Aviation Investigation Final Report

Location:	Hot Springs, Virginia	**Accident Number:**	ERA24FA136
Date & Time:	March 10, 2024, 14:52 Local	**Registration:**	N1125A
Aircraft:	ISRAEL AIRCRAFT INDUSTRIES 1125 WESTWIND ASTRA	**Aircraft Damage:**	Destroyed
Defining Event:	Controlled flight into terr/obj (CFIT)	**Injuries:**	5 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

Following an uneventful flight, the flight crew was descending the twin-engine business jet for landing at the destination airport, which was equipped with a 5,600-ft-long runway and located on a mountain ridge. Cockpit voice recorder (CVR) audio indicated that the pilot-in-command (PIC) was the pilot flying and the second-in-command (SIC) was the pilot monitoring. Air traffic control provided the crew with the local altimeter setting as they began their descent from cruise altitude about 24 minutes before the accident. About 12 minutes later, the crew informed the controller that they had obtained the weather information at the destination. Shortly thereafter, the controller cleared the crew direct to an intermediate fix on the intended instrument landing system (ILS) approach, instructing them to cross the fix at or above 6,100 ft mean sea level (msl). The crew acknowledged and began turning toward the final approach course. About two minutes later, the controller queried the crew about their altitude, stating that he observed the airplane at 5,900 ft msl. The crew responded that they were at the assigned altitude and continued the approach. Given that the CVR did not record the crew performing any crosscheck or verification of the altimeter settings as they descended, nor did it capture the crew conducting an approach briefing, the controller's observation that the airplane 200 ft lower than its assigned altitude suggests that the crew did not reset the airplane's altimeter setting during the descent.

As the crew descended toward the final approach fix, the SIC asked the PIC if he would like the airplane's flight guidance system (FGS) set to vertical speed (VS) mode, which the PIC confirmed. In this mode, the airplane's autopilot would maintain a specified descent rate set by the crew, and would continue to descend to the set altitude at the specified rate of descent regardless of the airplane's position on the glideslope. As the airplane neared the final approach course, the SIC stated that FLOC was captured on both sides. This likely referenced a flight management system (FMS)-generated final approach course based on the waypoints that had been programmed into the system, rather than the localizer signal broadcast by the ILS. If the ILS frequency had been tuned and selected as the navigation source, the display should have indicated LOC, not FLOC.

About 7 miles from the runway threshold (about 3 minutes before the accident), the crew began to configure the airplane for landing. The PIC stated that he had the airport in sight, and shortly thereafter, the SIC confirmed that he also had the airport in sight. Upon crossing the final approach fix, the PIC began a descent and the SIC extended the landing gear. There was no mention of a change in autopilot mode, and it is likely that this descent was also performed in VS mode. The PIC called for the before landing checklist, which the SIC completed, concluding the checklist by reporting to the PIC that the airplane was below glideslope. About 1.5 nautical miles (nm) from the runway, the SIC reported full deflection below glideslope.

Shortly thereafter, the SIC announced that the airplane was 15 knots above reference speed. About 30 seconds before the accident, the PIC turned the autopilot off. Shortly after the automated Enhanced Ground Proximity Warning System (EGPWS) 1,000-ft annunciation, the SIC suggested a go-around; the PIC did not respond. The SIC again called for a go-around just before the EGPWS 500-ft annunciation; again, the PIC did not respond. About 3 seconds later, the airplane impacted rising terrain about 300 ft before the runway threshold.

Based on the SIC's statement that FLOC was displayed, it is likely that the flight crew did not arm the approach on either the FMS or FGS, and as a result, the system did not automatically tune the ILS frequency or capture the glideslope. Alternatively, the flight crew could have manually tuned and verified the ILS frequency on the ILS receiver. The flight crew was likely seeing advisory lateral and vertical guidance on the flight instruments based on the waypoints and altitudes input into the FMS; however, to obtain glideslope vertical guidance, the ILS frequency would need to be tuned and selected, and approach mode would need to be armed. Additionally, given the crew's failure to properly set the altimeter, the SIC's programming of the autopilot in VS mode to a final altitude of 4,100 ft would have resulted in the airplane descending to a true altitude between 3,800 ft and 3,900 ft before the autopilot would attempt to maintain altitude. The airport was located at an elevation about 3,792 ft msl.

The airplane's EGPWS was capable of producing an aural "Glideslope" alert for a deviation in excess of 1.3 dots fly up (as depicted by a glideslope needle deflection of 1.3 dots above the cockpit glideslope indicator's centerline) if the ILS was tuned and providing deviation information to the EGPWS. The accident airplane deviated beyond 1.3 dots fly up multiple times with no glideslope aural alert heard on the CVR. The EGPWS was also capable of producing radio altitude callouts for non-precision approaches and a review of the CVR found three of these callouts were heard, at 2,500 ft, 1,000 ft, and 500 ft. Based on the lack of a "Glideslope" aural alert, it is likely that the ILS was not tuned. Therefore, the flight instruments would not have received or displayed lateral localizer or vertical glideslope deviation information and the EGPWS would not have the required inputs to provide the aural "Glideslope" alert.

A review of the data recovered from the airplane's EGPWS unit revealed that the software was not updated in accordance with an FAA special airworthiness information bulletin (SAIB) applicable to the accident airplane, nor had the EGPWS been wired directly into the airplane's GPS as specified in the SAIB. Had the operator completed these actions, it is likely that, based on the accident flight path, the flight crew would have received an EGPWS "too low terrain" aural alert about one mile from the end of the runway, which may have prompted the PIC to take corrective action.

The PIC obtained his type rating in the accident airplane make and model about two months before the accident. A review of his training records found that multiple instructors had listed flight management system (FMS) use as one of the pilot's weaknesses. About six months before the accident, the PIC had been dismissed from another operator due to his lack of adherence to SOPs, poor CRM, poor checklist usage, inability to manage the FMS, and poor aircraft control.

The accident airplane operator's stabilized approach policy required that a missed approach or go-around be initiated immediately upon an approach becoming unstable below 1,000 ft above airport elevation when in instrument meteorological conditions and below 500 ft when in visual meteorological conditions. During the approach, the PIC exceeded multiple criteria that should have resulted in a missed approach or go-around, including reference speed, glideslope deviation, and descent rate parameters.

