LYCOMING
A Textron Company

Air Safety Investigation ✈

Single Engine Final Report

Mishap Date:	May 16, 2002	**Mishap Time (24 hr.):**	2154 MST
Aircraft Registration:	N328CG	**Air Safety Investigator:**	Mark W. Platt
Aircraft Manufacturer:	Socata 2000	**Aircraft Model:**	TB-21
Location:	New River, AZ	**Aircraft S/N:**	2025
On Scene Examination:	Yes	**Aircraft Damage:**	Destroyed
Federal IIC:	Wayne Pollack	**NTSB Report#:**	LAX02FA166

Engine:	**Engine**
Model	TIO-540-AB1AD
Serial Number	L-10523-61A
Total Time	~125 Hours Since New
Crankshaft S/N	Unknown
Case Match #	K0136

Propeller:	**Manufacturer**	**Part Number**	**Serial Number**
	Hartzell		

Injuries:	**Number**	**Fatal**	**Serious**	**Minor**	**None**
Crew	1	1	0	0	0
Passengers	1	1	0	0	0
Ground		0	0	0	

Registered Owner: Avex Inc
205 Durley Ave Suite A
Camarillo, CA 93010

Operator: Same as owner

Pilot: Arlen Barry Braunstein

Medical, Date Issued: 03/02
Pilot Rating: CASEL

Summary:

On May 16, 2002, about 2154 mountain standard time (MST), a Socata TB-21, registered as N328CG, descended into mountainous terrain in the Tonto National Forest, about 7 nm northeast of New River, Arizona. The airplane was destroyed. The pilot, who was demonstrating the airplane to the prospective purchaser, possessed a commercial pilot certificate and was fatally injured. The prospective purchaser possessed a student pilot certificate and was also fatally injured. The sales demonstration flight was performed under the provisions of Title 14 CFR Part 91. No flight plan was filed. Visual meteorological conditions during the hours of darkness prevailed in the vicinity of the Phoenix Deer Valley Airport, 17 nm south of the accident site.

Cockpit Instruments and Switches

Legend:
D – Destroyed
B – Broken
N – No Damage
F – Fire Damage
I – Impact Damage
S – Separated
OSL – Off Scale Left
OSR – Off Scale Right
E Electronic/ Digital
Unk – Unknown
N/A – Not Applicable
N/O – Not Obtainable
N/L – Not Located

Communication and Navigational Aids

☐ All Destroyed by Fire

	On	Off	Destroyed	Freq
COM 1	☐	☐	☒	D, N/O
COM 2	☐	☐	☐	
DME	☐	☐	☐	
ADF	☐	☐	☐	
NAV 1	☐	☐	☒	D, N/O
NAV 2	☐	☐	☐	
RNAV	☐	☐	☐	
Loran	☐	☐	☐	
GPS	☐	☐	☐	
Auto Pilot	☐	☐	☐	
Transponder	☐ Off ☐ Sby ☐ On ☐ Alt			D, N/O

Electrical Switches

☐ All Destroyed by Fire

	On	Off	Destroyed
Master Switch	☐	☐	☒
Alternator Switch	☐	☐	☒
Avionics Switch	☐	☐	☒
Pitot Heat	☐	☐	☒
Navigation Lights	☐	☐	☒
Rotating Beacon	☐	☐	☒
Landing Lights	☐	☐	☒
Taxi Lights	☐	☐	☒
Strobe Lights	☐	☐	☒
Instrument Lights	☐	☐	☒
Stall Heat	☐	☐	☐
Fuel Pump	☐	☐	☒

Flight Instruments & Controls

☐ All Destroyed by Fire

	Left	Right
Airspeed Indicator	123 kts	
Altimeter		
Altimeter Setting		
Directional Gyro		
Heading Bug		
Vertical Speed Indicator		
Attitude Indicator (pitch)		
Attitude Indicator (roll)		
Turn Coordinator (Indicator)		
Turn Coordinator (Ball)		
Magnetic Compass		
NAV1 OBS		
NAV2 OBS		
RNAV Bearing		
RNAV Distance		
Clock		

Magnetos ☐ Destroyed by Fire

☐ Off ☐ L ☐ R ☐ Both

Environmental Controls ☐ Destroyed by Fire

	On	Off	Destroyed
Cabin Heater	☐	☐	☐
Air Conditioner	☐	☐	☐
Cabin Vent	☐	☐	☐

Pressurization Controls

Cabin VSI	n/a
Cabin Altitude	n/a
Differential Pressure	n/a
Press. Safety Valve	n/a
Pressurization Overflow Valve	n/a

Comments:

The subject aircraft sustained extensive damage resulting from the absorption of impact energy. The instrument panel was extensively fragmented. Reliable and useful information could not be extracted due to the destruction of the instrument panel.

