Aviation Investigation Final Report

Location:	SEATTLE, Washington	**Accident Number:**	SEA00LA066
Date & Time:	April 8, 2000, 13:50 Local	**Registration:**	N258AG
Aircraft:	Beech A200	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	6 None
Flight Conducted Under:	Part 91: General aviation - Executive/Corporate		

Analysis

The pilot reported that very shortly after takeoff, both DC generator lights illuminated. He stated he tried to reset the generators but was unsuccessful. The aircraft experienced a total electrical failure shortly thereafter. The pilot returned to the departure airport, manually lowering the gear (by pumping a handle that drives a mechanical extension mechanism) since normal electrical gear extension was not available. The pilot stated he pumped the manual extension handle until he felt a drop in resistance, at which point he assumed the gear was down-and-locked. The airplane's left main landing gear collapsed during landing. The pilot, who had 26 total hours in make and model of which 11 was as pilot-in-command, could not remember placing the engine ignition/start switches from ON to OFF after starting the engines as specified by the checklist. Each of the airplane's engines is equipped with a DC electric starter/generator; with the engine ignition/start switches in the ON position, these devices function as starter motors driven by ground power or the aircraft battery. In post-accident examinations, the battery was found discharged but once it was recharged and reinstalled in the aircraft, investigators were able to start one of the aircraft's engines on battery power and bring a generator on line with no electrical power distribution anomalies noted. The GENERATOR INOPERATIVE emergency procedure in the aircraft's FAA-approved Airplane Flight Manual (AFM) does not contain a step for checking the engine ignition/start switches in the OFF position prior to attempting generator reset, and the AFM LANDING GEAR MANUAL EXTENSION procedure does not contain information on how long to pump the manual extension handle for a down-and-locked condition in the event the green GEAR DOWN lights do not illuminate (as in an electrical failure condition.)

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

The pilot's failure to properly follow pre-takeoff checklists (resulting in the engine starters remaining engaged after engine start, generators not being activated, discharge of the aircraft battery and consequent total electrical failure during flight with associated disabling of normal landing gear extension capability), and his subsequent failure to properly perform a manual landing gear extension resulting in a landing with the gear not down-and-locked. Factors included: the pilot's lack of experience in type, steps not listed in the manufacturer's Airplane Flight Manual (AFM) GENERATOR INOPERATIVE procedure, conditions not listed in the manufacturer's AFM MANUAL LANDING GEAR EXTENSION procedure; and the FAA's inadequate approval of both of these procedures.

Findings

Occurrence #1: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION
Phase of Operation: CLIMB

Findings
1. (C) CHECKLIST - NOT FOLLOWED - PILOT IN COMMAND
2. (F) LACK OF TOTAL EXPERIENCE IN TYPE OF AIRCRAFT - PILOT IN COMMAND
3. ENGINE ACCESSORIES,ENGINE STARTER - ENGAGED
4. ELECTRICAL SYSTEM,GENERATOR - NOT ACTIVATED
5. (F) CONDITION(S)/STEP(S) NOT LISTED - MANUFACTURER
6. (F) INADEQUATE CERTIFICATION/APPROVAL,AIRCRAFT - FAA(ORGANIZATION)
7. ELECTRICAL SYSTEM,BATTERY - DISCHARGED
8. ELECTRICAL SYSTEM - FAILURE,TOTAL

Occurrence #2: GEAR COLLAPSED
Phase of Operation: EMERGENCY LANDING

Findings
9. LANDING GEAR,NORMAL RETRACTION/EXTENSION ASSEMBLY - DISABLED
10. (C) EMERGENCY PROCEDURE - IMPROPER - PILOT IN COMMAND
11. (F) CONDITION(S)/STEP(S) NOT LISTED - MANUFACTURER
12. (F) INADEQUATE CERTIFICATION/APPROVAL,AIRCRAFT - FAA(ORGANIZATION)
13. LANDING GEAR - NOT SET - PILOT IN COMMAND

Factual Information

On April 8, 2000, approximately 1350 Pacific daylight time, a Beech A200 airplane, N258AG, being operated by Wild Angels (a Santa Fe, New Mexico-based environmental/ecological organization), was substantially damaged when its main landing gear collapsed on landing roll at Boeing Field/King County International Airport, Seattle, Washington. The 14 CFR 91 executive/corporate transport flight, originally destined for Pullman/Moscow Regional Airport, Pullman, Washington, had returned to its departure airport of Boeing Field after experiencing a total loss of electrical power shortly after departure. There were no injuries to the commercial pilot-in-command or 5 passengers aboard the accident aircraft. Visual meteorological conditions prevailed and no flight plan had been filed for the accident flight.

The pilot reported that "very shortly" after departing Boeing Field, both DC generator caution lights illuminated on the aircraft's annunciator panel. The pilot stated that he tried to reset both generators, but that nothing changed. He stated that he subsequently recognized indications of an impending electrical failure when Seattle Approach told him he was barely readable on the radio while the aircraft was still in the Renton/Seattle general area. He stated he then declared an emergency and turned back toward Boeing Field. He reported that he then selected landing gear down, but that nothing happened (normal landing gear extension on the aircraft is via an electric motor.) He stated that he then lowered the gear manually (accomplished by pumping a ratchet handle which actuates a mechanical chain drive to the gear linkage.) The pilot, who stated he recently underwent Beech 200 type training with SimCom, Inc., stated that he referred to the manual landing gear extension procedure in SimCom's Beech 200 training manual to accomplish the procedure. The pilot reported that he pumped the manual gear extension handle to a point where resistance on the handle dropped, which he interpreted at that time as the landing gear being down and locked (the pilot reported he could see the nose landing gear down and vertical in nacelle-mounted mirrors on the aircraft at that time.) The pilot reported that while landing on Boeing Field runway 31L, the main gear "sagged" to a collapsed position. The pilot stated that in retrospect, he could not recall placing the engine ignition/start switches back to the OFF position at the completion of the engine start sequence (the engine start procedure dictates that these switches, which are not spring- or solenoid-actuated from the ON position back to the OFF position, be placed back to the OFF position at a minimum engine N1 RPM of 50%.) The pilot reported he had 26 total hours in Beech 200 aircraft, of which 11 hours were as pilot-in-command.