Snow showers were reported in the area around the time of the accident; however, the crew reported the airport in sight about two minutes before the accident and the CVR recording did not subsequently indicate that they lost sight of the runway. Therefore, it is likely that they remained in visual contact with the airport throughout the final portion of the approach. The wind conditions at the time of the accident were conducive to updrafts and downdrafts. It is likely that the crew encountered these conditions during the accident approach, which may have contributed to the airplane's deviation from stabilized approach criteria and its subsequent impact with terrain; however, the PIC had ample time to complete a go-around or missed approach if he had initiated it when the approach became unstabilized. Instead, the PIC chose to continue the approach in challenging wind conditions despite exceeding multiple stabilized approach parameters.

Finally, the operator's policy dictated that all pilots would incorporate crew resource management (CRM) considerations and practices into all aspects of flight operations. A vital CRM practice is for either crew member to be able to call for a go-around and for the pilot flying to immediately initiate the maneuver. The SIC made multiple references to the approach being unstable and twice called for a go-around. It is possible that the accident could have been prevented if the PIC had immediately initiated a go-around when the go-around call was made by the SIC.

Probable Cause and Findings

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

The PIC's continuation of an unstabilized approach in gusting wind conditions and his failure to monitor the airplane's altitude during the approach, which led to a descent into terrain short of the runway. Contributing was the flight crew's failure to set the appropriate altimeter setting and failure to properly configure the avionics for the ILS approach.

Findings

Personnel issues	Decision making/judgment - Pilot
Aircraft	Descent/approach/glide path - Not attained/maintained
Personnel issues	Monitoring equip/instruments - Pilot
Aircraft	Altitude - Not attained/maintained
Personnel issues	Forgotten action/omission - Flight crew
Aircraft	Configuration - Not attained/maintained

Factual Information

History of Flight

Approach-IFR final approach	Altitude deviation
Approach-IFR final approach	Controlled flight into terr/obj (CFIT) (Defining event)

On March 10, 2024, about 1452 eastern daylight time, an Israel Aircraft Industries 1125 Westwind Astra, N1125A, was destroyed when it was involved in an accident near Hot Springs, Virginia. The airline transport pilot, commercial pilot, and three passengers were fatally injured. The airplane was operated by SkyJet Elite as a Title 14 *Code of Federal Regulations* (*CFR*) Part 91 personal flight.

According to the flight crew's itinerary provided by the operator, the accident flight, which departed Fort Lauderdale/Hollywood International Airport (FLL), Fort Lauderdale, Florida, for Ingalls Field Airport (HSP), Hot Springs, Virginia, was the crew's first flight of the day. After dropping off the passengers at HSP, the crew was scheduled to continue to Teterboro Airport (TEB), Teterboro, New Jersey. According to the itinerary, both flights were non-revenue flights conducted under 14 *CFR* Part 91.

A review of ADS-B data and air traffic control (ATC) audio recordings showed that the airplane departed FLL at 1246 and climbed to a maximum cruising altitude of 41,000 ft mean sea level (msl). The enroute portion of the flight was uneventful. At 1428, the controller issued a descent to 17,000 ft msl and an altimeter setting of 29.81 inches of mercury (inHg), which the flight crew acknowledged. At 1430, the flight crew was issued a frequency change, which they acknowledged. At 1431, the new controller issued a descent to 11,000 ft msl and the altimeter setting of 29.81 inHg; after the controller's third attempt, the flight crew acknowledged The airplane's CVR recording indicated that the crew did not cross check or verify the altimeter settings.

At 1432, the controller asked if the flight crew had the weather conditions, NOTAMs, and knew what approach they were expecting to fly into HSP. The crew responded with a request for the instrument landing system (ILS) approach for runway 25 at HSP, and that they were attempting to get the weather conditions. The controller then instructed the crew to proceed direct to AHLER, an intermediate fix for the ILS RWY25 approach, which they acknowledged. At 1433:30, the CVR recorded a partial automated weather observation for HSP, which was reporting an altimeter setting of 29.65 inHg. The CVR did not contain any cross check or verification of the altimeter setting from either member of the flight crew, nor did the crew conduct an approach briefing before beginning the approach.

From 1433 to 1438, the controller provided 5° to 10° right-of-course headings as the airplane continued to AHLER intersection. At 1439, the controller instructed the flight crew to confirm they had the current weather conditions and NOTAMs at HSP and issued a clearance to descend to 7,000 ft msl.

At 1440, the flight crew advised they had the current weather conditions and NOTAMs. At 1444, the flight crew requested to descend from 7,000 ft msl to 6,000 ft msl. The controller responded by clearing the flight direct to AHLER intersection for the ILS RWY25 approach and to cross AHLER at or above 6,100 ft msl. The flight crew read back the clearance and requested radar vectors for the approach, but subsequently followed up that they were proceeding direct to AHLER and acknowledged that they were cleared for the approach. At 1445:45, the SIC was heard on the CVR stating, "and NAV available it should start turning." ADS-B data showed that, about 15 seconds later, the airplane began a left turn toward the final approach course. At 1446:41, the SIC was heard on the CVR stating, "FLOC captured my side. FLOC captured your side."

At 1446, the controller queried the flight crew asking them to verify they were maintaining 6,100 ft msl until AHLER, as their altitude indicated 5,900 ft. The SIC was heard on the CVR responding "yes sir we're six thousand one hundred and we're now intercepting the localizer." The transmission from the SIC was broken when played back on the FAA ATC recordings.

At 1447, the flight crew requested to switch to the HSP common traffic advisory frequency (CTAF) and stated they would cancel their instrument flight rules flight plan on the ground; the controller approved the frequency change.

At 1448:12, the SIC was heard on the CVR stating, "that's uh AHLER sir, six thousand one hundred." At 1448:21, the SIC offered to set the next altitude, which the PIC agreed to. The SIC then stated, "five thousand one hundred selected, okay?" to which the PIC agreed. The SIC then asked the PIC if he would like "VS," or vertical speed mode, which the PIC agreed to. The SIC then stated "ok VS selected your side. Five thousand one hundred….six miles to DURAN." At 1448:45, the PIC was heard stating, "okay its descending." At 1449:12 the SIC made a radio call on the HSP CTAF reporting that they were on the ILS RWY25 approach for a full-stop landing.

At 1449:57, the PIC asked the SIC if he could see the airport. The SIC responded, "Uh no sir, not yet." At 1450:09, the PIC stated, "'kay. Okay there is the airport. I saw it." The SIC then stated, "okay. I see it now."

