Aviation Investigation Final Report

Location:	Wheeling, Illinois	**Accident Number:**	CEN23LA403
Date & Time:	August 21, 2023, 13:15 Local	**Registration:**	N39TT
Aircraft:	ISRAEL AIRCRAFT INDUSTRIES 1125 WESTWIND ASTRA	**Aircraft Damage:**	Substantial
Defining Event:	Runway excursion	**Injuries:**	2 None
Flight Conducted Under:	Part 91: General aviation - Positioning		

Analysis

According to the flight crew, the airplane touched down within the touchdown zone. The pilot reported that he applied the brakes and deployed the thrust reversers (TRs), but the brakes "were not grabbing." The pilot released and reapplied brake pressure with no effect and advised the co-pilot he had no brakes. The co-pilot applied his brakes with no effect. The pilot selected the emergency brake handle and applied emergency braking. The emergency braking produced some slowing, and with the airplane's nose wheel tiller, the pilot attempted a left turn to exit the runway onto a 45° taxiway, which he thought provided additional stopping distance; however, the airplane slid off the taxiway and into the adjacent grass. The right main landing gear collapsed, and the airplane came to rest upright, resulting in substantial damage to the right wing spar.

Examination and testing of the airplane systems did not reveal any evidence of preimpact mechanical malfunctions with the wheel brakes or any other systems. Video evidence and recorded airplane data revealed the TRs were not deployed during the landing sequence. The cockpit voice recorder was overwritten during postaccident maintenance actions, and the accident flight communications were not available.

Landing simulations based on available data were consistent with reduced deceleration during the landing roll; however, the simulations could not determine if the airbrakes were stowed or extended during the landing, and the airplane was not equipped with a flight data recorder, which could have captured airbrake deployment and position. Landing performance calculations showed that, without ground airbrakes, the landing ground roll distance exceeded the runway available from the airplane's touchdown point. Tire skid marks indicated that heavy wheel braking occurred on the runway and taxiway surfaces. Based on the available

information, the reason for the flight crew's reported loss of braking effectiveness during landing could not be determined.

Probable Cause and Findings

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

A loss of braking effectiveness during landing for reasons that could not be determined, which resulted in a runway excursion.

Findings

Aircraft	Brake - Unknown/Not determined
Not determined	(general) - Unknown/Not determined

Factual Information

History of Flight

Landing-landing roll	Unknown or undetermined
Landing-landing roll	Runway excursion (Defining event)

On August 21, 2023, about 1315 central daylight time, an Israel Aircraft Industries 1125 Westwind Astra airplane, N39TT, sustained substantial damage when it was involved in an accident near Wheeling, Illinois. The pilot and co-pilot were not injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 positioning flight.

The flight crew reported that they were cleared to land on runway 16 at Chicago Executive Airport, Wheeling, Illinois, and the airplane touched down within the touchdown zone. The pilot reported that he applied the brakes and deployed the thrust reversers (TR), however, the brakes "were not grabbing." The pilot released the brakes and reapplied brake pressure with no effect and advised the co-pilot that he had no brakes. The co-pilot applied his brakes, also with no effect. The pilot then selected the emergency brake handle and applied emergency braking. The pilot reported that the emergency braking produced some slowing, and with the airplane's nose wheel tiller, he attempted a left turn to exit the runway onto the 45° taxiway D, which he thought provided additional stopping distance. Due to the airplane's energy and momentum, the airplane slid off the taxiway and into the adjacent grass. The airplane's right main landing gear collapsed, and the airplane came to rest upright (see Figure 1). The flight crew reported that they did not observe any normal or abnormal cockpit annunciators during the approach and landing sequence.


Figure 1. Accident airplane (Source: Airport operations)

Surveillance videos from nearby airport facilities captured portions of the landing sequence. Based on the videos, the flaps appeared to be in the 40° extended position, and the TRs were not deployed during the landing sequence. The position of the airbrakes (stowed or deployed) could not be determined due to the video quality.

