

INVESTIGATION SUPPLEMENTAL INFORMATION

HISTORY OF FLIGHT

On October 14, 2021 at 1600 Pacific daylight time, a WSK Mielec AN-2TD, N857PF, was substantially damaged when it was involved in an accident near Wilton, California. The pilot and one passenger sustained serious injuries and the other two passengers sustained minor injuries. The airplane was operated as a Title 14 Code of Federal Regulations Part 91 personal flight.

The pilot stated that he configured the airplane for takeoff and had flaps down and the elevator trim was neutral. The departure started normally and after becoming airborne, the airplane controls were not responding to his inputs as expected. The airplane continued to pitch up in a nose-high attitude and he was unable to push the control yoke forward which he described as feeling like he was “stretching” cables with forward pressure. The pilot set the electric trim to full nose-down and it made no effect. With the airplane’s pitch uncontrollable, he saw an open area and elected to make a rapid maneuver toward the area. He added full left rudder and aileron and the airplane banked left. The airplane descended into trees and after coming to a stop, a fire erupted. The back door would not open due the deformation of the airframe and the broke a front window. The pilot and passengers all climbed out the window and the airplane continued to burn.

There were two witnesses located at the airport that took videos of the airplane departing. One video showed the airplane just prior to the takeoff roll. The tailwheel is positioned backward and as the airplane starts the roll, the tailwheel swivel and the airplane moves to the right of the runway (see Figure 1 below).



Figure 1: The Airplane Starting the Takeoff Roll

The airplane then veered to the left of the runway and became airborne shortly thereafter. In the approximate 10 seconds that followed, the airplane pitched up at an increasingly higher and higher angle-of-attack. The airplane then made a sharp left turn and goes behind the trees as it descends (see Figure 2 below).



Figure 2: The Airplane Airborne



Figure 3: Composite of the Video Images

EXAMINATION

CONTROL SYSTEM DESIGN

The altitude control system was composed of the left and right control columns, cable transmission drive control levers, and control rods. The control columns were constructed from two box-shaped duralumin sections joined together with rivets. Welded brackets were attached to the lower ends of the control columns, securing the pulleys for aileron control. The left and right control columns were connected by a transversal duralumin tube located beneath the cockpit floor. Levers were welded to the left joint underneath, and the elevator control cables were connected to them.

The duplicated cable transmission ran across the pulleys fixed under the left beam of the cockpit floor, rose aft of frame No. 5, and then descended into the fuselage interior, running rearward along the upper left side of the fuselage until it reached the three-arm lever fixed on frame No. 25. From this lever, the drive was directly transmitted to the elevator via a rod. Turnbuckles for cable tension adjustment were situated behind the cargo cabin.

CONTROL SYSTEM EXAMINATION

The elevator system was separated into numerous sections as a result of the impact and for recovery purposes. A majority of the system sustained severe thermal damage. The left control column was fractured from the welded brackets and was located in a bag that contained a majority of the cockpit components. The aileron chain was free from the columns respective cog. The left control column body's levers remained attached and the forward and aft elevator control cables were secured. The cables extended only a short distance with surfaces consistent with being cut for recovery purposes. The forward rotating arm was frozen in an upward position with what appeared to be the ground cable melted into the crevasse between the rotating and fixed levers. It could not be determined if the grounding cable had melted into the lever after impact or captured in the lever prior. The aft cables showed a more normal coloration where they would have presumably been routed around the fixed pulleys.

The No. 5 lower pulley gang was found loose in the wreckage with the cover still attached. The No. 5 upper pulley gang had the elevator cables routed through the assembly. The cables were severed after they passed through the pulley gang. There were several markings and abrasions on the cable lengths that were consistent with rub or abrasions from a passage of the cables structure. The cables were loose to being severed in the ft fuselage area. The severed cables were found in the aft separated section. They were loose in the aft section through the other pulley gang where they both contained two spaced out turnbuckles before going aft toward the tail section. The No. 9 pulley gang had an s-hook attached. It is unknown if this could have possibly interfered with the cables.

The elevator bellcrank was intact with the four elevator cables connected to their respective arms. From the bellcrank the control was continuous from the control rod to the elevator control surfaces.