Direct current (DC) for the electrical system of the aircraft (nominally 28 volts) is supplied by a 24-volt, 34 ampere-hour battery and by two 30-volt, 250-ampere starter-generators (one per engine) connected in parallel. In normal operation with the engines operating, the starter-generators function as engine-driven electrical generators, supplying power to aircraft DC busses, two alternating current (AC) inverters, and the aircraft battery. With the corresponding engine ignition/start switch in the ON position, the starter-generator operates as an electrical

starter motor driven by a ground power unit (GPU) or by aircraft battery power. A check of the aircraft's battery after the accident determined the as-found battery voltage to be 22.74 volts. The battery failed a capacity check in the "as-found" condition, but subsequently accepted a charge and, once charged, passed a capacity check. After charging, the battery was reinstalled in the aircraft and an examination of the aircraft's electrical system was conducted on April 14, 2000. During the electrical system examination, the aircraft's right engine was successfully started on battery power and the right generator was successfully brought on line with no electrical power distribution problems noted. The "Before Starting Engines" current limiter checks were also successfully performed on battery power (after the battery had been fully charged) per the Beech A200 Airplane Flight Manual, with both the #1 and #2 inverters. No attempt was made to start the aircraft's left engine during the electrical system examination, due to damage to the left nacelle and fuel tank.

The FAA-approved A200 Airplane Flight Manual (AFM) emergency procedure for GENERATOR INOPERATIVE (DC GEN ANNUNCIATOR LIGHT ON) is as follows:

1. Generator Switch - OFF, RESET, then ON

IF GENERATOR WILL NOT RESET:

2. Generator Switch - Off 3. Operating Generator - Do not exceed 100% load

The procedure does not specify that the engine ignition/start switches be checked to ensure they are in the OFF position.

The FAA-approved A200 AFM emergency procedure for LANDING GEAR MANUAL EXTENSION contains the following CAUTION:

Do not continue pumping after receiving three green lights (gear down indication). Further movement of the handle could damage the drive mechanism....

The AFM procedure does not contain any information as to how long to pump the gear extension lever to obtain a full down-and-locked condition in the event the green GEAR DOWN lights do not illuminate, as in the case of an electrical failure. SimCom training material found in the accident aircraft states that "If for some reason the gear does not indicate down and locked, continue pumping the lever until sufficient resistance is felt to be sure that the gear is down and locked." A SimCom-produced Super King Air 200 emergency procedures checklist marked "FOR SIMULATOR TRAINING PURPOSES ONLY", also found in the accident aircraft, lists the last step of the LANDING GEAR MANUAL EXTENSION procedure as: "EXTENSION LEVER...PUMP UNTIL 3 GREEN OR UNTIL SUFFICIENT RESISTANCE IF NO POWER."

Pilot Information

Certificate:	Commercial	**Age:**	50,Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	**Seat Occupied:**	Unknown
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 2 Unknown	**Last FAA Medical Exam:**	September 11, 1998
Occupational Pilot:	UNK	**Last Flight Review or Equivalent:**	
Flight Time:	9740 hours (Total, all aircraft), 26 hours (Total, this make and model), 9510 hours (Pilot In Command, all aircraft), 48 hours (Last 90 days, all aircraft), 24 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Beech	**Registration:**	N258AG
Model/Series:	A200 A200	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	BC-44
Landing Gear Type:	Retractable - Tricycle	**Seats:**	0
Date/Type of Last Inspection:	January 7, 2000 AAIP	**Certified Max Gross Wt.:**	12500 lbs
Time Since Last Inspection:		**Engines:**	2 Turbo prop
Airframe Total Time:		**Engine Manufacturer:**	P&W
ELT:	Installed, not activated	**Engine Model/Series:**	PT6A-41
Registered Owner:	STANFORD & ASSOCIATES INC.	**Rated Power:**	850 Horsepower
Operator:	WILD ANGELS	**Operating Certificate(s) Held:**	None
Operator Does Business As:		**Operator Designator Code:**	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:		**Distance from Accident Site:**	
Observation Time:		**Direction from Accident Site:**	
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	5 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	310°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:		**Temperature/Dew Point:**	11°C / 5°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	(BFI)	**Type of Flight Plan Filed:**	None
Destination:	PULLMAN , WA (PUW)	**Type of Clearance:**	VFR
Departure Time:	13:30 Local	**Type of Airspace:**	Class D

Airport Information

Airport:	KING CO INTL-BOEING FIELD BFI	**Runway Surface Type:**	Asphalt
Airport Elevation:	18 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	31L	**IFR Approach:**	None
Runway Length/Width:	9201 ft / 200 ft	**VFR Approach/Landing:**	Full stop;Precautionary landing

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	5 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	6 None	**Latitude, Longitude:**	47.540328,-122.310348(est)

Administrative Information

Investigator In Charge (IIC):	Nesemeier, Gregg
Additional Participating Persons:	BRENT MORROW; RENTON , WA
Original Publish Date:	May 22, 2001
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=48910