



# Aviation Investigation Final Report

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<b>Location:</b>	Banner Elk, North Carolina	<b>Accident Number:</b>	ERA21LA353
<b>Date &amp; Time:</b>	August 26, 2021, 13:34 Local	<b>Registration:</b>	N413N
<b>Aircraft:</b>	Embraer EMB-505	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>	Loss of control on ground	<b>Injuries:</b>	2 None
<b>Flight Conducted Under:</b>	Part 91: General aviation - Positioning		

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## Analysis

The pilots were conducting a repositioning flight in a light business jet to a private airport located in mountainous terrain. Both pilots reviewed a manual and a video to become familiar with the unique approach and landing features at this airport along with the landing performance data for both a dry and a wet runway. Visual meteorological conditions existed at the time; however, a rainstorm had just passed over the airport, the runway was wet, and a security video showed rain as the airplane rolled down the runway. The PIC stated that he flew the approach at the landing reference speed ( $V_{ref}$ ) and applied full brakes once the airplane touched down on the 4,600 ft-long runway. The airplane did not slow down and started to veer to the right. The PIC applied full left rudder to steer the airplane back to the left to avoid a cliff located off the end of the runway. The PIC also stated that the airplane crossed over a small taxiway and into a grassy area, where the airplane's left wing impacted a sign. The airplane continued to travel forward before the left wingtip impacted a parked vehicle, which stopped the airplane but also resulted in substantial damage to the left wing.

Flight recorder data revealed that the airplane was configured to land (full flaps and landing gear extended) as it flew toward the airport. As the airplane was crossing over the runway threshold, it was still rolling back to a wings-level attitude. The airplane's indicated airspeed was 118 knots (the landing reference speed [ $V_{ref}$ ] for the assumed landing weight was 110 knots). The airplane touched down about 1,410 ft past the runway threshold with a 3-knot tailwind. The airplane landed about 9 ft to the right of the runway centerline and continued to drift right about 29 ft before returning toward the runway centerline. The pilot applied the brakes and used the rudder pedals to steer the airplane back to the left to maintain control, but this effort did not prevent the airplane from departing the runway.

An airplane performance study of the FDR and other data for this accident determined that the airplane exceeded some of the landing criteria outlined in the manufacturer's *Pilot's Operating Handbook* (POH), which was most likely due to the unique characteristics of the landing approach, including a steeper-than-normal approach and the requirement for a left turn to align with the runway on short final, which would have made it more difficult to achieve the published landing distances outlined in the POH. In addition, the performance study found that the maximum wheel braking friction coefficient developed by the airplane during the landing ground roll was significantly less than that implied in the unfactored wet-runway landing distances published in the POH.

The study further determined that, if the maximum wheel braking friction coefficient implied in the POH wet-runway landing distances had been achieved during the accident landing (and if maximum braking could have been maintained from the point at which both brakes were applied), the airplane would have stopped on the runway with about 290 ft remaining, even with the higher-than-nominal airspeed over the threshold. In addition, if the airplane had crossed the runway threshold at the  $V_{ref}$  (instead of at  $V_{ref}$  plus 8 knots) and had achieved the same maximum wheel braking friction coefficient as during the accident landing roll (lower than that implied in the POH but still with continuous braking), then the airplane would have stopped on the runway with about 265 ft remaining. However, the friction available from the runway has to be shared between the braking and cornering demands of the airplane. In this case, the airplane was unable to stop on the paved runway because the combination of the airspeed above  $V_{ref}$ , the lower-than-assumed maximum wheel braking friction coefficient during the landing roll, and the cornering forces required for directional control increased the required stopping distance beyond the stopping distance available.

The flight's operator held a Part 135 operating certificate, but the accident flight was conducted under the provisions of Part 91. The operator's *General Operations Manual* (GOM) did not state whether any of the Part 135 procedures or requirements for determining an airplane's limiting weight at landing could be changed for a Part 91 repositioning flight. According to the pilot, he did not differentiate between a Part 91 and a Part 135 flight.

