



NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety

Onscene Examination Report

May 24, 2022

A. ACCIDENT WPR22FA184

Location: Cape Girardeau, Missouri
Date: May 22, 2022
Time: 0803 CDT
Operator: Private
Aircraft: Experimental amateur-built Magni M24 Orion Plus
Registration: N590DM

B. PARTICIPANTS or GROUP NAME:

Stephen Stein National Transportation Safety Board Federal Way, Washington
Bob Prenger Federal Aviation Administration St. Louis, Missouri
Greg Gremminger Magni USA LLC St. Genevieve, Missouri

C. SUMMARY

On May 5, 2022, about 0803 central daylight time, an experimental amateur-built M24 Orion Plus gyroplane, N590DM, was substantially damaged when it was involved in an accident near Cape Girardeau, Missouri. The private pilot was fatally injured. The gyroplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

A witness reported that the pilot was ferrying the gyroplane to his home in South Dakota on a cross-country flight and had planned a stopover at Cape Girardeau Regional Airport (CGI).

According to preliminary air traffic control (ATC) audio, the pilot informed the ATC tower of his intent to taxi to runway 02. After the controller issued taxi instructions, the pilot requested progressive assistance to the departure runway. A tower controller stated that the pilot departed runway 02 to the northwest. During the gyroplane's climbout, the pilot informed the controller that he wanted to return to the airport and the controller cleared him to land on runway 02.

Witnesses stated that the gyroplane made a left turn towards the downwind leg of the airport traffic pattern for runway 02. About this time a witness heard a "crack" coming from the direction of the gyroplane. The same witness immediately observed the gyroplane descend rapidly towards the ground. The controller reported that the gyroplane appeared to enter a spin during the descent. Witnesses estimated that the gyroplane was between 750 ft and 1,000 ft above ground level when the rapid descent began.

The gyroplane impacted a wetland about 1,000 ft west of the departure end of runway 10 at a field elevation of about 330 ft mean sea level. All major structures were accounted for at the accident site. The main wreckage, comprised of the fuselage, rotor, engine, and empennage, was oriented on a northwest heading. A section of the right horizontal stabilizer had separated from the main wreckage and was located 171 ft southwest of the main wreckage. The engine was partially submerged in mud and two propeller blades appeared above the surface; both separated about midspan. Both rotor blades were intact and attached at the rotor hub. One of the outboard section of the blades was found about 200 ft south of the main wreckage. The blades exhibited similar impact signatures about 3 ft from the outboard ends and black transfer markings about 3 ft from the hub of each blade. One blade displayed blue transfer markings on the bottom of the blade about 3 ft from the outboard end.



Photograph 1: Accident site

D. DETAILS OF THE INVESTIGATION

D.1 Onscene Examination

D.1.1 Accident site

The gyroplane came to rest towards its right side in a slight nose up attitude. The right side of the engine was partially submerged in mud along with the keel beam. The tail section remained attached to the fuselage through its steel keel, which was canted to the left. The tail showed a similar roll orientation as the fuselage. The engine was attached to the firewall through both lower mounts and the upper right mount; the upper left mount was fractured. Both fuselage doors were separated at their hinges and the windshield was broken and fragmented. The fuel tank, located beneath the seat structure, was fractured. Both the left main landing gear and nose landing gear were intact; however the nose landing gear was bent to the left. The right main landing gear was not visible due to the gyroplane's orientation. The left side lower enclosure was fragmented below the cockpit, while the main structure was intact.



Photograph 2: View of cockpit at accident site

D.1.2 Cockpit

Both seat tanks were fractured and the instrument panel displayed multiple separations. The cockpit controls were noted in the following positions:

Master: OFF
Battery backup: OFF
Start power: OFF
Line A: OFF
Line B: OFF
Fuel Pump A: OFF
Fuel Pump B: ON
Landing light: ON
Strobes: OFF
Rotor brake: OFF
Throttle: IDLE

Annunciator panel: the fuel, rotor brake, trim, and fire light covers were present (the fire light cover was fractured). The Line A, Line B, Fan, and Doors Open light covers had separated from the annunciator panel.

