. The points were also covered with dirt and debris, but not to the same extent as the left magneto. The magneto's inlet port from the pressurized line displayed a dark brown oily streak running down the inside housing. Oil was found throughout the right magneto.

The right engine was examined on October 29, 1999, by the NTSB IIC. The right engine exhaust system was found cracked at the wye piping from the turbocharger turbine inlet. Exhaust soot directed from the wye piping crack had melted the inspection panel's seal and discolored the engine's firewall. The wye piping was forwarded to the NTSB Materials Laboratory for further examination.

ADDITIONAL INFORAMTION

In the Cessna 414 Pilot Operating Handbook, under the Airplane Flight Manual Supplement section, it addresses the auxiliary fuel pump switching system. In part, the supplement states "The HIGH position is reserved for emergency operation, and operates the pumps at high speed. The HIGH position supplies sufficient fuel flow to sustain partial engine power in the event of an engine-driven fuel pump failure." The supplement continues with "The new HIGH position supplies sufficient fuel flow to sustain partial engine power and should be used solely to sustain the operation of an engine in the event its engine-driven fuel pump fails." A CAUTION section of the supplement states in bold print, "If the auxiliary fuel pump switches are placed in the HIGH position with the engine-driven fuel pump(s) operating normally, total loss of engine power may occur."

Examination of the exhaust system components by the NTSB Materials Laboratory revealed that some of the crack fracture surfaces contained lead and bromine, which is typical for an exhaust gas deposit. Some of the fractures on the wye piping from the right engine revealed heavy corrosion "typical of long term cracking in a corrosive environment."

The wreckage was released to the owner's representative.

Pilot Information

Certificate:	Commercial	**Age:**	32, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Seatbelt
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 3 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	06/30/1997
Occupational Pilot:		**Last Flight Review or Equivalent:**	
Flight Time:	383 hours (Total, all aircraft), 24 hours (Total, this make and model), 360 hours (Pilot In Command, all aircraft), 44 hours (Last 90 days, all aircraft), 39 hours (Last 30 days, all aircraft), 3 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N67JM
Model/Series:	414 414	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Normal	**Serial Number:**	4140066
Landing Gear Type:	Retractable - Tricycle	**Seats:**	7
Date/Type of Last Inspection:	06/25/1999, Annual	**Certified Max Gross Wt.:**	6390 lbs
Time Since Last Inspection:	39 Hours	**Engines:**	2 Reciprocating
Airframe Total Time:	5581 Hours	**Engine Manufacturer:**	Continental
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	TSIO-520-N
Registered Owner:	MACK PONDER	**Rated Power:**	325 hp
Operator:	MACK PONDER	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Day
Observation Facility, Elevation:	MRF, 4849 ft msl	**Distance from Accident Site:**	17 Nautical Miles
Observation Time:	1015 CDT	**Direction from Accident Site:**	250°
Lowest Cloud Condition:	Clear / 0 ft agl	**Visibility**	10 Miles
Lowest Ceiling:	None / 0 ft agl	**Visibility (RVR):**	0 ft
Wind Speed/Gusts:	Light and Variable /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30 inches Hg	**Temperature/Dew Point:**	25°C / 16°C
Precipitation and Obscuration:			
Departure Point:	(E38)	**Type of Flight Plan Filed:**	None
Destination:	LAJITAS, TX (17XS)	**Type of Clearance:**	None
Departure Time:	1021 CDT	**Type of Airspace:**	Class G

Airport Information

Airport:	ALPINE MUNICIPAL (E38)	**Runway Surface Type:**	
Airport Elevation:	4515 ft	**Runway Surface Condition:**	
Runway Used:	19	**IFR Approach:**	
Runway Length/Width:	6003 ft / 75 ft	**VFR Approach/Landing:**	Forced Landing

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Destroyed
Passenger Injuries:	1 Minor, 2 None	**Aircraft Fire:**	On-Ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Minor, 3 None	**Latitude, Longitude:**	

Administrative Information

Investigator In Charge (IIC):	NICOLE LUPINO	**Report Date:**	03/02/2001
Additional Participating Persons:	MICHAEL JORDAN; LUBBOCK, TX		
Publish Date:			
Investigation Docket:	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at pubinq@ntsb.gov, or at 800-877-6799. Dockets released after this date are available at http://dms.ntsb.gov/pubdms/.		