Engine Instruments and Controls

Legend:
D – Destroyed
B – Broken
N – No Damage
F – Fire Damage
I – Impact Damage
S – Separated
OSL – Off Scale Left
OSR – Off Scale Right
E Electronic/ Digital
Unk – Unknown
N/A – Not Applicable
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N/L – Not Located

Engine Instruments	
Hourmeter	n/a
Tachometer - RPM	0
Tachometer - Hours	E, UNK
Manifold Pressure	D, N/O
Cylinder Head Temp	D, N/O
Oil Pressure	photo 25
Oil Temperature	photo 25
Fuel Pressure	D, N/O
Exhaust Gas Temperature	D, N/O
Turbine Inlet Temperature	n/a
Ammeter	
Voltmeter	photo 25
Vacuum Pressure	D, N/O
Fuel Flow	D, N/O
Primer Locked?	n/a

Engine Control Positions (Engine Compartment)	
Throttle	D, N/O
Mixture Control	D, N/O
Propeller Control	D, N/O
Cowl Flaps	
Carburetor Heat	n/a
Alternate Air	D, N/O
Ram Air	n/a

Engine Controls (Cockpit)	
Throttle	D, N/O
Mixture Control	D, N/O
Propeller Control	D, N/O
Cowl Flaps	
Carburetor Heat	n/a
Alternate Air	D, N/O
Ram Air	n/a

Fuel Management	
Selector Handle	Left
Selector Valve	Left
L Main Tank Quantity	D, N/O
L Aux Tank Quantity	
R Main Tank Quantity	D, N/O
R Aux Tank Quantity	

Fuel Management Comments:

Comments:

The subject aircraft sustained extensive damage resulting from the absorption of impact energy. The instrument panel was extensively fragmented. Reliable and useful information could not be extracted due to the destruction of the instrument panel.

Engine Data

Model	Serial Number	Total Time
TIO-540-AB1AD	L-10523-61A	~125 Hours Since New

Above engine Information taken from: Aircraft Maintenance logbook.

Case Match # K0136 Engine S/N on Case: L-10523-61A

Crankshaft S/N: Not recorded

Last Annual Inspection by: Date

Last Overhaul by: TEXTRON Lycoming Date

Maintenance Records Attached? ☐ Yes ☒ No

On-Scene Exam? ☒ Yes ☐ No

Propeller Attached? ☐ Yes ☒ No

Was Engine Disturbed Prior to Your Arrival? ☐ Yes ☒ No

Does Engine Appear to be Runnable? ☐ Yes ☒ No

Does Crankshaft Rotate? ☐ Yes ☒ No

Evidence of Fire? ☐ Yes ☒ No

Comments:

Investigators from the National Transportation Safety Board (NTSB), the Federal Aviation Administration, Flight Standards District Office (FAA-FSDO), and Lycoming Engines responded to and documented the mishap site. Reference the report narrative for additional information.

The aircraft was subsequently removed from the site and transported to the facilities of Air Transport Inc; Phoenix, Arizona.

Engine Data

Propeller

Manufacturer	Part Number	Serial Number
Hartzell	Unknown	Unknown

Propeller Type ☒ Metal ☐ Wood ☐ Composite ☐ Unknown

Propeller Blade Serial Numbers:

Blade 1 Unknown Blade 2 Unknown

Blade 3 Unknown Blade 4

Propeller Governor

Manufacturer	Part Number	Serial Number
Woodward	F210761	12316990

Gasket Screen Condition: Not removed

Governor Oil Line:

