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Subject: Full accident synopsis N298WY_Eric Achen
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PRIOR TYPE SPECIFIC SPIN TEST REPORTS

Prior to the unrecoverable flat spin event on August 10, 2020 a 20 year history of spin testing conducted in prior A1 spin test programs program indicated prompt and correct recovery by test pilots with “no tendency to go flat or develop into an unusual spin” reported at similar weights and farther aft in C.G., (see 2007 below).

1987 The spin data at the most rearward C.G. reports that all spins were recovered in ¾ of a turn or less without exceeding limitations, however this was a previous wing design.

2005 An updated wing design was tested to the rear C.G. of 80.0 inches, the same as the event, and 2045lbs. These tests included spins with control inputs against the spin both with and without flaps. It is reported “All spins were acceptable after an accelerated entry.” Test comments indicate, “Aft CG spins are easier to achieve. Spins will only last one turn. Recovery from all spins was quick and correct” in all aspects.

2007 Under the new design wing with a higher gross weight of 2247lbs and C.G. of 81.2” AFT spins are reported normal and recovery is standard. No adverse conditions were found in any tests conducted. No tendency to go flat or develop into an unusual spin.

BACKGROUND

The event occurred on August 10, 2020 early afternoon while spin testing an A-1C-200 “Husky” prototype aircraft with the following modifications. The prototype modifications included a 215 Horsepower IO-390-C3B6 Lycoming FAA certified engine, an 80” HC-C2YR-1N/NG8301-3 Hartzell FAA certified propeller, and an experimental flight control configuration. The experimental flight controls included a rudder system with added centering springs, and the aileron system with increased travel of roughly 30%.

It should be noted that Hartzell STC SA11177SC has authorized the installation of the 80” HC-C2YR-1N/NG8301-3 propeller on the 200 horsepower Lycoming IO-360-A1D6 FAA certified engine installed on the Model A-1C-200. These propellers have been delivered on A-1C-200 aircraft since 2014.

The engine’s rated 35 horsepower increase over the original 180 horsepower is enough to require spin testing per FAA Advisory Circular (AC)23-24T dated August 24, 2005, “Airworthiness Compliance Checklists for Common Part 23 Supplemental

Type Certificates (STC) Projects" specifically on page 16, paragraph 13.d.(2) "Airplanes modified by increasing the installed horsepower (maximum takeoff power) by more than 10% or 25 horsepower, whichever is less, over the original type certificated airplane installed horsepower rating, will require spin testing." The original installed horsepower rating is 180 horsepower per Type Certificate Data Sheet A22NM Model A-1 approved May 1, 1987 with O-360-C1G or O-360-A1P Lycoming engines. Thus, a Project Specific Certification Plan (PSCP) Rev. B report AAI-2017-100-001 and Company Flight Test Plan report AAI-2017-100-011 were created including a spin matrix submitted by the applicant with cooperation and guidance of the FAA Aircraft Certification Branch to demonstrate compliance with AC23-24T, FAR23.221, and AC-23-8C Chapter 2 Subpart B-Flight, Section 8. Spinning.

All testing occurred from the factory at Afton airport while operating under an Experimental for Research and Development FAA Airworthiness Certificate and associated limitations.

THIS SPIN PROGRAM
The aircraft rigging was measured by Quality on August 3, 2020. Rigging dimensions were recorded as follows:
Tail; Horizontal tail was level within -0.1 degree.
Rudder was set to 25 degrees left and right tolerance of 25+-2.
Vertical stab was 89.9 or -0.1 degree.
Elevator travel was 29 up tolerance of 29, and 15 degree down.
Wings; Flap travel was 28.5 degrees L&R with a tolerance of 28-30 degrees.
Aileron travel RH +20.7, -18.5 LH+19.4, -19.8.

Additionally, on or before August 7th, 2020 the following dimensions were verified or changed:
Aileron LH, Tension 38lbs travel +19.0, -20.0 degrees.
Aileron LH, Tension 38lbs travel +18.6, -20.6 degrees.
Elevator travel 29 degrees up and 15 degrees down.
Rudder cable tensions verified at 65lbs left & right.

During this spin validation program numerous build ups were completed with satisfactory results.

On or before July 29, 2020 twenty-four spins were completed in the heavy forward C.G. location. These included left and right spins with and without flaps, with and without power, and spins with ailerons into the spin and ailerons out of the spin. In all cases recovery was correct and within aircraft control limits. Spins exhibited no unusual or flat tendency.

On or before August 3, 2020 twenty-four additional spins were completed in the light forward C.G. location. The results were the same as stated above.