The operator's runway length requirements for dispatching flights under Part 135 were incorporated in the GOM. A review of those procedures revealed that the airplane could only have been dispatched (based on landing weight and runway conditions) using the Destination Airport Analysis Program (DAAP). The DAAP allows 80% of the available runway length to be used for landing instead of the 60% allowed by section 135.385(b), but 25% of the unfactored dry landing distance must still be added to the required runway length to account for wet conditions.

The airplane's calculated landing weight was 15,210 lbs. The unfactored dry runway landing distance using the 60% factor was 4,595 ft (2,757 ft. / 0.6). Dispatching to a wet runway with the 60% factor would require an additional 15% safety margin (as recommended by FAA SAFO 19001), or 689 ft, for a total required runway length of 5,284 ft. Therefore, the flight could not

be dispatched to NC06 using the 60% factor. However, using the 80% factor the required dry runway length was 3,446 ft (2,757 / .08), and 4,135 ft with the 15% safety margin. Consequently, the airplane could only have been dispatched using the 80% factor. The GOM content for the DAAP is regulated by section 135.23(r), which in-part states that the GOM must account for “airport facilities and topography” when “establishing runway safety margins at destination airports.” However, the operator’s GOM did not specifically require consideration of airport facilities and topography in its DAAP. The absence of this requirement is concerning because the terrain surrounding the accident airport requires a relatively steep glidepath angle and a significant heading change on short final approach to the runway, which makes it difficult to achieve the airplane state at 50 ft above the runway threshold needed for the landing distances published in the manufacturer’s POH. Thus, if the operator’s GOM had considered airport topography (that is, the unique terrain and approach procedures for landing on the runway) as a DAAP requirement for calculating runway safety margins, the accident flight would most likely not have been dispatched.

Per the GOM, the 80% factor can be used but only with prior permission from the director of operations. The available evidence did not show whether the pilot and the director of operations spoke before the accident about landing at the airport. However, the director of operations was aware that another company pilot had attempted to land at the airport 11 days before accident but diverted to another airport due to the terrain.

The investigation revealed that the airplane could have landed using 80% of the available runway length, as outlined in the DAAP. However, the combination of factors described above increased the required landing distance beyond the runway distance available, and the pilot lost control of the airplane while maneuvering on the runway.

## Probable Cause and Findings

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

The pilot’s failure to achieve the approach criteria for the available runway landing distances published in the POH, likely as a result of the steeper-than-normal approach and the required left turn on short final to avoid the terrain surrounding the airport. Contributing to the accident were a lower runway friction than that assumed by the airframe manufacturer and tire cornering forces imparted during the landing roll, which reduced the airplane’s reduced braking effectiveness, which when combined with a high approach speed, increased the required stopping distance beyond the runway distance available. Also contributing to the accident was the operator’s lack of consideration of airport topography in its Destination Airport Analysis Program.

## Findings

<b>Personnel issues</b>	Aircraft control - Pilot
<b>Environmental issues</b>	Mountainous/hilly terrain - Effect on operation
<b>Organizational issues</b>	Adequacy of policy/proc - Operator

## Factual Information

### History of Flight

<b>Landing</b>	Loss of control on ground (Defining event)
<b>Landing-landing roll</b>	Runway excursion
<b>Landing-landing roll</b>	Collision with terr/obj (non-CFIT)

On August 26, 2021, about 1334 eastern daylight time, N413N, an Embraer EMB-505 (Phenom 300), sustained substantial damage when it was involved in an accident while landing at Elk River Airport (NC06), Banner Elk, North Carolina. The two pilots were not injured. The flight was conducted as a Title 14 *Code of Federal Regulations (CFR)* Part 91 repositioning flight.

The airplane was operated by Nicholas Services, dba Nicholas Air, on an instrument flight rules (IFR) flight plan from Teterboro Airport (TEB), Teterboro, New Jersey, to NC06. NC06 was a private, exclusive-use-only airport surrounded by mountainous terrain. All flights were restricted to daytime visual flight rules (VFR) operations. According to the Elk River Airport website, all pilots who fly into NC06 are advised to “carefully read the Elk River Pilot Manual” and view the “video presentation of arrival and departure procedures for the Elk River Airport.”