Properly Secured? ☐ Yes ☐ No ☐ Unknown ☒ N/A

Correct Line Nuts? ☐ Yes ☐ No ☐ Unknown ☒ N/A

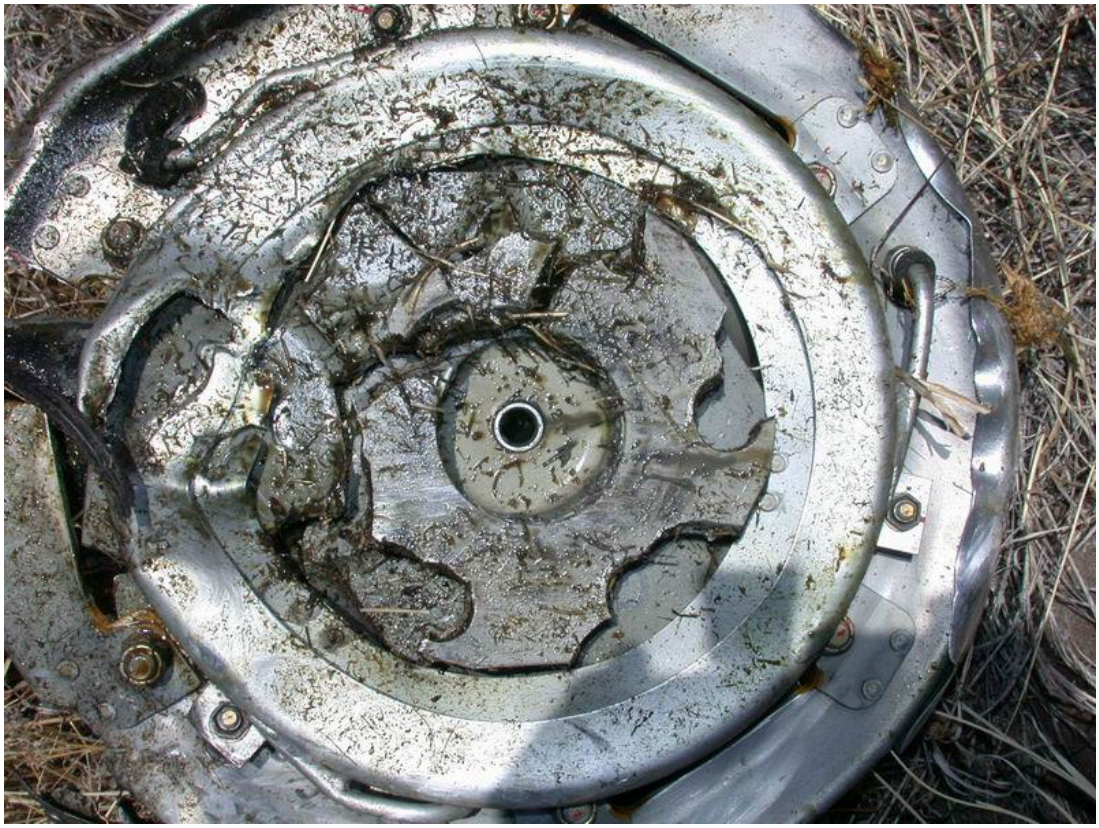
Correct Fittings? ☐ Yes ☐ No ☐ Unknown ☒ N/A

Propeller Comments:

The three bladed constant speed propeller was displaced from the crankshaft flange at the mechanical attachment area of the hub. The fracture surfaces exhibited signatures consistent with overload due to the absorption of rotational energy. The spinner and dome were displaced from the propeller hub. The propeller blades remained attached to the propeller hub. In addition to significant material loss at each propeller blade tip area, the propeller blades displayed leading edge gouging, torsional twisting, chordwise striations across the cambered surface and trailing edge “S” Bending. The signatures were consistent with the absorption of rotational forces applied at the crankshaft at the time of impact. Reference photographs 74-83 for views of the subject propeller.

The propeller governor (photo 47) was securely attached at the mounting pad with the pitch control rod securely attached at the control wheel.

General view of propeller and blade damage.



View of the mechanical attachment area of propeller hub.

Engine Data

Fuel System ☒ Injection ☐ Carburetor

Manufacturer: Unknown Model: Unknown Setting: Unknown

Serial. No.: Unknown Floats: ☐ Metal ☐ Composite

Fuel Screens

Carburetor/Injector Inlet: ☐ Clean ☐ Contaminated ☒ Unknown

Aircraft Main Fuel Strainer: ☐ Clean ☐ Contaminated ☒ Unknown

Flow Divider

Manufacturer: Precision Part No.: 75283 Serial No.: 0207813

Evidence of Fuel Found? ☐ Yes ☒ No ☐ Unknown

Injector Nozzles:

Type: ☐ One Piece ☐ Two Piece ☒ Unknown

Condition: ☐ Open ☐ Plugged ☒ Unknown

Fuel Pump: ☐ Diaphragm ☐ Geared ☒ Unknown ☐ None

Manufacturer: Unknown Part No.: Unknown Serial No.: Unknown

Fuel System Comments:

The fuel injection servo and fuel pump were destroyed and not available for examination.

