



Aviation Investigation Final Report

Location:	TALKEETNA RIVER, Alaska	Accident Number:	ANC93FA172
Date & Time:	September 7, 1993, 16:00 Local	Registration:	N64AT
Aircraft:	INTERSTATE ARCTIC TERN	S-1B2	Aircraft Damage: Destroyed
Defining Event:		Injuries:	2 Serious
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

PILOT IN COMMAND ATTEMPTED TAKEOFF WITH OVERLOADED AIRPLANE FROM ROUGH RIVERBAR STRIP AND COLLIDED WITH TERRAIN. AIRPLANE EQUIPPED WITH MANUFACTURER'S AFTER-MARKET 32 GALLON BELLY TANK WHICH ALLOWED AIRCRAFT GROSS WEIGHT TO EXCEED MAXIMUM CERTIFICATED WEIGHT ANYTIME 10 GALLONS OF FUEL AS WELL AS MINIMUM CREW WERE ABOARD. THE AIRCRAFT WOULD ALWAYS BE OVER GROSS WEIGHT WHENEVER THE REAR SEAT WAS OCCUPIED. NO CAUTION BY MANUFACTURER OR FAA REGARDING LIMITATIONS ON USE OF PASSENGER SEAT WITH BELLY FUEL. AIRCRAFT WAS CERTIFIED AS 2 PLACE AIRPLANE BY FAA ALTHOUGH ADDITION OF ANY BELLY FUEL WOULD EXCEED MAXIMUM TAKEOFF WEIGHT WITH BOTH SEATS OCCUPIED.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: THE PILOT IN COMMAND'S IMPROPER PREFLIGHT PLANNING. FACTORS IN THE ACCIDENT WERE: THE ROUGH/UNEVEN TAKEOFF LOCATION, THE EXCESS WEIGHT OF THE AIRPLANE, THE INADEQUATE DESIGN OF THE ADD-ON TANK BY THE MANUFACTURER AFFECTING THE WEIGHT AND BALANCE, AND THE INADEQUATE CERTIFICATION/APPROVAL OF THE TANK BY THE FAA.

Findings

Occurrence #1: IN FLIGHT COLLISION WITH TERRAIN/WATER

Phase of Operation: TAKEOFF - INITIAL CLIMB

Findings

1. (F) TERRAIN CONDITION - ROUGH/UNEVEN
2. (F) AIRCRAFT WEIGHT AND BALANCE - EXCEEDED - PILOT IN COMMAND
3. (F) ACFT/EQUIP,INADEQUATE DESIGN - MANUFACTURER
4. (F) INADEQUATE CERTIFICATION/APPROVAL - FAA(ORGANIZATION)
5. (C) PREFLIGHT PLANNING/PREPARATION - IMPROPER - PILOT IN COMMAND

Factual Information

HISTORY OF FLIGHT

On September 7, 1993, at approximately 1600 Alaska daylight time, a tundra tire-equipped Interstate S-1B2 Arctic Tern airplane, N64AT, crashed on takeoff from a gravel bar strip on the Talkeetna River, approximately 40 miles northeast of Talkeetna, Alaska, seriously injuring the private pilot and his passenger. The two were reported overdue that day by the next of kin and the crash site was located at approximately 2000 on September 8, 1993. No flight plan was filed by the pilot who had told relatives that they planned to return to Anchorage on September 7, following two days of hunting. The flight was conducted under 14 CFR Part 91 for personal reasons.

The pilot was interviewed by investigators on November 19, 1993. He recalled that he had departed Anchorage at approximately 0900 on September 5, 1993, flying one hour to Talkeetna where he picked his passenger, Mr. Scott Weber of Anchorage. The two then flew to the Talkeetna River bar strip, landing at approximately 1030. He said that he had used approximately 1.5 hours (he estimated 15 gallons were used) from his fully fueled wing and belly tanks. He said that his aircraft held 40 gallons in the wings and 32 gallons in the belly tank.

Asked about weight and balance information, he recalled that the airplane had a 900 pound useful load, that information being provided by the manufacturer at the time of a complete rebuild by the Alaska company, two years prior to the accident. He said that weighing records and all other information regarding maintenance were destroyed in the aircraft fire. The pilot also recalled that the airplane had an empty weight of 1108 pounds and the empty belly tank weighed 20 pounds. Information provided to investigators indicated that the airplane actually weighed approximately 2060 pounds on landing at the accident site and between 2060 and 1868 pounds at the time of the takeoff accident.