At 1450:46 the PIC stated "ok DURAN" followed by "descending" at 1450:49. At 1450:53, the PIC was heard asking "next altitude is?" and the SIC responded "next altitude is four thousand, sir. You want four thousand?" The PIC responded in the affirmative. The SIC responded, "yeah I set four thousand one hundred. Uh speed checks gear selected down" followed shortly thereafter by the sound of landing gear extension.

At 1451:04 the PIC called for the before landing checklist, then stated, “look there’s snow ha ha ha. You see it?” which the SIC responded “yup. yup.” At 1451:16, the SIC began the before landing checklist and asked the PIC if he would like the flaps set to forty; the PIC agreed. The SIC then continued with the checklist, then noted that the airplane was below glide slope, which the PIC acknowledged.

At 1451:38 the SIC stated “full below glide slope,” which the PIC acknowledged; at this time, the airplane was 1.5 nm from the runway 25 threshold. At 1451:45, the SIC stated “and V-REF is one twenty five. V-REF plus fifteen.” The PIC acknowledged, stating “okay. Oh my gosh. Let me put the autopilot off.”

At 1451:53 the SIC asked whether the autopilot was on or off. He repeated the question about five seconds later, to which the PIC responded, “shhh…” Shortly thereafter, the PIC stated, “it’s off?” to which the SIC responded, “it’s uh…it’s no its off yeah.” At 1452:12.7, the EGPWS could be heard announcing “one thousand” followed by the SIC stating, “sir I suggest go around” at 1452:14.4.

At 1452:17.1, the SIC again stated, “Go around,” which was spoken with increased intensity. At 1452:17.4, the EGPWS 500-ft annunciation was heard. At 1452:18, the PIC was heard stating multiple expletives. The sounds of impact were recorded at 1452:20 and the recording ended at 1452:21.

The final recorded ADS-B position was about 200 ft from the airplane’s initial impact point with terrain. Figure 1 provides an overview of the airport environment, accident site, and the final 45 seconds of flight track data. Figure 2 provides an overview of the final 1 minute and 18 seconds of flight track data.

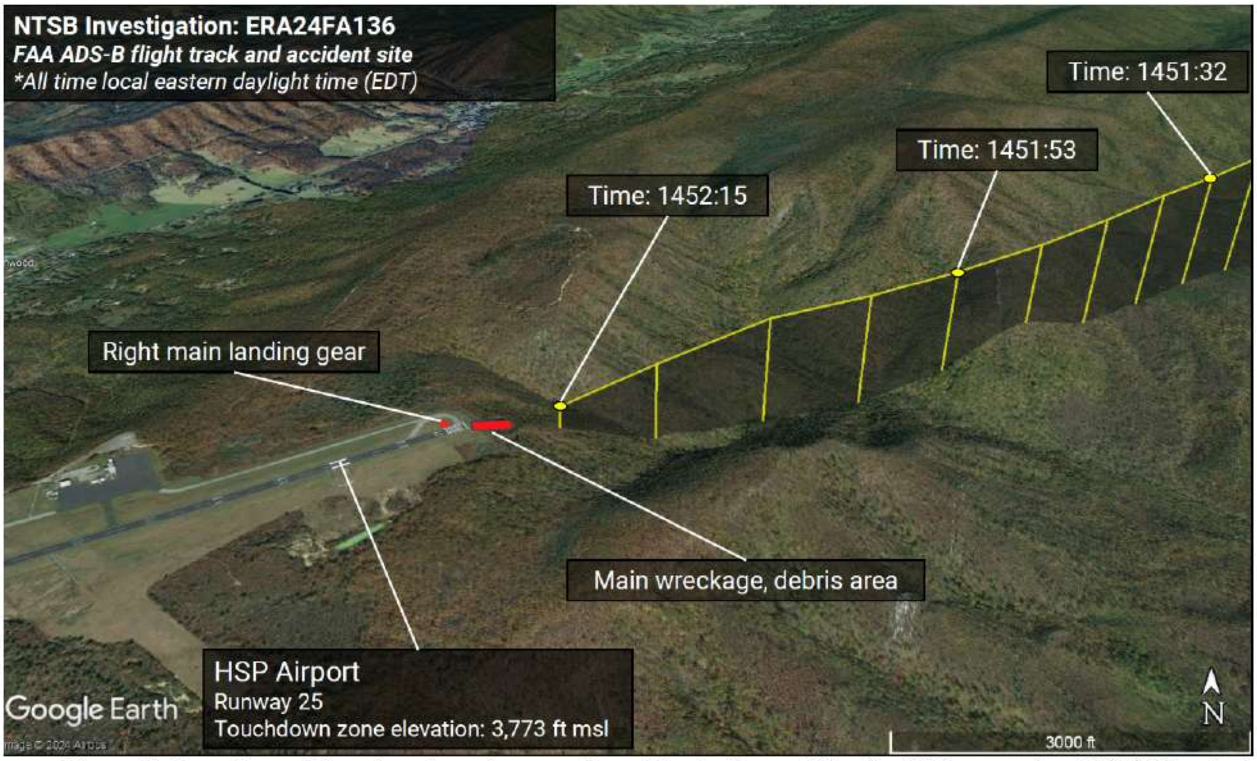

Figure 1: Overview of the airport environment, accident site, and the final 45 seconds of flight track data.