Pilot Information

Certificate:	Airline transport; Commercial; Private	**Age:**	64,Male
Airplane Rating(s):	Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	5-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	
Medical Certification:	Class 1 With waivers/limitations	**Last FAA Medical Exam:**	June 7, 2023
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	June 1, 2023
Flight Time:	7500 hours (Total, all aircraft), 2000 hours (Total, this make and model), 6500 hours (Pilot In Command, all aircraft), 18 hours (Last 90 days, all aircraft), 10 hours (Last 30 days, all aircraft), 3 hours (Last 24 hours, all aircraft)		

Co-pilot Information

Certificate:	Airline transport; Commercial; Flight instructor; Private	**Age:**	61,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):		**Restraint Used:**	5-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Instrument airplane	**Toxicology Performed:**	
Medical Certification:	Class 1 With waivers/limitations	**Last FAA Medical Exam:**	February 15, 2023
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	April 1, 2023
Flight Time:	8500 hours (Total, all aircraft), 2300 hours (Total, this make and model), 1700 hours (Pilot In Command, all aircraft), 22 hours (Last 90 days, all aircraft), 14 hours (Last 30 days, all aircraft), 3 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	ISRAEL AIRCRAFT INDUSTRIES	**Registration:**	N39TT
Model/Series:	1125 WESTWIND ASTRA	**Aircraft Category:**	Airplane
Year of Manufacture:	1991	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	053
Landing Gear Type:	Retractable - Tricycle	**Seats:**	9
Date/Type of Last Inspection:	August 16, 2023 AAIP	**Certified Max Gross Wt.:**	20700 lbs
Time Since Last Inspection:		**Engines:**	2 Turbo fan
Airframe Total Time:	8307 Hrs at time of accident	**Engine Manufacturer:**	Honeywell
ELT:	Installed, not activated	**Engine Model/Series:**	TFE731-3C-200G
Registered Owner:	ASTRA053 LLC	**Rated Power:**	3700 Lbs thrust
Operator:	ASTRA053 LLC	**Operating Certificate(s) Held:**	On-demand air taxi (135)

According to airplane maintenance manual, the ground and flight airbrakes (A/B) have four control surfaces, two on each wing, that are electrically controlled and hydraulically operated. The airbrake system operates in flight via deployment of the inboard surfaces and on the ground via deployment of the inboard and outboard surfaces. The ground airbrakes are activated by the flight crew using the ground A/B switch, set to the ON position. The system requirements for ground airbrake deployment included airplane electrical power, main system hydraulic pressure, at least one of two main landing gear weight-on-wheel switches in ground

mode, both throttle quadrant angle levers below 18°, and the ground A/B switch set to ON. If these parameters were met, the ground airbrakes would deploy automatically upon landing.

According to the airplane flight manual, if the ground airbrakes were inoperative for landing, landing performance would be affected. If all ground airbrakes were inoperative, the landing distance must be increased by 30%.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	PWK,647 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	13:25 Local	**Direction from Accident Site:**	0°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	7 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	80°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.24 inches Hg	**Temperature/Dew Point:**	27°C / 19°C
Precipitation and Obscuration:			
Departure Point:	Chicago, IL (MDW)	**Type of Flight Plan Filed:**	IFR
Destination:	Wheeling, IL	**Type of Clearance:**	IFR
Departure Time:	13:00 Local	**Type of Airspace:**	Class D

Airport Information

Airport:	CHICAGO EXEC PWK	**Runway Surface Type:**	Asphalt
Airport Elevation:	647 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	16	**IFR Approach:**	Visual
Runway Length/Width:	5001 ft / 150 ft	**VFR Approach/Landing:**	Full stop

Wreckage and Impact Information

Crew Injuries:	2 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	N/A	**Aircraft Fire:**	None
Ground Injuries:		**Aircraft Explosion:**	None
Total Injuries:	2 None	**Latitude, Longitude:**	42.116713,-87.903704(est)

Substantial damage was confirmed to the right wing spar on September 7, 2024, and the event was classified as an accident. Before the confirmation of substantial damage, maintenance tests were completed on the airplane and its braking system components and under the supervision of the FAA. No anomalies were noted during the airbrake system (in air and ground modes) and TR tests, which were performed in accordance with maintenance manual procedures. The configuration of the airplane's cockpit switch positions was not documented, and the switch positions at the time of the accident could not be determined. According to the operator who assisted in the recovery operations, the flaps were found in the 40° extended position, and the slats were extended.