The pilot-in-command (PIC) and the second-in-command (SIC) reported that the accident flight was the first time that they had flown into the airport. They prepared for the flight during the night before; their preparations included reviewing landing performance data for a dry and wet runway, watching the airport video, and reading the manual suggested by the airport website.

The PIC, who was the pilot flying, reported that, while en route to NC06, he and the SIC observed a small rain cell near the airport on the weather radar. The SIC contacted airport security via radio to ask about weather conditions on the field and was told that the wind was calm, and that light rain was occurring. The crew decided that, if they could not make the visual approach, they would divert the airplane to another airport or enter a holding pattern until the weather passed. As the airplane approached the airport, the PIC made visual contact with the runway and canceled the IFR flight plan. The PIC then began the visual approach to runway 12 (the preferred runway due to surrounding terrain) using the visual cues recommended in the airport video. He stated that he and the SIC configured the airplane to land and that the airplane was at the landing reference speed ( $V_{ref}$ ) by the time of the 1-mile final. The PIC also used the precision approach path indicator (PAPI) to fly the airplane down to the runway at the  $V_{ref}$ .

The PIC stated that he applied full brakes once the airplane touched down on the runway, but the airplane did not slow down and started to veer to the right. After the airplane departed the right side of the paved runway surface, the PIC applied full left rudder to steer the airplane back

to the left to avoid a cliff located off the end of the runway. The PIC also stated that the airplane crossed over a small taxiway and into a grassy area, where the airplane impacted a sign with the left wing. The airplane continued to travel forward before the left wingtip impacted a parked sport utility vehicle, which stopped the airplane and resulted in substantial damage to the left wing. The airplane stopped in the grass area near the threshold of runway 30, with its left wingtip still in contact with the vehicle. The nose of the airplane came to rest about 20 ft from the cliff located off the end of the runway.

Airport security video captured the airplane during landing roll. The video depicted the left side of the airplane as it traveled down the runway. The airplane's spoilers could be seen on the left wing. Rain was falling, and water spray was trailing behind the airplane.

#### AIRCRAFT INFORMATION

The accident airplane was equipped with a combination cockpit voice and data recorder (CVDR). The unit was recovered and sent to the National Transportation Safety Board (NTSB) Recorders Laboratory in Washington, DC, for readout.

The airplane's hydraulic brake system delivers hydraulic pressure to the brakes as a function of the brake pedals input. The pilot's (left seat) and copilot's (right seat) brake pedals are mechanically linked. Each brake pedal of the pilot station is connected to a pedal position transducer, which produces two independent electrical outputs to the brake control unit (BCU) that are proportional to the respective pedal displacement. The BCU controls the main brake system, which is a brake-by-wire system with an antiskid function.

#### METEOROLOGICAL INFORMATION

NC06 was not equipped with any weather reporting equipment.

Watauga County Hospital Heliport (TNB), Boone, North Carolina, located about 12 miles east of NC06, at 1350, reported wind from 190 degrees at 7 knots, wind variable between 150 and 210 degrees, visibility 10 miles, temperature 28 degrees C, dewpoint 18 degrees C, and a barometric pressure setting of 30.30 inHg. Lightning was observed north and southwest of the airport.

The multi-radar multi-sensor Q3 radar, which was operated by the National Severe Storms Laboratory at the National Oceanic and Atmospheric Administration, provided an estimate of precipitation accumulation and rate. At 1348, the estimated rainfall rate near NC06 was about 1/2 to 2/3 -inch per hour.

#### AIRPORT INFORMATION

NC06 was a non-tower-controller airport with an elevation of about 3,468 ft. The airport had a single runway, 12/30. The runway was 4,605 ft-long by 75 ft-wide and constructed of asphalt. It was not equipped with centerline lights or runway end identifier lights. A two-light PAPI system was located on the right side of runway 12. There were no instrument approaches to NC06.

Because of mountainous terrain, the visual approach to runway 12 was not straight-in; pilots were required to fly through a valley and then make a left turn while on short final approach to align with the runway.