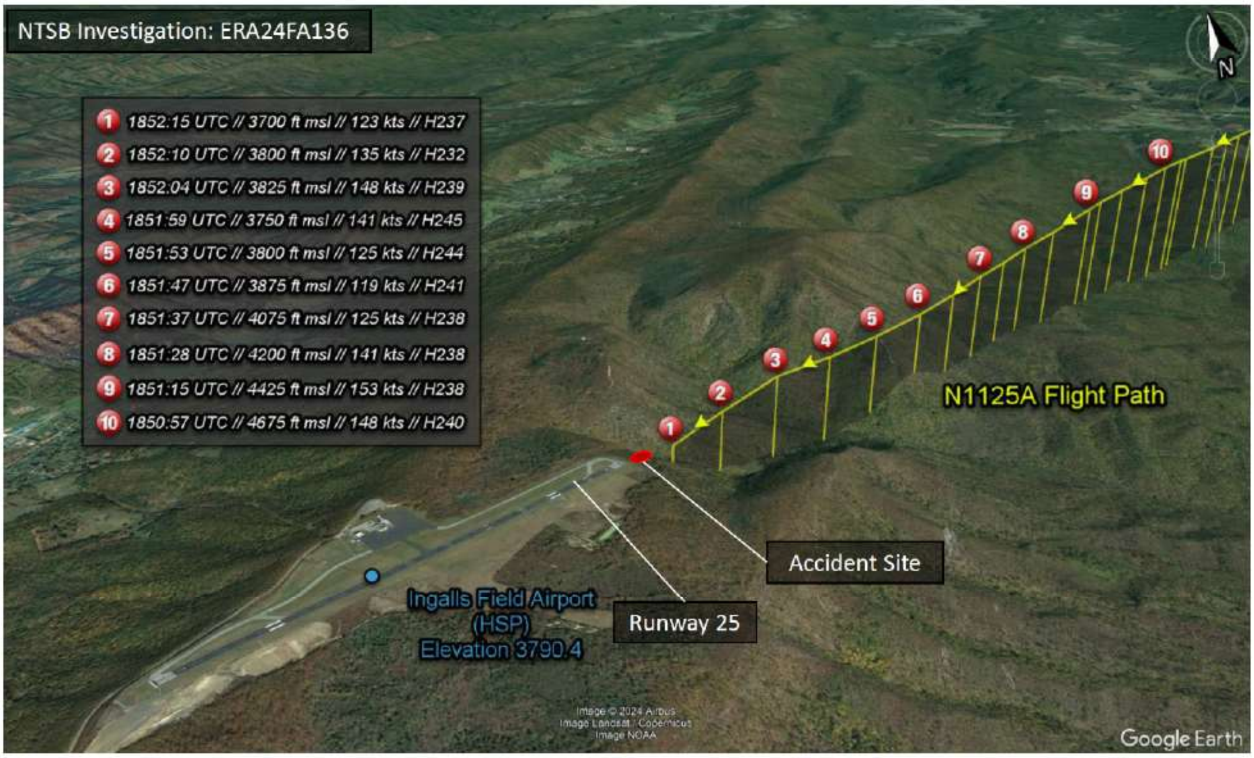

Figure 2: Overview of the final 1 minute and 18 seconds of flight track data.

According to an HSP airport staff member who was monitoring the CTAF, shortly before the accident, he heard two radio calls from an airplane announcing that they were conducting an approach to land on runway 25. Shortly thereafter, he heard the airplane's impact with terrain and turned to see smoke rising from the approach end of runway 25.

Pilot Information

Certificate:	Airline transport; Commercial; Foreign	**Age:**	63,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Unknown
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 With waivers/limitations	**Last FAA Medical Exam:**	December 19, 2023
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	February 7, 2024
Flight Time:	(Estimated) 13776 hours (Total, all aircraft), 63 hours (Total, this make and model), 6185 hours (Pilot In Command, all aircraft), 63 hours (Last 90 days, all aircraft)		

Co-pilot Information

Certificate:	Commercial; Flight instructor; Remote	**Age:**	24,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Unmanned (sUAS)	**Restraint Used:**	Unknown
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane single-engine; Instrument airplane	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 Without waivers/limitations	**Last FAA Medical Exam:**	April 4, 2023
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	November 20, 2023
Flight Time:	(Estimated) 1068 hours (Total, all aircraft), 136 hours (Total, this make and model), 854 hours (Pilot In Command, all aircraft)		

Pilot in Command (PIC)

The PIC moved to the United States in 2014 from Venezuela. He held Venezuelan pilot certificates that were converted to FAA certificates after he relocated.

The PIC was the officially designated Part 135 Chief Pilot at SkyJet Elite. According to the former Director of Operations (DO) of SkyJet, who worked for the operator for about four years and ceased employment with them in November 2023, the PIC was hired as the Chief Pilot "in name only" and was a "place holder." The former DO explained that the PIC/Chief Pilot had little to no involvement in SkyJet during his tenure as DO at the operator.

The PIC began new hire training in September 2022. The former DO and current DO of SkyJet reported that the PIC was supposed to fly Piper PA31 Navajo airplanes on the SkyJet Part 135 certificate. But from the fall of 2022 through the entirety of 2023, the pilot never completed a Part 135 checkride. An oral exam (135.293a) was completed with the South Florida FAA Flight Standards District Office (FSDO) twice; however, the practical examination was never attempted due to maintenance issues with the PA31 airplanes.

According to both SkyJet DOs, the pilot worked at other Part 135 operators while being named as the Chief Pilot at SkyJet, including Aztec Airways and REVA, a Part 135 Learjet air ambulance operator.

According to REVA, the PIC was hired in May of 2023 as a PIC candidate for the Learjet 31. REVA reported that he struggled tremendously at FlightSafety PIC ground and simulator training and that he needed extra training time. He initially failed his Part 135 PIC checkrides before passing after additional training. Although the PIC passed the Flight Safety training, REVA downgraded his assignment to SIC.

Three standards captains at REVA were interviewed, and all provided similar accounts of the PIC's performance during his initial operating experience after completing his training at FlightSafety. They stated that the PIC demonstrated a lack of adherence to standard operating procedures (SOPs), poor crew resource management (CRM), poor checklist usage, required constant reminders, could not manage the FMS, and had poor aircraft control. One captain stated that they could not believe he passed FlightSafety training and was sent to the line. In September 2023, the PIC was dismissed from REVA.

The current DO for the accident operator stated that in December 2023, when a decision was made to allow the PIC to attend PIC training for the accident airplane make and model, his employment file did not include a background check or fingerprints. The SkyJet DO said that he did not run a Pilot Records Improvement Act (PRIA) or Pilot Records Database (PRD) check in December 2023, because the PIC was not a new hire.

The PIC underwent ground and simulator training on the accident airplane make and model in January 2024. He completed 11 simulator training sessions from January 12, 2024, through January 27, 2024, before taking his checkride on January 28, 2024. A review of the flight instructor's comments showed FMS as a weakness in 8 of the 11 simulator sessions, including the session before the checkride. There were also multiple comments stating that the PIC had set the wrong minimums during instrument approach procedures. During the simulator session before the checkride, the PIC was paired with a different instructor than his primary instructor for the purpose of a line-oriented simulator training session. The instructor was interviewed and reported that after the session he felt the PIC was not ready for the checkride and needed more training. The recommendation the instructor wrote on the grade sheet stated "Needs a lot of help with the FMS. Client needs much more training time to be a safe and effective PIC." The pilot passed his checkride on January 28, 2024, and was issued a PIC type rating on the accident airplane make and model (G-100, IA-1125).