The pilot told investigators that prior to the takeoff run he had observed the wind varying from a head wind to a slight tail wind. He said that he had about 500 feet of take off run and felt that it was enough to complete a successful takeoff. When, during the takeoff run, it became evident that he was nearing the end of the strip without becoming airborne, he initiated a full flap takeoff attempt, became briefly airborne and settled back and touched his wheels on the river surface. The aircraft's main wheels and landing gear impacted on a 3 foot high river bank and were sheared off or bent rearward. Following a belly slide the airplane came to rest upright and the cabin area was described as becoming engulfed in flame from below.

Performance information from Arctic Tern airplanes, serial numbers 1010 and 1029, available to investigators, do not include takeoff run data, nor does it include information regarding the

option of a full-flap takeoff. The accident pilot told investigators that he had not attempted nor had he been trained in the procedures for a full-flap takeoff. The pilot also told investigators that he believed that the airplane was within allowable gross weight limits at the time of the takeoff.

INJURIES TO PERSONS

Medical personnel at the Providence Hospital told investigators that both the pilot and passenger were being treated for extensive third degree burn injuries following their medical evacuation to that facility.

DAMAGE TO AIRCRAFT

The airplane was destroyed by post-crash fire. The pilot told investigators that all pilot's logs, airplane and engine log books, flight manuals, weight and balance records, FAA Form 337's (Major Repair or Alteration Records), repair invoices, cancelled checks and modification records were likewise destroyed with the aircraft.

AIRCRAFT INFORMATION

N64AT was manufactured by Interstate Aircraft Company in Anchorage, Alaska as serial number 1015, and was believed to have been built in 1979 or 1980. The basic operating weight of similar airplane (N59AT, serial number 1010, manufactured in August 1978) was 1141.1. The addition of the belly tank modification would have increased the empty weight to 1170 pounds.

The records of the pilot's and passenger weights and the flight plan report of 8 hours of fuel on board at departure from Anchorage, indicates that the aircraft took off with full tanks. Examination of similar engine and airplane configurations by investigators on cross-county flights indicates that the aircraft typically uses 8.8 gallons per hour. The aircraft's tank capacity was 72 gallons (including an estimated one gallon of unusable fuel). At a consumption rate of 8.8 gallons per hour, N64AT is estimated to have arrived at the Talkeetna River accident site with approximately 59 gallons of fuel on board. According to the pilot, 40 gallons were in the wing tanks and investigators estimated that 19 gallons remained in the belly tank.

Based on the discussion with the pilot, investigators estimated the weight for pilots, their personal clothing (including hip boots), survival equipment, food and supplies to total 490 pounds. The maximum certificated weight of N64AT was 1650 pounds. Based upon this data alone, the airplane would have exceeded the maximum certificated weight before any fuel was added to its wing or belly tanks.

The approximate 1170 pound (empty weight) airplane, as loaded and fueled at the time of the accident would have weighed as much as 2014 pounds or as little 1900 pounds. No

determination could be made as to the exact weight of the aircraft at the time of the accident, however the weight of a similar aircraft with the same engine and fuel tank and wheel configuration was used to estimate the accident airplane's weight.

Comparisons of known weight records by investigators using Arctic Tern airplanes manufactured before and after (serial number 1010 and serial number 1029) indicated that serial number 1015 could have weighed as little as 1170 or as much as 1273 pounds when empty of passengers or fuel.

There was no flight test data on record with the FAA Aircraft Certification Office for any S-1B2 Arctic Tern airplane configured with an auxiliary belly tank. No flight tests to determine stall speeds, spin characteristics or recovery, climb or cruise speeds, or center-of-gravity numerical data have been recorded on the Arctic Tern S1B2 at weights above 1650 pounds. A calculation using the Arctic Tern's production weight record indicates that the airplane would be limited to a maximum of 11.5 gallons of fuel in the belly tank if flown by a 170 pound pilot (standard weight used by FAA calculations), with full wing tanks. (20 gallons left and right) Given the accident pilot's weight alone, he would always have exceeded the certificated gross weight of the aircraft whenever any fuel exceeding 4.8 gallons was carried in the belly tank in addition to full wing fuel.

The aircraft, configured with an FAA-Approved, factory-installed belly tank and filled to the capacity of those tanks, can not remain within the certificated weights if flown by a pilot weighing greater than forty seven (47) pounds. No caution or warning is given in the manual or placarded in the airplane that the full tank capacity of the airplane can not be used for flight. Although the owner pilot reportedly worked closely with the manufacturer during a rebuild of the accident airplane and the installation of a 32 gallon belly tank, he stated that he was not aware of the limitation with fuel and a passenger in the rear seat.