The *Elk River Airport Pilot's Manual* stated the following:

- *Expect potentially significant changes in wind direction and velocity over the approach end of runway 12.*
- *Higher terrain exists in close proximity to the approach end of runway 12.*
- *A slightly higher approach angle is suggested to compensate for the higher terrain and the possibility of occasional wind shear. In addition, due to the higher terrain at the approach end of the runway, the initial heading for the approach should be approximately 140 degrees until the aircraft is aligned with the runway on short final.*
- *Maintain strict alignment with the centerline! Remember, runway width is only 75 feet, and the existence of hills and trees on either side of the end of runway 12 allows for little deviation from the centerline.*
- *It is important to fly a controlled and stabilized approach as go arounds are not recommended. Runway 12 has a significant upslope and higher terrain exists at the departure end of the runway....*
- *Wind speed and direction may indicate a landing on runway 30. Be advised that the terrain at the approach end of runway 30 is higher than that at the approach end of runway 12, requiring a steeper approach and that you will be landing on a downward sloping runway.*

#### WRECKAGE AND IMPACT INFORMATION

The airplane sustained substantial damage to the left-wing attach point link fitting. The leading edges of both wings were also damaged.

The BCU was removed from the airplane and sent to the manufacturer to be functionally tested. Test results revealed no anomalies that would have precluded normal operation of the unit at the time of the accident.

#### MEDICAL AND PATHOLOGICAL INFORMATION

Toxicology testing was performed by the operator after the accident. The results were negative for both pilots for all substances tested.

#### TESTS AND RESEARCH

The NTSB conducted an airplane performance study to analyze the motion of the airplane during its approach and landing and the braking performance achieved during the landing roll

on a wet runway. The study used various data sources, including FDR data, automatic dependent surveillance-broadcast (ADS-B) data, and airplane thrust and aerodynamic performance information.

The study also referenced the landing performance parameters in the EMB-505 (POH) to determine if the airplane had sufficient runway length to land and if the pilot followed specified landing procedures and techniques outlined in the POH. According to the EMB-505 POH, landing performance data were predicated on the following criteria:

- ? Steady 3° angle approach at  $V_{ref}$  in the landing configuration,
- ?  $V_{ref}$  maintained at the runway threshold,
- ? idle thrust established at the runway threshold,
- ? attitude maintained until main landing gear touchdown,
- ? maximum brake applied immediately after main landing gear touchdown, and
- ? antiskid system operative.

Any deviation from these criteria could increase the total landing distance.

The performance study revealed that the airplane was configured to land (full flaps and landing gear extended) as it flew toward the airport. The airplane's flightpath angle averaged about -5° and decreased to -8° as the airplane made a left turn on short final approach to align with the runway. As the airplane was crossing over the runway threshold at 1334:40, it was still rolling back to a wings-level attitude. The airplane's indicated airspeed was 118 knots ( $V_{ref}$  for the assumed landing weight was 110 knots) at a radio altitude of 86 ft. The airplane reached a wings-level attitude at 1334:41 when it was about 54 ft above and 313 ft past the runway threshold.

The airplane touched down at 1334:47, about 1,410 ft past the runway threshold, at an indicated airspeed of 111 knots, a true airspeed of 118 knots, and groundspeed of 121 knots. The difference between the true airspeed and groundspeed indicated a 3-knot tailwind at touchdown.

The airplane landed about 9 ft to the right of the runway centerline and reached 29 ft to the right of the runway centerline at 1335:05. At that point, the airplane was about 4,292 ft from the runway threshold and 313 ft from the runway end.

As the airplane was moving down and to the right on the runway, between 1334:47 and 1335:05, the rudder was deflected between 0° and 3° right and reached 9.2° right at 1335:01 before deflecting to the left, reaching 31.6° at 1335:07. The airplane's heading responded to this pedal input, decreasing from 121° true at 1335:02 to 71.3° true at 1335:07. The drift angle increased during this time, indicating that the tires became yawed at a considerable angle to the direction of travel and were likely unable to produce much braking force at the time. Both the heading and drift angle exhibited oscillations between about 1334:53 and 1335:02; these oscillations were reflected in the rudder deflections during this time, suggesting that some

aircraft-pilot coupling might have contributed to the pilot's directional control difficulties and the continued drift of the airplane toward the right edge of the runway.