Second in Command (SIC)

A review of FAA airman records showed the SIC had received a notice of disapproval during his first attempt to obtain an instrument rating on September 4, 2020. The comments from this disapproval indicated that he did not properly tune and identify the ILS frequency, misidentified approach minimums and leveled off early, and was high on the approach. The SIC received a temporary airman certificate for his instrument rating on September 17, 2020. On July 23, 2021, the SIC received another notice of disapproval during the practical test for his commercial pilot certificate, indicating weaknesses in aircraft systems knowledge and emergency procedures. He received a temporary airman certificate for his commercial pilot certificate on July 25, 2021.

The SIC was hired by the operator in March of 2023 and received a SIC type rating for the IA-1125 and G-100 in November of 2023. The SIC's instructor at FlightSafety for his type rating reported that the SIC "improved very quickly," and "was a very good student."

As of the date of the accident, the SIC had accumulated a total of 136 hours in the accident airplane make and model, all of which was SIC time.

Aircraft and Owner/Operator Information

Aircraft Make:	ISRAEL AIRCRAFT INDUSTRIES	**Registration:**	N1125A
Model/Series:	1125 WESTWIND ASTRA NO SERIES	**Aircraft Category:**	Airplane
Year of Manufacture:	1990	**Amateur Built:**	
Airworthiness Certificate:	Transport	**Serial Number:**	051
Landing Gear Type:	Retractable - Tricycle	**Seats:**	9
Date/Type of Last Inspection:	March 1, 2024 AAIP	**Certified Max Gross Wt.:**	24650 lbs
Time Since Last Inspection:		**Engines:**	2 Turbo fan
Airframe Total Time:	8145 Hrs as of last inspection	**Engine Manufacturer:**	Honeywell Aerospace
ELT:	C126 installed	**Engine Model/Series:**	TFE731-3C-200G
Registered Owner:	AVIATION TRUST COMPANY LLC TRUSTEE	**Rated Power:**	3700 Lbs thrust
Operator:	On file	**Operating Certificate(s) Held:**	On-demand air taxi (135)
Operator Does Business As:	SkyJet Elite	**Operator Designator Code:**	

SkyJet Elite was a Part 135 operator based in Fort Lauderdale, Florida. The flight was dispatched as a Part 91 non-revenue flight with SkyJet Elite's CEO onboard, with a SkyJet PIC and SIC. Also onboard were the CEO's wife and child. The flight crew were due to continue Part 91, repositioning to Teterboro, New Jersey, after the passenger drop off at Hot Springs. On March 12, the flight crew were scheduled for Part 135 flying in the accident airplane.

A dry lease agreement for the accident airplane stated that operational control for all flights would be the responsibility of SkyJet Elite. The operator had a total of four Astra jets on the certificate, a Citation, and a Learjet. The PIC and SIC were qualified and current to operate the airplane for Part 91 and Part 135 operations.

The airplane was equipped with a Universal Avionics UNS-1Lw Flight Management System (FMS). Neither the FMS manufacturer's operator's manual nor the SkyJet Elite's training manual provided a description of FLOC. A production test pilot for the airframe manufacturer, who was familiar with the FMS system, described FLOC as:

In this mode, the system is in position for a transition from long range navigation (FMS) to short range navigation (LOC) (commonly referred to as a "NAV-to-NAV" transfer), but it is tracking the course laterally using FMS. It is incapable of actually tracking the ground based LOC in this mode, but a representation ("ghost" needles) of the localizer course and glideslope is displayed on the PFD and HSI for crew awareness as indicated by the FLOC and symbology on the displays. It will not capture the glideslope, it is still in a baro-referenced altitude mode.

In order to couple to the LOC and GS to fly the ILS, the crew must select approach mode in the flight guidance system by selecting the APPR button on the Mode Selector Panel. Once APPR is selected, the FMS will switch flight guidance to LOC when within parameters. FLOC will change to LOC on the displays and there will be a color change in the CDI needles. Once the LOC is captured, the GS will capture when it is within parameters. Once this is accomplished, the airplane will fly the ILS like any conventional non-FMS aircraft, but the waypoints in the approach will sequence so that a transition back to FMS can occur in case of a go-around or missed approach.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	HSP,3793 ft msl	**Distance from Accident Site:**	1 Nautical Miles
Observation Time:	14:55 Local	**Direction from Accident Site:**	131°
Lowest Cloud Condition:	Scattered / 2000 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	Broken / 2400 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	19 knots / 38 knots	**Turbulence Type Forecast/Actual:**	Unknown / Unknown
Wind Direction:	280°	**Turbulence Severity Forecast/Actual:**	Unknown / Unknown
Altimeter Setting:	29.65 inches Hg	**Temperature/Dew Point:**	-2°C / -8°C
Precipitation and Obscuration:			
Departure Point:	Fort Lauderdale, FL (FLL)	**Type of Flight Plan Filed:**	IFR
Destination:	Hot Springs, VA (HSP)	**Type of Clearance:**	IFR
Departure Time:	12:46 Local	**Type of Airspace:**	Class E

The airport was equipped with an automated weather observation system (AWOS), which was not augmented by any observers. Observations were broadcast locally or within line of sight via radio. The AWOS station was located about 1,000 ft from the touchdown zone of runway 25, about 280 ft south of the runway, and about 1,300 ft southwest of the accident site.

The 1435 observation recorded wind from 270° at 21 knots gusting to 31 knots, 10 statute miles or more visibility, temperature -2° C (29°F), dew point temperature of -9°C (16°F), and altimeter setting of 29.65 inHg.

The 1455 observation included wind from 280° at 19 knots gusting to 38 knots, 10 statute miles or more visibility, scattered clouds at 2,000 ft above ground level (agl), ceiling broken at 2,400 ft agl, overcast at 4,500 ft agl, temperature -2°C (28°F), dew point temperature -8°C (18°F), and altimeter setting of 29.65 inHg.

A photograph of the conditions at the touchdown point of runway 25, looking towards the northeast and the accident site, was taken by a first responder about 30 minutes after the accident (figure 3). The image depicted general broken to overcast cloud layers with showers and virga below the clouds over the area, with several of the precipitation shafts reaching the ground and restricting visibility.