The fuel flow divider (aka: spider) remained secure at the mounting bracket situated at the top of the engine. The fuel lines remained secure at each flow divider fitting and fuel injector at each cylinder. The flow divider was disassembled. There was no evidence of internal mechanical malfunction or obstruction to fuel flow. The fuel injection nozzles remained secure at cylinder(s) 1,3,5,2&4 with the respective fuel line attached. The number 6 cylinder head had been displaced from the engine; however, the nozzle remained attached to the fuel line.

The fuel flow divider was opened for examination. No visible contaminates were observed. The roll pin that indexes internal components of the flow divider had penetrated the diaphragm material, coming to rest on the reverse side of the diaphragm. The displacement of the roll pin was attributed to high G-loading vectors sustained during the impact with terrain. Reference photographs 55-67 for views of the fuel flow divider and internal components.

Engine Data

Ignition System:

Magnetos:

☐ **Left or** ☒ **Dual Magneto**

Manufacturer: TCM Model: D6LN-3000 P/N _____ S/N C070018G
Impulse Coupling? ☒ Yes ☐ No Functioning? ☒ Yes ☐ No ☐ Unknown
Timing Checked? ☐ Yes ☒ No Results: _____
Damage: Substancial

Right Magneto

Manufacturer: _____ Model: _____ P/N _____ S/N _____
Impulse Coupling? ☐ Yes ☐ No Functioning? ☐ Yes ☐ No ☐ Unknown
Timing Checked? ☐ Yes ☐ No Results: _____
Damage: _____

Magneto Comments: Reference the "Engine Observations" narrative for information.

Spark Plugs

Manufacturer: Champion Type: RHB-36S SI 1042 Approved? ☒ Yes ☐ No

1 Top	Undamaged electrode, normal color	1 Bottom	Not removed
2 Top	Undamaged electrode, normal color	2 Bottom	Not removed
3 Top	Undamaged electrode, normal color	3 Bottom	Not removed
4 Top	Undamaged electrode, normal color	4 Bottom	Not removed
5 Top	Undamaged electrode, normal color	5 Bottom	Not removed
6 Top	Undamaged electrode, normal color	6 Bottom	Not removed
7 Top		7 Bottom	
8 Top		8 Bottom	

Spark Plug Comments:

The spark plugs were secure at each position with their respective spark plug lead "B-nut" attached. The top spark plugs were removed, examined and photographed. The spark plug electrodes remained mechanically undamaged, and according to the Champion Spark Plugs Check-A-Plug chart AV-27, the spark plug electrodes displayed coloration consistent with normal operation. Reference photographs 48-50 for views of the spark plugs, as removed.

Ignition Harness

Tested: ☐ Yes ☒ No Condition: Destroyed

Comments: The ignition harness had sustained varying degrees of damage by impact energy and was not tested. The ignition harness was attached at the respective magneto and spark plugs.

Engine Data

Starter:

Manufacturer: Unknown

Part No.: Unknown Serial No.: Unknown

Comments: The starter was displaced from the engine and destroyed. The subject starter was not examined.

Alternator:

Manufacturer: Unknown

Part No.: Unknown Serial No.: Unknown

Comments: The alternator was detached from the engine and destroyed. The subject alternator was not examined.

Generator:

Manufacturer:

Part No.: Serial No.:

Comments:

Vacuum Pump:

Manufacturer: Unknown

Part No.: Unknown Serial No.: Unknown

Comments: The vacuum pump was destroyed and not available for examination.

☐ Stand-by Pump or ☐ Aux. Pump:

Manufacturer:

Part No.: Serial No.:

Lubrication System:

Oil Suction Screen: ☐ Clean ☐ Contaminated ☒ Unknown

Oil Pressure Screen: ☐ Clean ☐ Contaminated ☐ Unknown ☒ N/A

Oil Filter: ☐ Clean ☐ Contaminated ☒ Unknown ☐ N/A

Oil Cooler Integrity: ☐ Secure ☐ Leaking ☒ Unknown ☐ N/A

Oil Cooler Hoses: ☐ Tight ☐ Leaking ☒ Unknown ☐ N/A

Oil System Comments: The oil cooler, oil suction screen and oil filter (photos 35-36) were destroyed by impact.