The pilot told investigators that N64AT was fitted with an R2B8078 auxiliary belly fuel tank at the Arctic Aircraft Company facility. He also told investigators that no weight and balance revisions were made in airplane records for that installation. That tank, according to the FAA-Approved factory installation specification, adds a 32 gallon capacity to the 40 gallon main tank capacity. The weight of the empty belly tank installation, with associated fuel plumbing, is recorded to be 30.1 pounds.

The S1B2 FAA-Approved Flight Manual provides the following caution on page 9 regarding the use of the belly tank:

"The maximum approved capacity of the belly tank is 32 U.S. gallons. However, when both main tanks are full (20 U.S. gallons each), the amount of fuel carried in the belly tank must be reduced so as not to exceed the maximum approved gross weight (1650 lbs.) of the airplane. Since it is the responsibility of the pilot to assure that the aircraft is loaded within its approved weight and center of gravity limits, the amount of fuel which may be carried in the auxiliary belly tank must be calculated prior to each flight."

The accident pilot told investigators that the airplane had been equipped with tundra tires. The FAA Aircraft Certification Office in Anchorage, Alaska, told the NTSB that no certification flight tests have been recorded to determine the center of gravity envelope, the change in stall or other speeds for S-1B2 airplanes equipped with tundra tires. The FAA aerospace engineer Gordon Mandell of the Certification Office told the NTSB that large tires and other modifications such as external belly tanks affect the momentum of airstream over the horizontal stabilizer and ultimately affect the stall characteristics.

WRECKAGE AND IMPACT INFORMATION

The aircraft wreckage showed the aircraft to have remained upright and level, without main gear. While the fabric cover and interior was approximately 90 percent burned away, the frame showed the aircraft to be whole, without loss of structure or major distortion due to impact. Loss of form due to thermal damage at the wing roots and cabin was evident and centered around the location of the belly tank beneath the cockpit.

Pilot Information

Certificate:	Private	Age:	Male
Airplane Rating(s):	Single-engine land	Seat Occupied:	Front
Other Aircraft Rating(s):	None	Restraint Used:	
Instrument Rating(s):	None	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 3 Valid Medical--w/ waivers/lim	Last FAA Medical Exam:	October 17, 1991
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:	150 hours (Total, all aircraft), 50 hours (Total, this make and model), 125 hours (Pilot In Command, all aircraft), 10 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	INTERSTATE	Registration:	N64AT
Model/Series:	S-1B2 ARCTIC TERN S-1B2 ARCT	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	1015
Landing Gear Type:	Tailwheel	Seats:	2
Date/Type of Last Inspection:	Annual	Certified Max Gross Wt.:	1650 lbs
Time Since Last Inspection:		Engines:	1 Reciprocating
Airframe Total Time:		Engine Manufacturer:	LYCOMING
ELT:	Installed, not activated	Engine Model/Series:	O-320-B2B
Registered Owner:	GARY L. FRANKLYN	Rated Power:	160 Horsepower
Operator:	FRANKLIN, GARY L.	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:	Unknown	Visibility	15 miles
Lowest Ceiling:	Overcast / 3000 ft AGL	Visibility (RVR):	
Wind Speed/Gusts:	/	Turbulence Type Forecast/Actual:	/
Wind Direction:	0°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:		Temperature/Dew Point:	4°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:		Type of Flight Plan Filed:	None
Destination:	ANCHORAGE , AK (ANC)	Type of Clearance:	None
Departure Time:	16:00 Local	Type of Airspace:	Class G

Airport Information

Airport:		Runway Surface Type:	
Airport Elevation:		Runway Surface Condition:	
Runway Used:	0	IFR Approach:	
Runway Length/Width:		VFR Approach/Landing:	

Wreckage and Impact Information

Crew Injuries:	1 Serious	Aircraft Damage:	Destroyed
Passenger Injuries:	1 Serious	Aircraft Fire:	On-ground
Ground Injuries:	N/A	Aircraft Explosion:	Unknown
Total Injuries:	2 Serious	Latitude, Longitude:	61.410034,-149.169433(est)

Administrative Information

Investigator In Charge (IIC):	Herlihy, Douglas
Additional Participating Persons:	HARRY R SMITH; ANCHORAGE , AK MAURICE D HENDERSON; ANCHORAGE , AK GORDON K MANDELL; ANCHORAGE , AK
Original Publish Date:	January 18, 1995
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=2315

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, “accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties ... and are not conducted for the purpose of determining the rights or liabilities of any person” (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB’s statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available [here](#).