Aviation Investigation Final Report

Location:	Anchorage, Alaska	**Accident Number:**	ANC18LA030
Date & Time:	March 25, 2018, 17:30 Local	**Registration:**	N4844E
Aircraft:	Champion 7GC	**Aircraft Damage:**	Substantial
Defining Event:	Loss of control on ground	**Injuries:**	2 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot was landing at the airport after a personal flight. After obtaining weather information for the destination airport, the pilot contacted the air traffic control (ATC) tower and requested to land on the runway that corresponded to the current wind condition. The pilot's intent was to land with a direct headwind. The controller responded that the requested runway was not available due to other airplanes landing and directed the pilot to land on another runway that would result in the airplane landing with a crosswind.

The pilot reported that the approach was stable. Upon touchdown, the airplane began to ground loop to the left, so she applied rudder and brake inputs as a corrective action, with no success. Subsequently, the right main landing gear separated, and the right wing impacted the runway; the airplane sustained substantial damage to the right wing and right aileron.

An examination of the main landing gear (right side) strut threaded sleeve and jam nut found that the oleo strut had fractured. Overstress fracture features were consistent with the sleeve fracturing from the end of the oleo strut assembly with the assembly loaded in tension.

No evidence of progressive or long-term cracking was observed on the fracture surface, which indicates that no cracks developed in the braze due to the low-tension loads during flight or due to attachment loads from assembly of the cap onto the strut cylinder assembly. Although the brazed joint between the sleeve and the oleo strut tube did not conform to the engineering drawing and the strength would have been substantially less than a properly brazed joint, there was no evidence to indicate that the joint would have separated if loaded as designed; the joint appeared to be strong enough to perform under normal operation given that there was no evidence of progressive fracture. Therefore, the strut likely fractured due to abnormal side loading of the wheel with little or no loads in the upward direction as the airplane tipped to the right during the landing sequence involving the ground loop to the left.

The pilot reported she should have "held firm" to her request to land with a headwind and not a direct crosswind or quartering tailwind. She further reported that in the "future I will be more firm in my requests as pilot in command for the runway that I feel comfortable with and will wait as necessary for tower permission to use my requested runway." It is likely that if the pilot had contacted the ATC tower again and waited to land to her original runway of choice, the landing would have had a direct headwind instead of a crosswind. The pilot's decision to land on a runway with a crosswind was likely due to self-induced pressure to land.

Probable Cause and Findings

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

The pilot's failure to maintain directional control during landing with a crosswind, which resulted in a loss of control and failure of the main landing gear. Contributing to the accident was the pilot's self-induced pressure to land.

Findings

Personnel issues	Aircraft control - Pilot
Aircraft	Directional control - Not attained/maintained
Environmental issues	Crosswind - Effect on operation
Personnel issues	Motivation/respond to pressure - Pilot

Factual Information

History of Flight

Landing	Air traffic event
Landing	Other weather encounter
Landing	Loss of control on ground (Defining event)
Landing	Attempted remediation/recovery
Landing	Landing gear collapse
Landing	Part(s) separation from AC
Landing	Collision with terr/obj (non-CFIT)

On March 25, 2018, about 1730 Alaska daylight time, a Champion 7GC airplane, N4844E, sustained substantial damage following a loss of control and subsequent landing gear separation during landing at the Merrill Field Airport (MRI), Anchorage, Alaska. The private pilot in the front seat and the pilot-rated passenger in the rear seat sustained no injury. The airplane was registered to a private individual and was operated by the pilot as a Title 14 *Code of Federal Regulations* Part 91 visual flight rules (VFR) personal flight. Day visual meteorological conditions were present at the time of the accident and a VFR flight plan was filed. The airplane departed the Quartz Creek Airport (JLA), Cooper Landing, Alaska, about 1600.

The pilot reported that after departure from JLA, she listened to the MRI automatic terminal information service (ATIS), she contacted the MRI air traffic control (ATC) tower and requested to land to runway 34 at MRI. Her reason for requesting runway 34 was to land with a direct headwind as the ATIS reported the wind condition as 6 kts from 340°. The MRI ATC tower denied her request based on multiple airplanes already landing to runway 34 and she was instructed to fly straight in for landing to runway 25.

She reported the approach was stable, but she was concerned about the direct crosswind for the landing touchdown. Upon landing to the dry asphalt, the tailwheel-equipped airplane ground looped to the left, and she tried to control the airplane with rudder and brake inputs with no success. Subsequently, the right main landing gear separated (as shown below in figure 1), and the right wing impacted the runway. The airplane came to rest on the runway, the pilot shutdown the airplane, and the two occupants were able to egress from the airplane without further incident.