Figure 3: Photograph taken by first responder looking northeast from the touchdown point of runway 25 towards the approach path to the runway.

Figure 4 shows a weather surveillance radar base reflectivity image generated at 1454 with the flight track overlaid in black. Several bands of very light intensity echoes extend along the flight path and immediately northeast of the airport. The accident airplane's flight track depicted it flying through two of the bands on approach, with the accident site immediately on the southwestern edge of one of the bands.

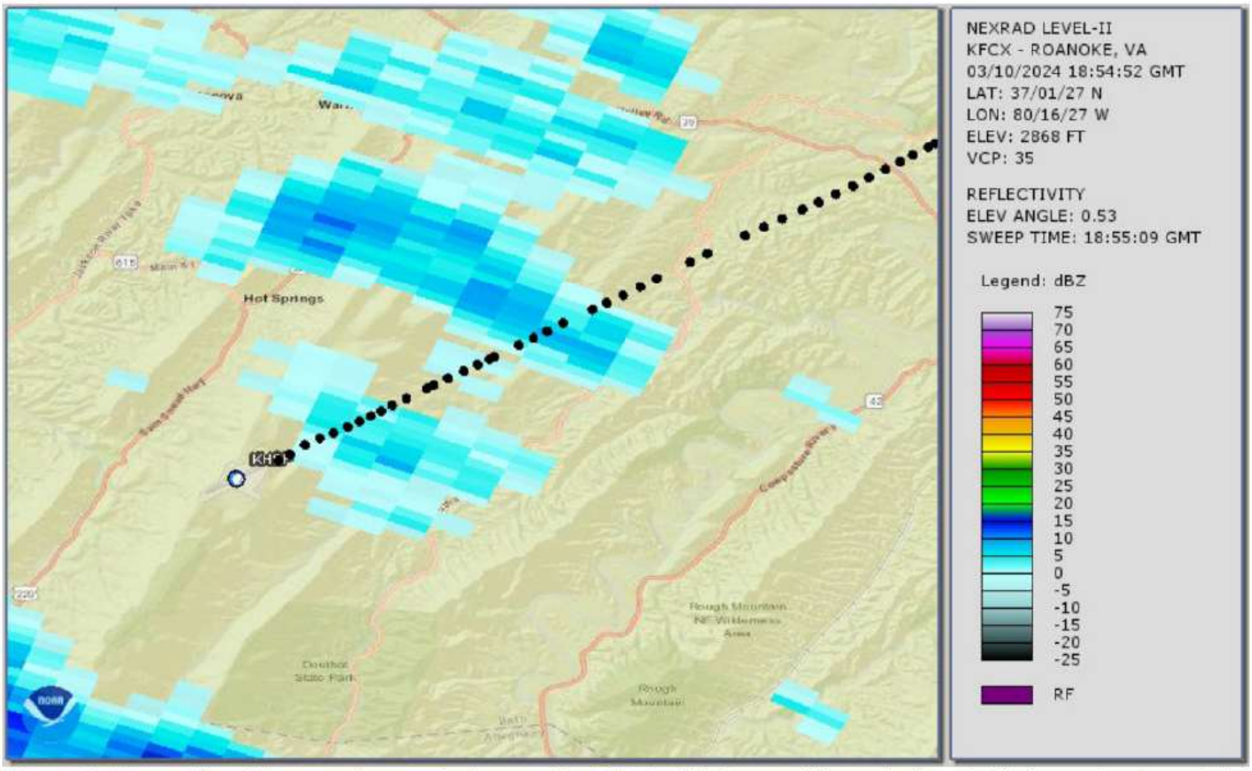

Figure 4: Base reflectivity weather radar image for 1454 with the accident airplane's flight track of overlaid.

The CVR recording indicated that, at 1441:32 (about 11 minutes before the accident), the SIC reported seeing ice on the wing. The crew turned on the left and right engine anti-ice and set the de-icing boots to normal. The crew was heard on the CVR stating “okay it's working. Great” shortly thereafter.

A Weather Research and Forecast (WRF) model simulation surrounding the time of the accident using initialization data from the North American Mesoscale Forecast System showed sustained winds of 40 to 50 knots immediately above the ridge level, with updrafts on the windward, or west, side of the ridges from 400 to 800 fpm with similar downdrafts on the leeward, or east, side of the ridge over the approach path and the accident site. The isentropes at higher altitudes show a slight wave-like flow pattern.

At the time of the accident, a SIGMET was current over the area for occasional severe turbulence below 9,000 ft due to strong low-level winds and mountain wave activity. A series of G-AIRMETs were also current for mountain obscurations and IFR conditions, occasional moderate turbulence below 10,000 ft, and for occasional moderate icing conditions between the freezing level and 10,000 ft.

According to an airport staff member, the wind at the time of the accident was unusual, even for the airport's mountaintop location. He stated that it was very windy, and that there was a known downdraft that could exist when approaching runway 25 with high wind. A pilot who was familiar with the airport reported that, on windy days, an updraft could be experienced while on short final approach to runway 25. A review of the HSP chart supplement found there was no special airport advisory or warning of adverse conditions with updrafts and downdrafts during windy periods.

The most recent altimeter setting for HSP before the accident was 29.65 inHg, 0.27 inHg lower than standard altimeter setting of 29.92 and 0.16 inHg lower than the last altimeter setting issued to the flight crew by ATC of 29.81 inHg. If the airplane's altimeter was set to 29.92 inHg instead of the reported airport altimeter setting, the altimeter would indicate 270 ft higher than true airplane altitude. If the airplane's altimeter was set to 29.81 inHg instead of the reported airport altimeter setting, the airplane altimeter would indicate 160 ft higher than true airplane altitude.

The Pilot's Handbook of Aeronautical Knowledge (FAA-H-8083-25C) discussed the importance of having an accurate altimeter setting. It stated in part:

It is easy to maintain a consistent height above ground if the barometric pressure and temperature remain constant, but this is rarely the case. The pressure and temperature can change between takeoff and landing even on a local flight. If these changes are not taken into consideration, flight becomes dangerous. If altimeters could not be adjusted for nonstandard pressure, a hazardous situation could occur. For example, if an aircraft is flown from a high pressure area to a low pressure area without adjusting the altimeter, a constant altitude will be displayed, but the actual height of the aircraft above the ground would be lower then the indicated altitude. There is an old aviation axiom: "GOING FROM A HIGH TO A LOW, LOOK OUT BELOW."