The FDR data confirmed that the pilot applied brakes after touching down on the runway, with the left brake pedal applied somewhat more aggressively than the right brake pedal. The left and right brake pressures increased nearly simultaneously, with the right brake pressure leading the left brake pressure by a fraction of a second. The brake pressures reached their peak values 4 seconds after the start of the brake application.

The brake pedals were applied symmetrically from about 1334:52 to about 1335:01. Between 1335:03 and 1335:06, the right brake pedal was released, and the left brake pedal was deflected consistent with the use of differential braking to assist the rudder in yawing the airplane to the left.

The airplane crossed over the northeast corner of the runway into the grass at 1335:10 at a groundspeed of about 30 knots. After entering the grass, rudder and differential braking to the right were applied, keeping the airplane on the grass and off the paved ramp next to the hangars on the southeast end of the airport. The airplane came to rest at 1335:16, 4,752 ft past the runway 12 threshold (147 ft past the end of the runway) and 147 ft to the left of the runway centerline. The performance study determined that the airplane exceeded some of the landing criteria outlined in the POH most likely because of the unique approach characteristics required to land at NC06, which made it more difficult for the pilot to satisfy the landing criteria and achieve the published landing distances outlined in the POH.

In addition, the performance study found that the maximum wheel braking friction coefficient developed by the airplane during the landing ground roll was significantly less than that implied in the unfactored wet-runway landing distances published in the POH. The study determined that, if the maximum braking coefficient implied in the POH wet-runway landing distances had been achieved on the accident landing (and if maximum braking could have been maintained from the point in the landing at which both brakes were applied), the airplane would have stopped on the runway with about 290 ft remaining, even with the higher-than-nominal airspeed over the threshold.

Further, if the airplane had crossed the threshold at  $V_{ref}$  instead of  $V_{ref}$  plus 8 knots and had achieved the same maximum braking coefficient as during the accident landing roll, then the airplane would have stopped on the wet runway with about 265 ft remaining.

Additionally, the friction available from the runway has to be shared between the braking and cornering demands of the airplane. It is not possible to achieve the maximum available braking force from the runway while at the same time maneuvering to correct for a deviation from the centerline. Consequently, circumstances that place cornering or maneuvering demands on the tires during the landing roll (such as a crosswind) can increase the required stopping distance.

In this case, the airplane was unable to stop on the paved runway because the combination of airspeed above  $V_{ref}$ , the lower-than-assumed runway friction achieved during the landing roll,

and the cornering forces required for directional control increased the required stopping distance beyond the stopping distance available.

#### ORGANIZATIONAL AND MANAGEMENT INFORMATION

Nicholas Air holds operation specifications for its operations conducted under Parts 91 and 135. Nicholas Air's *General Operations Manual* (GOM) specifies requirements and procedures for operations that comply with Part 135 requirements. The GOM does not distinguish between flights conducted under Part 135 and those conducted under Part 91, but section 3.4.4 does state that "aircraft repositioning upon completion of a revenue flight may be operated under 14 CFR Part 91." The GOM does not state whether the procedures or requirements for determining the limiting weight at landing could be changed or relaxed for flights conducted under Part 91.

The destination airport runway length requirements for dispatching flights under Part 135 were also incorporated into Nicholas Air's GOM. A review of these procedures revealed that the accident airplane could only have been dispatched to NC06 with wet conditions under the provisions of the Destination Airport Analysis Program (DAAP). The DAAP allows 80% of the available runway length to be used for landing instead of the 60% allowed by 14 CFR 135.385(b), but 25% of the unfactored dry landing distance must still be added to the required length to account for wet conditions.

Section 4.5.3 of the GOM, "Runway Analysis – Landing Performance Planning," describes the steps used to determine the maximum allowable weight for landing using the runway analysis application developed by the commercial company Aircraft Performance Group (APG). The application was accessible to the flight crew through ARINC Direct or iPreflight.

The input data to the application included the airport, aircraft type, powerplant, systems configuration, landing flap setting, wind, and temperature. One of the steps listed in the GOM was to "enter [the resulting landing distance tables] at zero wind for pre-departure planning. For inflight computations, due to changing circumstances, enter at [sic] applicable headwind / tailwind component." The application then provides the maximum allowable landing weight, which "is the lowest of the Approach Climb Weight Limit, the Field Length Weight Limit, and the structural Landing Weight Limit." This information was provided for both the 60% and 80% available runway lengths.