AIRPLANE INFORMATION

Federal Aviation Administration			
1. AIRCRAFT DESCRIPTION	1. REGISTRATION MARK 857 PF	2. AIRCRAFT BUILDER'S NAME (Make) PZL Mielec	3. AIRCRAFT MODEL DESIGNATION AN-2TD
	5. AIRCRAFT SERIAL NO. 1G10857	6. ENGINE BUILDER'S NAME (Make) ASZ	4. YR. MFR. 1969
	8. NUMBER OF ENGINES 1	7. ENGINE MODEL DESIGNATION ASZ-62IR	10. PROPELLER MODEL DESIGNATION AW-2
		9. PROPELLER BUILDER'S NAME (Make) PZL WARSZAWA	11. PROPELLER SERIAL NO. 1

According to an article by Stephan Wilkinson, from [The Un-Falco: Antonov An-2 \(segair.com\)](http://segair.com):

With the default load of 12 passengers and their luggage under their seats, the center of gravity (COG) was positioned at the rear end of the allowable range, requiring nearly full forward trim for takeoff. Additionally, some right rudder trim was necessary to maintain a straight path during the takeoff run and initial climb. Notably, there were no trim indicators except the trim lamps indicating the neutral position, so it was crucial to monitor trim travel time and count the seconds for correct trim adjustment. Neglecting this could result in the aircraft taking off prematurely, leading to potential issues.

During takeoff, the procedure involved slowly advancing the throttle over 2-3 seconds to reach the desired manifold pressure (MAP), typically around 120 kPa MAP and 2100 RPM, suitable for a runway of sufficient length. If a quicker takeoff was required, 140 kPa MAP and RPM could be used. Assuming the correct trim setting, the An-2 aircraft had a tendency to lift off automatically. Some pilots recommended applying forward pressure on the control column to raise the tail earlier, enhancing visibility on the runway. Takeoff was performed with flaps set at 15 degrees, with the tail starting to rise at approximately 65 km/h, and a gentle pull on the controls at 85-90 km/h for liftoff. After liftoff, the pull was released to stabilize the aircraft at 120 km/h for the initial climb.

Takeoff power was maintained until reaching 50 meters above ground level (AGL). Beyond this point, acceleration to 140 km/h was initiated, and the flaps were retracted. The aircraft was then maintained at 140 km/h with 120 kPa and 2100 RPM. When retracting the flaps, the elevator trim needed to be gradually adjusted back to approximately the neutral position, which could take up to 10 seconds for the full trim travel.

WEIGHT AND BALANCE

The accident airplane's exact weight is unknown. Using the manufacturer's basic weight and balance data a rough estimate as to the fuel, passengers, motorcycles and personal belongings in his airplane, a calculation was performed

The calculations show that the aircraft had a CG of 35.51% MAC. This would put the CG 3.51% aft of the Absolute AFT CG limit of 32.0%.

	WEIGHT	ARM	Moment		
Empty Weight	7,465	20	149,300		EWCG: 20.01% MAC
OIL	120	-62.4	-7488		
FUEL	2,000	37	74,000		(Weight)(Arm)=Moment
Pilot	155	-13.5	-2092.5		
PAX 1	140	-13.5	-1,890.00		Total Arm -2 then divide by 89.33
PAX 2	140	69.68	9755.2		to get MAC%.
PAX 3	110	71	7810		
TOTAL	10,130	22.6	229394.7		
24.89-2=22.89					
22.89/89.33=.2573 or					
25.73% MAC					
	10,130		229394.7		
250 Motorcycle	213	102.99	21936.87		Total Moment: 342,604.76
125 Motorcycle	193	102.99	19877.07		Total Weight: 10,994 lbs.
50 Motorcycle	111	127.16	14114.76		Arm: 33.72
Cooler 1	75	127.16	9537		MAC%: 35.51%
Cooler 2	75	127.16	9537		
Cooler 3	35	135.5	4742.5		
Cooler 4	75	135.5	10162.5		FWD CG Limit: 17%
Sleeping Bags	23	279.52	6289.2		AFT CG Absolute Limit: 32%
Chairs	65	263.77	17013.16		
TOTAL	10,994	33.72	370735.4		
33.72-2=31.72					
31.72/89.33=.3551 or					
35.51% MAC					