Airport Information

Airport:	Ingalls Airport HSP	**Runway Surface Type:**	Asphalt
Airport Elevation:	3792 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	25	**IFR Approach:**	ILS
Runway Length/Width:	5600 ft / 100 ft	**VFR Approach/Landing:**	None

A field test of the HSP runway 25 precision approach path indicator (PAPI) lights on March 11, 2024, found that the system was working properly, with the approach path set at 3°.

Wreckage and Impact Information

Crew Injuries:	2 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	3 Fatal	**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	5 Fatal	**Latitude, Longitude:**	37.955627,-79.825144

The wreckage debris path was oriented on a 250° to 255° magnetic heading and extended about 150 ft from the initial impact point to the main wreckage. The initial impact point coincided with several trees that were located along a down-sloping ravine about 300 ft from the runway threshold. The wreckage was heavily fragmented and was thermally damaged during a postimpact fire.

All primary flight control surfaces and major portions of the airplane were found at the accident site. The right main landing gear was located next to runway 25, about 315 ft forward of the fuselage and about 10 ft to the right of the runway edge.

Flight control continuity could not be established from the cockpit to the flight controls due to the extensive impact damage; however, continuity was observed at the flight control surfaces that remained partially intact. Actuator and jackscrew positions were consistent with the airplane's landing gear being extended and the wing flaps set to 40° at the time of impact. The left wing outboard spoiler was observed retracted and its actuator position corresponded to a retracted position. The right wing spoilers were not identifiable due to the impact and thermal damage. The impact and thermal damage sustained to the cockpit prevented any data collection of instrument readings or switch positions.

Both engines were located in the debris field and sustained heavy impact and thermal damage. The left engine had separated into two pieces and the right engine remained mostly intact. Both engine spinners exhibited varying degrees of rotational scoring signatures. Both engine fan blade sections exhibited leading edge tearing, gouging, and battering damage, and several fan blades were observed to be bent opposite the direction of engine rotation.

The digital electronic engine computers were recovered and exhibited substantial thermal and impact damage. Due to the damage sustained to the memory chips, data could not be extracted.

Flight recorders

Cockpit Voice Recorder

The airplane was equipped with a Fairchild A100A cockpit voice recorder (CVR). The CVR records a minimum of 30 minutes of analog audio on a continuous loop tape in a four-channel format; one channel for each flight crew member, one channel for a cockpit observer, and one channel for the cockpit area microphone (CAM). The CVR sustained heat and impact damage to the outer case. The magnetic tape was retrieved and successfully read using NTSB vehicle recorders laboratory equipment. The CVR captured 30 minutes of audio from the PIC, SIC, and CAM of excellent quality, and included the accident sequence.

Enhanced Ground Proximity Warning System (EGPWS)

A review of the downloaded flight history data and the ADS-B data showed that the system did not produce a “Too Low Terrain” aural warning. The software installed, version -213-213, was not up to date with a version that would have allowed this function. The system was also not configured for direct GPS input, which was needed for this function.

FAA Special Airworthiness Information Bulletin (SAIB) NM-15-11 was issued on March 13, 2015, and advised registered owners and operators of certain transport category airplanes of potential safety improvements to Honeywell Enhanced Ground Proximity Warning System (EGPWS) software. The SAIB recommended owners update the software to version -218-218 or higher and to wire the GPS directly into the EGPWS. This SAIB was applicable to the accident airplane EGPWS.

The system also did not produce a “Glideslope” alert, which would be expected if the airplane deviated in excess of 1.3 dots fly up (“dots” referenced are the deviation from glideslope centerline that would have been seen on the cockpit glideslope indicator). This alert would only be available if an ILS was tuned and providing deviation information to the EGPWS.

The EGPWS was also capable of producing radio altitude callouts. Review of the CVR audio revealed that three of these callouts were heard, at 2,500 ft, 1,000 ft, and 500 ft. The 500 ft callout is only produced for non-precision approaches, and would not be present if the ILS was tuned and providing deviation information to the EGPWS at that point in the approach.

Medical and Pathological Information

The Virginia Office of the Chief Medical Examiner Western District determined the cause of death for both pilots as blunt injuries to the head, torso, and extremities and the manner of death for both pilots as accident.

The FAA Forensic Sciences Laboratory performed toxicological testing of postmortem specimens from the PIC. Ethanol, drugs of abuse, and carboxyhemoglobin were not detected. Losartan was detected in cavity blood and liver tissue. Losartan (Cozaar) is an ACE-II inhibitor-type antihypertensive used to treat high blood pressure and is acceptable for pilots.

The FAA Forensic Sciences Laboratory performed toxicological testing of postmortem specimens from the SIC. No tested-for substances were detected.

Tests and Research

The NTSB Office of Research and Engineering plotted the airplane's flight track using ADS-B data and airplane performance information. These plots showed that the airplane crossed the AHLER intersection at 5,800 ft, which was 200 ft below the "at or above" altitude noted on the ILS RWY25 instrument approach procedure (IAP) and 300 ft below the crossing altitude assigned by ATC. The airplane crossed the final approach fix at 4,800 ft, which was 300 ft below the "at or above" altitude noted on the IAP. The airplane continued at 4,800 ft until reaching a point where the glideslope indicator would have depicted about a half dot "fly up" indication. The airplane then began its final descent about 3.3 nautical miles nm from the runway threshold.

By 2.5 nm from the runway, the airplane had descended to a point where the glideslope indicator would have shown about a 1 dot fly up indication. At 1.6 nm from the runway threshold, the glideslope indicator would have shown about 2 dots fly up (full scale deflection). The airplane continued to descend below the glideslope until reaching 3,800 ft at 0.8 nm from the runway. This was about 300 ft below glideslope centerline and about 8 dots fly up. The airplane then began a climb. About 0.4 nm from the runway, the glideslope would have indicated about 1 dot fly up. The airplane subsequently began to descend, and about 0.25 nm from the runway, the glideslope would have shown below 2 dots fly up. The airplane continued to diverge below the nominal glideslope until it impacted terrain.

The airplane rate of descent from 4,800 ft to impact exceeded 1,000 ft/min multiple times including twice when the airplane was below 500 ft above airport elevation.