Engine Data

Turbo System: ☐ **Page Not Applicable on this engine model.**
☒ **Single or** ☐ **Left**

Manufacturer: Unknown
Part No.: Unknown Serial No.: Unknown

Rotate? ☐ Yes ☒ No Functioning? ☐ Yes ☐ No ☒ Unknown

Damage: Destroyed. No data plate found.

☐ **Right**

Manufacturer:
Part No.: Serial No.:

Rotate? ☐ Yes ☐ No Functioning? ☐ Yes ☐ No ☐ Unknown

Damage:

Density Controller ☐ **Not Applicable on this engine model.**
Manufacturer: Unknown
Part No.: Unknown Serial No.: Unknown

Differential Control ☐ **Not Applicable on this engine model.**
Manufacturer: Unknown
Part No.: Unknown Serial No.: Unknown

Variable Absolute Controller ☒ **Not Applicable on this engine model.**
Manufacturer:
Part No.: Serial No.:

Slope Controller ☒ **Not Applicable on this engine model.**
Manufacturer:
Part No.: Serial No.:

Manifold Pressure Relief Valve ☒ **Not Applicable on this engine model.**
Manufacturer:
Part No.: Serial No.:

Exhaust Bypass Valve ☐ **Not Applicable on this engine model.**
Manufacturer: Unknown
Part No.: Unknown Serial No.: Unknown

Comments: Reference the "Engine Observations" narrative for details.

Engine Observations

The subject wreckage and engine were examined on-scene on May 18, 2002, under the auspices of the National Transportation Safety Board, Investigator in charge (NTSB-IIC).

The powerplant is a six cylinder, air cooled, direct drive, horizontally opposed, turbo-charged fuel injected, internal combustion engine rated at 250hp @ 2575rpm.

The engine was displaced from the engine mount. The engine had sustained significant impact energy damage. The oil sump and induction system including the fuel injection servo and induction pipes were completely displaced from the engine. All of the accessories mounted at the rear of the engine were displaced from their respective mountings. The cylinder head of the number six cylinder was displaced. The crankcase at the cylinder number one position was fractured and the cylinder was skewed from its normal position. Visual examination of the engine revealed no evidence of pre-impact catastrophic mechanical malfunction or fire. The propeller was displaced from the crankshaft flange.

The top spark plugs were removed, examined and photographed. Rotation of the crankshaft was precluded due to impact damage to the case and cylinders. The gears at the rear of the engine could be visualized and appeared intact. Internal components of the engine were examined utilizing a lighted bore scope. The crankshaft and attached connecting rods remained intact and exhibited no evidence of heat distress or malfunction. The cylinder(s) combustion chamber was examined through the spark plug holes utilizing a lighted bore scope. The combustion chambers remained mechanically undamaged, and there was no evidence of foreign object ingestion. The valves were intact and undamaged. There was no evidence of valve to piston face contact observed. The gas path and combustion signatures observed at the spark plugs, combustion chambers and exhaust system components displayed coloration consistent with normal operation. There was no oil residue observed in the exhaust system gas path. There was significant ductile bending of the exhaust system components.

The single drive dual magneto had sustained minor impact energy damage, and was displaced from the mounting pad. The surface signatures at the magneto-mounting flange were consistent with overload forces applied. Magneto to engine timing could not be ascertained. The impulse coupler drive was found intact and secure. The drive functioned normally during hand rotation of the drive. The magneto produced spark at the twelve leads during hand rotation the drive. Reference photographs 52-54 for views of the magneto.

The turbo-charger system had sustained varying degrees of impact energy damage. The turbo-charger was displaced from the mountings and had sustained major damage. The turbine impeller remained secure and had sustained rotational damage. The impeller blades exhibited no damage consistent with the ingestion of foreign objects. The exhaust gas path coloration at the turbo and respective exhaust system components exhibited coloration consistent with normal operation and remained free of oil residue. The compressor impeller was destroyed and not found. The compressor impeller shroud was recovered and exhibited circumferential scoring where it had contacted the compressor turbine during the absorption of impact energy. The exhaust by-pass valve (aka: wastegate) was displaced from the engine. The butterfly valve within the pipe remained intact and undamaged. The density and differential controllers were destroyed with fragments of the components identified along the debris path. Reference photographs 27-33 for views of the various components, as described.