D.1.3 Tail Section

The empennage was comprised of the vertical stabilizer, left horizontal stabilizer and part of the right horizontal stabilizer. The leading edges of the vertical stabilizer and left horizontal stabilizer winglet displayed splitting along the center while the right horizontal stabilizer was separated about midspan. One section of the right horizontal stabilizer and part of its corresponding attached winglet were found 171 ft southwest of the main wreckage and the top skin of the winglet was found about 50 ft south of the main wreckage.

D.1.4 Rotor

Both rotor blades remained attached to the rotor head. The prerotator notched gear was bent and impact marks were noted in the bottom of the rotor head cover.



Photograph 3: Bent notched gear and rotor head housing

Blade 2

A four inch long split was observed outboard at the center trailing edge of the blade. An impact mark was observed at the bottom part of the blade about 3 ft from the outboard end. The remainder of the trailing edge of blade 2 was unremarkable. Black transfer marks were observed at the bottom of blade about 3 ft from the rotor head. Additionally impact marks were located at the leading edge of blade about 3 ft from the rotor head.



Photograph 4: Black transfer marks on blade 2

Blade 1

The blade displayed an impact mark at the leading edge about 3 ft from the rotor head with a corresponding impact signature at the trailing edge of the blade. Parallel striations were observed at the bottom of the blade also about 3 ft from the rotor head. The blade also displayed a slight bend about 3 ft from the outboard end near its trailing edge. Blue paint transfer marks were noted about 4 ft from the outboard end of the blade. The top skin of the blade was broken along the spar and cracks were noted on the top and bottom of the blade about 3 ft from the outboard end.



Photograph 5: Blue transfer marks on blade 1

D.1.5 Flight Controls

Both multifunction grips remained attached to their respective cyclic controls, which were connected to the torsion rod beneath the center console through the pilot and co-pilot sticks. All hardware was noted as secure. The controls were seized. The aft end of the torsion rod and the control fork could not be observed due to the orientation of the wreckage at the accident site. Both the left and right lower control rods were intact. The lower left control rod was continuous to the rotor head through the upper control rod and idler arm. The lower right control rod was continuous to the idler arm and the upper control rod was separated about midspan. However, the top half of the upper right control rod remained attached at the rotor head.

The left and right rudder pedals remained attached to the fuselage at both the pilot and co-pilot seats. Both the pilot and co-pilot rudder control link rods were intact and connected to the pulley at the main structure. The rudder cables were continuous to the middle of the cockpit beneath the center console. The cables could not be traced to the rudder control surface due to the orientation of the wreckage. Rudder control authority could not be achieved as the rudder cables were taught and seized. The rudder displayed minor deflection when actuated by hand.

The electric trim actuator was extended 3.5 inches.



Photograph 6: Electric trim actuator

D.1.6 Flight Controls

The gyrocopter was equipped with a Rotax Engines 915 is2A, a water cooled, 140 hp, reciprocating engine. The engine was in a tail down position with the right side partially submerged in mud. The air intake and inlet were intact and attached to the induction port. The throttle cable and arm were intact at the engine. Continuity of the fuel system was confirmed from the fuel gascolator to the left side of the engine at the injectors for cylinder nos. 1 and 3. The fuel tube was secured at the cylinder 1 and 3 injectors and cylinder 2 and 4 injectors and the fuel return line was continuous to the fuel tank beneath the pilot's seat. Ignition harness leads for cylinders 1 and 3 were secured tightly at the top and bottom spark plugs. The ignition harness leads for cylinders 2 and 4 could not be inspected due to the position of the engine. The turbo fan rotated freely by hand. The oil cooler was partially submerged in mud and the oil line had separated at the oil cooler.

The gyrocopter was equipped with a 4 bladed pusher propeller; two of the propeller blades were submerged and the two visible blades were separated about midspan.



Photograph 7: Visible propeller blades