On August 4, 2020 prior to moving the C.G. to the full aft C.G. the pilot added two additional flights not included in the test plan or test matrix as additional build ups to the aft C.G. line. One flight at 78.00" and another at 78.98". Both flights the aircraft

responded correctly to pilot input and spins exhibited no unusual or flat tendency.

Between August 5th and the morning flight of August 10th, 2020 six spin test flights with heavy aft weight and C.G. were completed. These six flights the spins were without power. These included left and right spins with and without flaps, spins with ailerons into and ailerons out of the spin. In all cases the recovery was correct and within aircraft control limits. Spins exhibited no unusual or flat tendency.

The event flight:

The aircraft was weighed just prior to flight fully loaded with fuel and ballast save pilot and parachute to confirm weight and balance. The tail spring bolt was weighed at 221.0lbs. The left main tire was weighed at 932.4lbs. The right main tire was weighed at 910.8lbs. for a total weight of 2064.20 and C.G. of 81.20. Pilot and parachute were weighed separately at 204.0lbs combined (pilot 190 and chute 14). A C.G. closer to 80” was desired thus 20lbs of ballast was removed from the baggage area post weigh. This yielded a net ramp weight of 2248.20 and a C.G. of 80.07” at engine start. It was computed a start test fuel load of 45 gallons would yield a start test weight of 2218.20 and a C.G. of 80.01”. However, engine start, taxi, takeoff and climb fuel burn was greater than 5 gallons and the first spin test was performed at 42.5 gallons or approximately 15lbs lighter than planned and closer to 2203lbs and slightly forward of the 80.00” aft C.G. line.

During this flight prior to the event seven power on test spins were completed. In all seven instances the spins exhibited no unusual or flat tendency. First, three power on spins to the right were completed against the engine torque and all three were found compliant with FAR 23.221. Next, three power on spins to the left were completed with ailerons neutral. One of the three, the rotation stopped in about 330 degrees (FAR 23.221 compliant) after power was reduced and correction controls were applied. Two of the three required 1 ¼ turns after power was reduced and correction controls were applied, the difference being pilot input. The pilot recorded the worst-case scenario to discuss post flight as a pilot could find compliance with 23.221 in 1 of 3 tests. The seventh spin was left, power on, with ailerons into the spin and the aircraft recovered in ¾ of a turn.

It is important to note in no instance had the 85 build up spins in the program prior to this point exhibited any flat tendency and in all cases the aircraft recovered correctly. It is also important to note this is consistent with the prior spin test programs back to the original type certificate issuance in 1987.

This test condition called for a spin from level flight, with flaps up, aft C.G., heavy weight, to the left, with aileron opposite of the turn. With full open throttle producing about 67% power (indicated), the spin entry included a deceleration from 75mph indicated to 55mph indicated over 23 seconds. At this point the stick was at the aft stop and full left rudder along with full right aileron was applied. The aircraft completed one 360-degree rotation in about 4 seconds. At this point the nose was much higher above the horizon than prior test conditions. However, power was reduced at one turn and corrective controls were applied. The corrective controls had

no effect in any axis.

The corrective control position was held for 2 to 5 rotations with no effect. During rotation 5 or 6, ailerons with the spin were applied in attempt to get the aircraft to roll into the spin thus allow the nose to drop with no effect. At this point no air loads were perceived in any axis (spring tension can hide air loads). Power was applied and this did not create any noticeable air loading on the tail surfaces however it did accelerate the rotation rate thus the engine was brought to idle and shut off with mixture. With the mixture shut off, pitch rocking was attempted however pitch change from aft to forward stick was negligible.

Briefed altitudes required to complete maneuvers by 11,200 ft MSL and initiate bailout by 9,200 ft MSL. The pilot exited the aircraft at roughly 10,180 ft MSL.

The door was opened, pilot G loads were not significant, and egress was as practiced, similar to a normal ground exit. Numerous rehearsals of the bailout procedure had occurred as the pilot rehearsed it prior to every spin flight. The only procedure forgotten was headset removal. As the aircraft was rotating counterclockwise the decision was to exit in front of the wing struts (clockwise would be aft exit).

The emergency parachute was deployed immediately and successfully. At this point the aircraft was observed by the pilot above in the flat spin, it passed an estimated 50-100 feet away and continued in the flat spin all the way to impact.

At this point, a wind from the west was blowing the pilot towards large high-power lines. A round parachute is difficult to steer away from obstacles however the pilot managed to avoid contact with the power lines. The power lines distraction and inexperience (first solo jump) led to a hard landing, two compression fractures in L1 and L2 along with a bulged disc. The pilot waited for emergency crews to arrive who moved him.

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