At the NTSB's request, APG provided the output of the runway analysis application for the conditions of the accident landing. The results indicated that, for landing with a wet runway, the limiting weights were 13,267 pounds (60% factor) and 17,042 pounds (80% factor). According to the load manifest, the expected landing weight was 15,210 pounds, so the landing could only have been made using the 80% factor.

The PIC stated that he does not operate airplanes differently under Part 91 and Part 135 because "performance doesn't differ between the two types of flights." The PIC added that he normally uses the 60% runway calculations for flights conducted under both Part 91 and 135,

even though he could use the 80% factor for Part 91 flights, which would provide a “good” and “comfortable” buffer.

According to the GOM, the 80% factor can be used by exercising the provisions of Nicholas Air’s DAAP, but “prior permission must be received from the Director of Operations before DAPP [sic] performance can be initiated.” No evidence indicated whether the PIC and Nicholas Air’s director of operations consulted with each other before the accident flight.

Nicholas Air’s DAAP is regulated by 14 CFR 135.23(r), which stated that the GOM must take “airport facilities and topography” into account when “establishing runway safety margins at destination airports.” Although Nicholas Air’s GOM contains most of the requirements contained in 135.23(r), it does not specifically require that “airport facilities and topography” be considered.

According to the FAA, the omission of “airport facilities and topography” from the DAAP requirements listed in Nicholas Air’s GOM is not an oversight or omission because a different section of the GOM reflects the requirements of section 135.385(b)(2), which states that “landing distance calculations assume...landing on the most suitable runway considering the probable wind velocity and direction and the ground handling characteristics of the airplane and considering the other conditions such as landing aids and terrain.”

The NTSB became aware of another Nicholas Air pilot who made an unsuccessful approach to land at NC06 11 days before the accident. This pilot submitted a safety management system (SMS) report to the operator, which stated,

*Arriving into NC06 as per instructional video, flying the plane at VREF and on the VASI [visual approach slope indicator], after negotiating the last terrain avoidance maneuver on short final, we found ourselves still around 100 feet over the runway and halfway down the runway. As landing would be impossible, we performed a missed approach and diverted to our alternate airport...it is my professional opinion that this airport should not be utilized for part 135 operations.*

In response to the SMS report, an FAA inspector asked Nicholas Air’s vice president of flight operations, the chief pilot, and the director of operations who in the company had reviewed the SMS report. The vice president stated that he reviewed the report but was not sure who else might have reviewed it. The vice president also stated, “the company wasn’t going to change the way it does business based on one report from a pilot.”

#### ADDITIONAL INFORMATION

As previously stated, the accident flight was conducted under the provisions of Part 91, and the corresponding regulation governing the runway lengths required at destination airports is section 91.103, “Preflight Action:” According to the regulation, “each pilot in command shall, before beginning a flight, become familiar with all available information concerning that flight.

This information must include...for any flight, runway lengths at airports of intended use, and...takeoff and landing distance information.”

On March 11, 2019, the FAA, issued Safety Alert for Operators (SAFO) 19001, which recommended that operators use a conservative approach to assessing landing distance requirements, including using the most adverse reliable braking action report or runway condition code and values for air distances and approach speeds that represent actual operations. A safety margin of at least 15% should be added to the computed (unfactored) landing distance “when the landing runway is contaminated or not the same runway analyzed for preflight calculations.”

At the airplane’s calculated landing weight of 15,210 pounds, the unfactored dry runway landing distance was 2,757 ft. For the 60% factor, the minimum runway length would be 4,595 ft. Dispatching to a wet runway with the 60% factor and the recommended additional 15% safety margin, 689 ft, would have resulted in a total required runway length of 5,284 ft. For the 80% factor, the calculated landing distance would have been 3,446 ft, and the wet runway length with the additional 15% safety margin would have been 4,135 ft.