Additional Information

The SkyJet Elite Flight Operations Training Manual (FOTM) described the stabilized approach criteria for the G100/Astra Series IA-1125 airplane:

*All flights must be stabilized by 1,000' above the airport elevation in instrument meteorological conditions (IMC) and by 500' above the airport elevation in visual meteorological conditions (VMC). An approach is stabilized when **all** of the following criteria are met:*

1. The aircraft is on the correct flight path;

2. Only small changes in heading/pitch are required to maintain the correct flight path;

3. The aircraft speed is not more than VREF + 10 KT indicated airspeed and not less than VREF;

4. The aircraft is in the correct landing configuration;

5. Sink rate is no greater than 1,000' per minute; if an approach requires a sink rate

greater than 1,000' per minute, a special briefing should be conducted;

6. Power setting is appropriate for the aircraft configuration and is not below the

minimum power for approach as defined by the aircraft operating manual;

7. All briefings and checklists have been conducted;

8. Specific types of approaches are stabilized if they also fulfill the following:

a. Instrument landing system (ILS) approaches must be flown within one dot of

the glideslope and localizer

b. A Category II or Category III ILS approach must be flown within the expanded

localizer band

c. During a circling approach, wings should be level on final when the aircraft

reaches 300' above airport elevation;

9. Unique approach procedures or abnormal conditions requiring a deviation from the

above elements of a stabilized approach require a special briefing.

An approach that becomes unstabilized below 1,000' above airport elevation in IMC or 500' above airport elevation in VMC requires an immediate missed approach or go-around.

The FOTM also discussed CRM and stated:

All pilots will incorporate CRM considerations and practices into all aspects of flight operations, and will specifically demonstrate effective application of the following CRM concepts: Crew Cooperation; Leadership and Management; Situational Awareness; and Decision Making.

FAA Safety Alert for Operators (SAFO) 10005 discussed go-around callouts and the need for an immediate response it stated:

It is critical to flight safety that both the pilot flying and the pilot monitoring should be able to call for a go-around if either pilot believes an unsafe condition exists. Also, although CRM principles prescribe that some cockpit decisions can be made by crew consensus, others, including the go-around callout, require immediate action, without question, because of the immediacy of the situation.

FAA regulations state that, when operating above 18,000 ft msl, pilots must maintain altitude by reference to an altimeter that is set to a standard pressure of 29.92 inHg.

The first item on the FAA-accepted Astra cockpit card “Descent – Transition Altitude” checklist is, “Altimeter – Set.” The third item on the same checklist is, “Crew Briefing – Complete.” The FAA’s Instrument Procedures Handbook (FAA-H-8083-16B) defined transition altitude as the altitude in the vicinity of an airport at or below which the vertical position of an aircraft is controlled by reference to altitudes above mean sea level. The handbook also noted that, in the United States, this altitude is 18,000 ft.

The Flight Management System (FMS) Operator’s Manual discussed the creation and use of ILS approaches:

ILS approaches may be defined and linked into a flight plan using the same procedures as VOR, RNV, VFR and TCN approaches. When ARM APPR is selected on the FMS, the ILS receiver is automatically tuned to the ILS frequency by the FMS, and the EFIS arms for capture. If the pilot arms APPR on the Flight Guidance System, the aircraft will transition from lateral and vertical FMS mode to Approach mode using the localizer and glideslope signals from the ILS receiver. If the pilot flies the approach with only NAV mode selected on the FGS then only lateral transitions will be made from FMS to Localizer.

The Astra Airplane flight manual addressed autopilot and flight guidance system modes. Below is how it described approach (APPR) and vertical speed (VS) modes:

APPR - Used to select approach mode, can be used with any vertical mode prior to GS capture. Roll limit is 15° for captured LOC. NAV capture angle is up to 90°. Automatic crosswind correction crab angle is up to 30°. The approach course corresponds with the course selected on the EHSI. With ILS approach, GS is armed after LOC capture.

VS - Used to select vertical speed mode, can be used with any lateral mode. When selecting VS, the VS reference is synchronized to the aircraft vertical rate. VS can be modified by either the VSI bug or the autopilot pitch wheel (at 100 ft increments). The engage range is ± 6000 fpm. If VMO/MMO is inadvertently exceeded VMO/MMO bell triggers vertical safety mode of IAS hold of VMO) -2 kt.

Preventing Similar Accidents

Stabilized Approaches Lead to Safe Landings (SA-077)

The Problem

Failing to establish and maintain a stabilized approach, or continuing an unstabilized approach, could lead to landing too fast or too far down the runway, potentially resulting in a runway excursion, loss of control, or collision with terrain. Regardless of the type of aircraft, the level of pilot experience, or whether the flight is being conducted under instrument flight rules or visual flight rules, a stabilized approach is key to maintaining control of the aircraft and ensuring a safe landing.

What can you do?

- Follow SOPs and industry best practices for stabilized approach criteria, including a normal glidepath, specified airspeed and descent rate, landing configuration (flaps, gear, etc.), appropriate power setting, landing checklists, and a heading that ensures only small changes are necessary to maintain runway alignment. Guidance and tips (see the “Interested in more information?” section) indicate that, in most cases, the approach should be stabilized by 1,000 ft in instrument conditions or 500 ft in visual conditions. If the approach becomes unstabilized at any time after that, go around.
- Practice go-arounds and missed approaches so that you are comfortable with the procedures when needed. Remember to establish personal minimums for all types of operations, including go-arounds and missed approaches.
- Use effective single-pilot resource management or crew resource management. A stabilized approach begins with an effective approach briefing. Ensure that you understand critical aspects of the approach, such as the minimum safe altitude, hazards, approach conditions, and missed approach procedures.
- Do not allow perceived operational pressures (for example, from air traffic controllers, passengers, etc.), continuation bias, or last-minute runway changes to influence your decision to execute a go-around; if your approach is not stabilized, go around.

- Never attempt to "save" an unstabilized approach. If the approach becomes unstabilized, conduct an immediate go-around. Remember, when two pilots are on duty, either crewmember may call for a go-around at any time.

See https://www.ntsb.gov/Advocacy/safety-alerts/Documents/SA-077.pdf for additional resources.

The NTSB presents this information to prevent recurrence of similar accidents. Note that this should not be considered guidance from the regulator, nor does this supersede existing FAA Regulations (FARs).

Administrative Information

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