In the recommendation section of the NTSB Accident/Incident Reporting Form 6120.1, the pilot reported that she, "should've held firm to my request to land with a headwind and not a direct crosswind or quartering tailwind." She further reported that, "the tower was unwilling to let me land on runway 34 but then permitted another plane to have a simultaneous landing on runway 34 as I was on runway 25." She concluded that in the, "future I will be more firm in my requests as pilot in command for the runway that I feel comfortable with and will wait as necessary for tower permission to use my requested runway."

Figure 1 – View of the intact left main landing gear and the separated right main landing gear (courtesy of the pilot).

Pilot Information

Certificate:	Private	**Age:**	47,Female
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Front
Other Aircraft Rating(s):	None	**Restraint Used:**	4-point
Instrument Rating(s):	None	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	February 5, 2018
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	(Estimated) 156 hours (Total, all aircraft), 49 hours (Total, this make and model), 54 hours (Pilot In Command, all aircraft), 11 hours (Last 90 days, all aircraft), 8 hours (Last 30 days, all aircraft), 4 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Champion	**Registration:**	N4844E
Model/Series:	7GC NO SERIES	**Aircraft Category:**	Airplane
Year of Manufacture:	1959	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	7GC-44
Landing Gear Type:	Tailwheel	**Seats:**	2
Date/Type of Last Inspection:	January 20, 2018 Annual	**Certified Max Gross Wt.:**	1650 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	2464.7 Hrs as of last inspection	**Engine Manufacturer:**	Lycoming
ELT:	C126 installed, not activated	**Engine Model/Series:**	O-290-D2B
Registered Owner:	On file	**Rated Power:**	140 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

An examination of the maintenance records revealed no evidence of uncorrected mechanical discrepancies with the airframe.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	PAMR,138 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	00:53 Local	**Direction from Accident Site:**	281°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	7 knots /	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:	360°	**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	29.59 inches Hg	**Temperature/Dew Point:**	4°C / -14°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Anchorage, AK (MRI)	**Type of Flight Plan Filed:**	VFR
Destination:	Anchorage, AK (MRI)	**Type of Clearance:**	VFR
Departure Time:		**Type of Airspace:**	Class D

Airport Information

Airport:	MERRILL FIELD MRI	**Runway Surface Type:**	Asphalt
Airport Elevation:	136 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	25	**IFR Approach:**	None
Runway Length/Width:	4000 ft / 100 ft	**VFR Approach/Landing:**	Full stop;Straight-in

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 None	**Latitude, Longitude:**	61.215831,-149.841949(est)

The airplane sustained substantial damage to the right wing and the right aileron as shown below in figure 2.

Figure 2 – View of the substantial damage to the right wing and the right aileron (courtesy of the pilot).

Tests and Research

The main landing gear (right side) strut threaded sleeve and jam nut (as shown below in figure 3) were recovered and transported to the National Transportation Safety Board Materials Laboratory in Washington, District of Columbia, for an examination. The complete examination report with photographs is in the public docket for this accident.

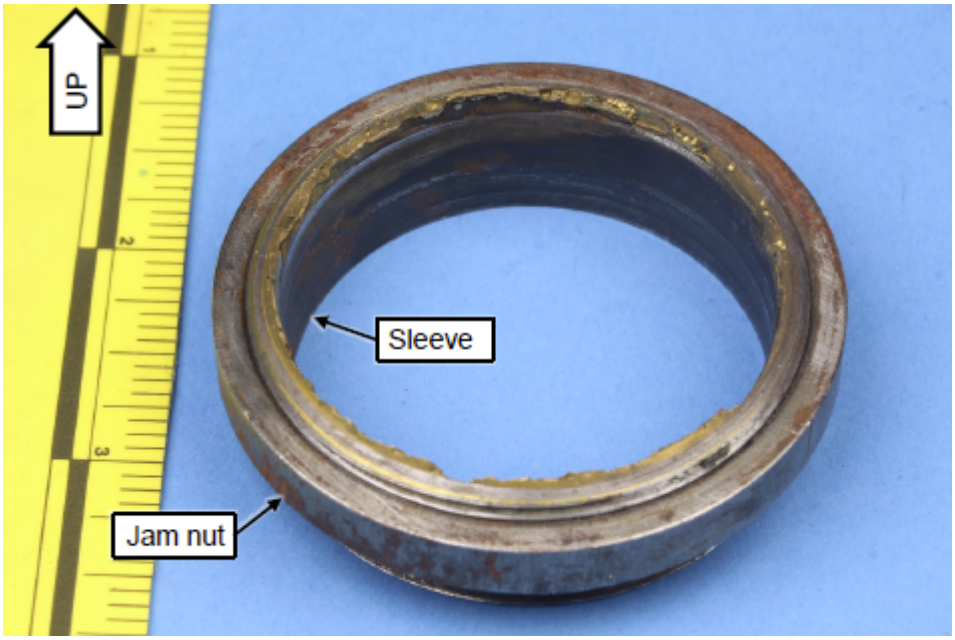

Figure 3 – View of the threaded sleeve with attached jam nut.