### Pilot Information

<b>Certificate:</b>	Airline transport; Commercial	<b>Age:</b>	36, Male
<b>Airplane Rating(s):</b>	Single-engine land; Multi-engine land	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	5-point
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	Yes
<b>Medical Certification:</b>	Class 1 With waivers/limitations	<b>Last FAA Medical Exam:</b>	June 14, 2021
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	June 5, 2021
<b>Flight Time:</b>	3946 hours (Total, all aircraft), 873 hours (Total, this make and model), 3272 hours (Pilot In Command, all aircraft), 270 hours (Last 90 days, all aircraft), 95 hours (Last 30 days, all aircraft), 5 hours (Last 24 hours, all aircraft)		

## Co-pilot Information

<b>Certificate:</b>	Airline transport; Commercial	<b>Age:</b>	40, Male
<b>Airplane Rating(s):</b>	Single-engine land; Single-engine sea; Multi-engine land	<b>Seat Occupied:</b>	Right
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	5-point
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	Yes
<b>Medical Certification:</b>	Class 1 With waivers/limitations	<b>Last FAA Medical Exam:</b>	December 5, 2020
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	June 2, 2021
<b>Flight Time:</b>	2089 hours (Total, all aircraft), 247 hours (Total, this make and model), 1706 hours (Pilot In Command, all aircraft)		

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Embraer	<b>Registration:</b>	N413N
<b>Model/Series:</b>	EMB-505	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>	2018	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Transport	<b>Serial Number:</b>	50500455
<b>Landing Gear Type:</b>	Retractable - Tricycle	<b>Seats:</b>	11
<b>Date/Type of Last Inspection:</b>	August 17, 2021 Continuous airworthiness	<b>Certified Max Gross Wt.:</b>	18387 lbs
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	2 Turbo jet
<b>Airframe Total Time:</b>	2621.01 Hrs at time of accident	<b>Engine Manufacturer:</b>	PWC
<b>ELT:</b>	Installed, not activated	<b>Engine Model/Series:</b>	PW535E1
<b>Registered Owner:</b>	NICHOLAS SERVICES LLC	<b>Rated Power:</b>	3478 Lbs thrust
<b>Operator:</b>	NICHOLAS SERVICES LLC	<b>Operating Certificate(s) Held:</b>	On-demand air taxi (135)

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	TNB,3120 ft msl	<b>Distance from Accident Site:</b>	12.6 Nautical Miles
<b>Observation Time:</b>	13:50 Local	<b>Direction from Accident Site:</b>	80°
<b>Lowest Cloud Condition:</b>	Unknown	<b>Visibility</b>	10 miles
<b>Lowest Ceiling:</b>	Unknown	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	7 knots / None	<b>Turbulence Type Forecast/Actual:</b>	None / None
<b>Wind Direction:</b>	190°	<b>Turbulence Severity Forecast/Actual:</b>	N/A / N/A
<b>Altimeter Setting:</b>	30.3 inches Hg	<b>Temperature/Dew Point:</b>	28°C / 18°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Teterboro, NJ (TET)	<b>Type of Flight Plan Filed:</b>	IFR
<b>Destination:</b>	Banner Elk, NC	<b>Type of Clearance:</b>	IFR
<b>Departure Time:</b>	11:30 Local	<b>Type of Airspace:</b>	Class E

## Airport Information

<b>Airport:</b>	ELK RIVER NC06	<b>Runway Surface Type:</b>	Asphalt
<b>Airport Elevation:</b>	3468 ft msl	<b>Runway Surface Condition:</b>	Wet
<b>Runway Used:</b>	12/36	<b>IFR Approach:</b>	Visual
<b>Runway Length/Width:</b>	4600 ft / 75 ft	<b>VFR Approach/Landing:</b>	Full stop

## Wreckage and Impact Information

<b>Crew Injuries:</b>	2 None	<b>Aircraft Damage:</b>	Substantial
<b>Passenger Injuries:</b>	N/A	<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	2 None	<b>Latitude, Longitude:</b>	36.159618,-81.892907

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Read, Leah
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<b>Investigation Class:</b>	<a href="#">Class 3</a>
<b>Note:</b>	The NTSB did not travel to the scene of this accident.
<b>Investigation Docket:</b>	<a href="https://data.ntsb.gov/Docket?ProjectID=103828">https://data.ntsb.gov/Docket?ProjectID=103828</a>

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](#).