A review of airport operations photographs revealed tire skid marks beginning on the runway surface and continuing onto taxiway D (see Figure 2) until the airplane departed the runway surface. Measurements of the tire skids marks were not recorded.

Figure 2. Airplane tire skid marks (Source: Airport operations).

The following components were removed for additional examination and testing at the original equipment manufacturers: anti-skid control box, anti-skid control valves, wheel speed transducers, and brake power valve. The examinations did not reveal any anomalies that would have resulted in a loss or reduced performance of wheel braking.

Landing performance calculations and simulations were completed based on ADS-B data, reported weather, and available data from the onboard Honeywell N1 Digital Electronic Engine Control (DEEC) devices. The simulation results were consistent with reduced deceleration or loss of anti-skid efficiency during the accident landing roll (assuming full-braking efforts by the flight crew immediately after touchdown). The magnitude of the deficiency required to match the ADS-B data depended on whether the airbrakes were stowed or deployed; however, the simulations could not help resolving whether the airbrakes were deployed or not. If the reduced deceleration evidenced by the ADS-B data could be explained simply by the airbrakes being stowed (while keeping wheel braking friction coefficient close to its expected dry-runway value), that could help to inform a conclusion that the airbrakes were indeed stowed. However, the simulations indicated that even when the airbrakes are deployed, wheel braking friction coefficient must be reduced by half from its expected value to match the ADS-B data. Consequently, the lack of deceleration during the accident could not be explained solely be

postulating that the airbrakes were stowed, and the simulation results could not be used to determine the actual airbrake position.

Review of the landing distance data for the approximate weather conditions and a Vref of 121 knots, revealed that at a landing weight of 17,576 lbs, the dry – unfactored landing distance was 2,525 ft with anti-skid and ground airbrakes on and about 4,200 ft with anti-skid and ground airbrakes off. There is no landing distance credit for TRs on a dry runway.

Flight recorders

The airplane was equipped with a CVR. Readout of the recorder revealed two short segments of voice from two individuals discussing powering the aircraft electrically on the ground. Some other voice data in another small segment was consistent with performing maintenance operations; however, there was not enough context in the conversation to determine the type of maintenance operation or the date of the conversation. The audio ended with no sounds associated with aircraft operations. Several maintenance actions were performed on the airplane between the time of the accident and the removal of the CVR.

According to the operator's general operations manual, in part, section 21.15 Cockpit Voice Recorder, "Where installed, the CVR shall be operated continuously from the time the electrical power is first applied to the time that the aircraft is shut down and the electrical power is removed. No communications may be erased from the CVR from the time that the electrical power is applied for the purpose of flight. After completing all emergency procedures [in accordance with] this manual and with the aircraft at a complete stop, personal safety permitting, the flight crew shall make every effort to preserve CVR data including but not limited to pulling the CVR circuit breaker, if applicable, or other means provided in the aircraft."

The airplane was not equipped with a flight data recorder, nor was it required to be.

Data from the Honeywell N1 DEECs were downloaded. A review of the data revealed that both engines were rotating, operating, and responding to power lever inputs throughout the flight and accident sequence. The data did not indicate a TR deployment. The TR deployment indication is not a discrete input, rather a calculation based on weight-on-wheels, MACH, and commanded N1. In this event, DEEC logic requirements for TR deployment indication were not met, nor were low pressure spool % speed (N1), high pressure spool % speed (N2), power lever angle (PLA), or inter-turbine temperature (ITT) increases observed. Typical thrust reverser usage is evidenced by an increase in PLA, N1, N2, and ITT, in addition to the TR deployment indication.

Administrative Information

Investigator In Charge (IIC):	Sauer, Aaron
Additional Participating Persons:	Sandy Boerman; FAA; Chicago, IL Boas Grossman; Aircraft Safety Investigation Authority Israel Keith Candline; Gulfstream Aerospace; Savannah, GA Jennifer McDuffie; Honeywell; Phoenix, AZ
Original Publish Date:	March 5, 2025
Last Revision Date:	
Investigation Class:	Class 3
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=193022