The sleeve fractured from the lower end of the right main landing gear during the accident landing sequence. As assembled on the airplane (as shown below in figure 4), the oil-filled oleo strut tube extends and retracts within the oleo strut covered frame to provide shock-absorbing movement for the axle strut and wheel assembly. The oleo strut cap and jam nut are attached to the lower end of the oleo strut tube. The lower end of the oleo strut assembly is attached to the axle strut, and the upper ends of both the axle strut and the oleo strut assembly are attached to the fuselage.

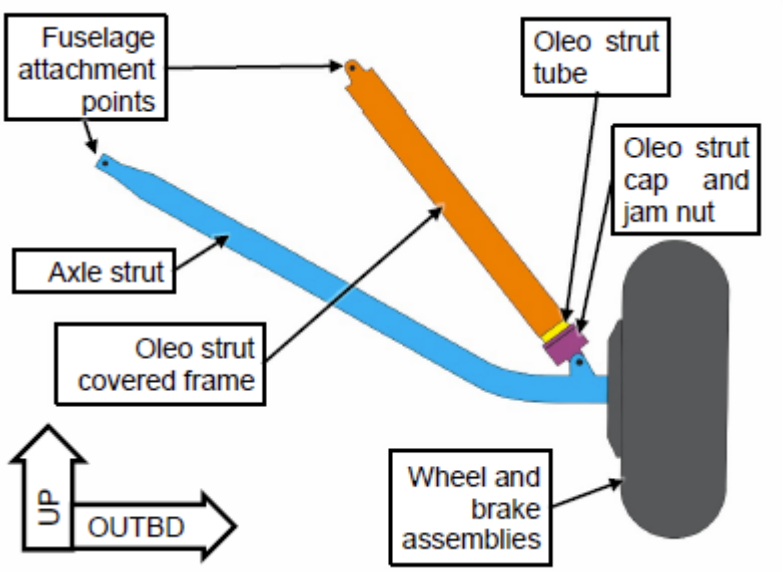

Figure 4 – Schematic drawing looking forward illustrating the right main landing gear components with the oleo strut assembly in the static position.

As manufactured, the oleo strut cylinder assembly consists of the oleo strut tube with a stuffing box (for the piston seal) brazed at the upper end of the tube and a sleeve with external threads brazed onto the exterior of the tube near the lower end of the tube. Internal threads in the oleo strut cap and jam nut engage with the threaded sleeve to attach the cap to the tube and lock it in place.

The sleeve had fractured from the lower end of the oleo strut tube. The jam nut was in place on the sleeve, and the external threads on the sleeve were intact.

The fracture occurred through the braze fillet at the upper side of the sleeve. The fracture surface and sleeve interior are shown below in figure 5. The interior surface of the sleeve had relatively prominent circumferential machining marks that extended around most of the circumference. However, a relatively smooth area where the circumferential machining marks were absent was observed. Pits with orange-colored oxidation was observed in the smooth area and an adjacent area with circumferential machining marks. The orange oxidation and pits extended around approximately 1/3 of the circumference. A chamfer between the inner diameter and the upper end of the sleeve was mostly covered by the braze fillet but was partially visible in areas.

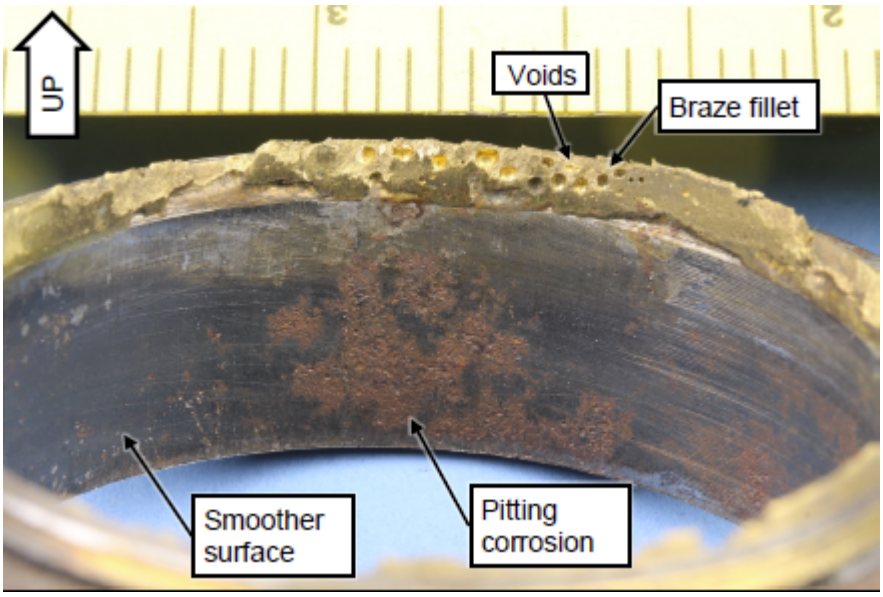

Figure 5 – View of the interior face of the sleeve in a smoother area with pitting corrosion.

The braze material had a light-yellow color in contrast to the silver and dark gray color of the sleeve surfaces. Fracture of the braze material occurred through middle of the fillet, near the upper side of the fillet, and close to the chamfer surface. Large voids were present at the interior surface of the fillet in some areas. The fracture also intersected smaller spherical voids in the fillet. Fracture features were generally uniform in color with no evidence of post-fracture rubbing or long-term oxidation. Secondary crack openings and deformation to the fillet material was consistent with ductile overstress fracture with the sleeve moving downward relative to the oleo strut tube.

Most of the interior surface of the sleeve had a dark gray color with areas of oxidation. However, the upper end of the sleeve had a yellow color consistent with a thin coating of braze material. The circumferential machining marks remained visible on the interior surface in the coated area, and none of the machining grooves on the interior surface of the sleeve were filled with braze material. According to the engineering drawing for the oleo strut tube assembly provided by a representative of American Champion Aircraft Corporation, the sleeve-to-tube joint should have a continuous braze fillet around the circumference of the tube. A note in the engineering drawing pertaining to the sleeve-to-tube joint stated the braze must penetrate and be evident on the opposite side of the sleeve and be continuous around the circumference.

Additional Information

Touchdown

The Federal Aviation Administration (FAA) has published the Airplane Flying Handbook (FAA-H-8083-3B). This document discusses a touchdown with a tailwheel airplane and states in part:

Tailwheel airplanes are less forgiving of crosswind landing errors than nosewheel models. It is important that touchdown occurs with the airplane's longitudinal axis parallel to the direction the airplane is moving along the runway.

Failure to accomplish this imposes side loads on the landing gear which leads to directional instability. To avoid side stresses and directional problems, the pilot should not allow the airplane to touch down while in a crab or while drifting.

Ground Loop

The Airplane Flying Handbook (FAA-H-8083-3B) discusses a ground loop with a tailwheel airplane and states in part:

A ground loop is an uncontrolled turn during ground operations that may occur during taxi, takeoff, or during the after-landing roll. Ground loops start with a swerve that is allowed to continue for too long. The swerve may be the result of side-load on landing, a taxi turn started with too much groundspeed, overcorrection, or even an uneven ground surface or a soft spot that retards one main wheel of the airplane.

Due to the inbuilt instability of the tailwheel design, the forces that lead to a ground loop accumulate as the angle between the fuselage and inertia, acting from the center of gravity, increase. If allowed to develop, these forces may become great enough to tip the airplane to the outside of the turn until one wing strikes the ground.

To counteract the possibility of an uncontrolled turn, the pilot should counter any swerve with firm rudder input. In stronger swerves, differential braking is essential as tailwheel steering proves inadequate. It is important to note, however, that as corrections begin to become apparent, rudder and braking inputs need to be removed promptly to avoid starting yet another departure in the opposite direction.

Pressure

The FAA has published the Risk Management Handbook (FAA-H-8083-2). This document discusses pressure with pilots and states in part:

External pressures are influences external to the flight that create a sense of pressure to complete a flight—often at the expense of safety.

Management of external pressure is the single most important key to risk management because it is the one risk factor category that can cause a pilot to ignore all other risk factors. External pressures place time-related pressure on the pilot and figure into a majority of accidents.

The key to managing external pressure is to be ready for and accept delays. Remember that people get

delayed when traveling on airlines, driving a car, or taking a bus. The pilot's goal is to manage risk, not increase it.

Administrative Information

Investigator In Charge (IIC):	Hodges, Michael
Additional Participating Persons:	Shawn Tu; FAA Anchorage FSDO; Anchorage, AK
Original Publish Date:	June 8, 2020
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=97015