



National Transportation Safety Board Aviation Accident Final Report

Location:	Miami, FL	Accident Number:	ERA15FA129
Date & Time:	02/11/2015, 1439 EST	Registration:	YV1674
Aircraft:	BEECH 1900	Aircraft Damage:	Destroyed
Defining Event:	Miscellaneous/other	Injuries:	4 Fatal
Flight Conducted Under:	Part 91: General Aviation - Positioning		

Analysis

The accident flight was a repositioning flight being operated by two airline transport pilots, and it was the multiengine turboprop airplane's first flight after an aviation maintenance technician (AMT) had replaced the left engine propeller with an overhauled propeller. The AMT subsequently performed an engine run, which included verifying correct power settings and corresponding blade angles.

A review of flight data recorder (FDR) data revealed that, about 2 seconds after rotation, the left engine propeller rpm decreased to 60 percent, and the left engine torque increased off-scale (beyond 5,000 ft-lbs), which is consistent with the left propeller traveling to the feathered position and the engine torque increasing in an attempt to maintain propeller rpm. About 30 seconds later, the flight crew shut down the left engine and attempted to return to the departure airport. Postaccident examination of the rudder trim actuator revealed that the rudder trim was at its full-right limit, which would have occurred to counteract the left engine drag before its shutdown. Based on this evidence, it is likely that the flight crew did not readjust the trim when the drag was alleviated, which resulted in the airplane being operated in a cross-controlled attitude for about 50 seconds with a left bank and full-right rudder trim. Although the airplane should have been able to climb about 500 ft per minute with one engine operating, it slowed and descended from 300 ft in the cross-controlled attitude until it stalled, as indicated by a stall warning recorded by the cockpit voice recorder, and subsequently impacted terrain.

Examination of the wreckage, including teardown examination of the left engine and propeller, did not reveal any preimpact mechanical anomalies. Review of the airplane maintenance manual revealed instructions to check the propeller reversing linkage on the front end of the engine, which controlled the beta valve, for proper rigging during propeller installation. The manual also contained a warning that misadjustment of the beta valve can cause unplanned feathering of the propeller and result in a possible hazard to airplane operation and overtorque damage to the engine; however, the beta valve rigging could not be verified postaccident due to impact damage. Additionally, the ground/flight idle solenoid energizes when weight becomes off wheels and further opens the beta valve, which could exacerbate an existing misrigged

condition as soon as the airplane becomes airborne, which is when the airplane experienced the uncommanded propeller feathering.

The FDR data were consistent with the flight crew not performing the Before Takeoff (Runup) checklist. One of the items on that checklist was a low-pitch solenoid test, which would have energized the solenoid and possibly driven the left propeller uncommanded to feather during ground operations rather than in flight. A similar test during the postmaintenance engine-run would have had the same results.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The left engine propeller's uncommanded travel to the feathered position during takeoff for reasons that could not be determined due to impact damage. Contributing to the accident was the flight crew's failure to establish a coordinated climb once the left engine was shut down and the left propeller was in the feathered position.

Findings

Aircraft	Propeller feather/reversing - Not specified (Cause) Configuration - Not specified (Cause)
Personnel issues	Aircraft control - Flight crew (Factor)

Factual Information

HISTORY OF FLIGHT

On February 11, 2015, at 1439 eastern standard time, a Beech 1900C, Venezuelan registration YV1674, registered to and operated by Aeropanamericano, C.A., was destroyed during collision with terrain and a postcrash fire, following a loss of propeller thrust during takeoff from Miami Executive Airport (KTMB), Miami, Florida. The two foreign certificated pilots and two passengers were fatally injured. The repositioning flight was conducted under the provisions of 14 Code of Federal Regulations Part 91. Visual meteorological conditions prevailed and an instrument flight rules flight plan was filed for the planned flight to Providenciales International Airport (MBPV), Providenciales, Turks and Caicos.

Review of radar and communication data from the Federal Aviation Administration (FAA), in addition to the cockpit voice recorder (CVR), revealed that the flightcrew started the engines at 1427:35 and began to taxi to runway 27L at 1432. At 1434:23, the air traffic controller asked the flightcrew if they were going to do a run-up. The flightcrew responded affirmative; however, subsequent recorded conversation between the flightcrew did not reveal any intelligible reference to a checklist and at 1436:08, a flightcrew member stated "prepare for takeoff now." The flight was cleared for takeoff at 1436:44 and then engine power increased at 1437:22. The flightcrew conversation included "(airspeed) alive" at 1437:38, "V-1" at 1437:51, and "rotate" at 1437:52. About 2 seconds later, at 1437:54, a sound was recorded consistent with a decrease in propeller rpm followed by "engine is lost" at 1437:56. The CVR also captured the sound of the landing gear retracting at 1438:03.

At 1438:13, the flightcrew reported an engine failure to air traffic control. The controller asked the flightcrew if they would like to return to the airport and they replied affirmative. The controller then offered a 180-degree turn to runway 9R and the flightcrew requested a traffic pattern to runway 27L, which the controller approved with left turns in the pattern. At 1438:56, the flightcrew reported that they needed to turn left downwind and the controller cleared them to land on runway 9R. An enhanced ground proximity warning sound was recorded at 1438:58, followed by a terrain warning at 1439:01 and a stall warning horn at 1439:04. No further communications were received from the accident flight and the CVR recording ended at 1439:20.

Review of radar data revealed that six targets were recorded during the accident flight. The first target was recorded at 1438:18, at an altitude of 200 feet mean sea level (msl) about 1,000 feet beyond the departure end of runway 27L. The next three targets indicated a slight left turn at 300 feet msl. The fifth target indicated a continued slight left turn at 200 feet msl. The last target was recorded at 1439:19, at 100 feet msl, next to a utility pole that was struck. Witnesses observed the airplane flying low, with the left wing down and the left propeller turning slower than the right propeller, before the airplane impacted the utility pole.

PILOT INFORMATION

The pilot held a Venezuelan pilot and medical certificate. According to logbook excerpts and information from the operator, the pilot had accumulated a total flight experience of approximately 19,053 hours; of which, 17,860 hours were in multiengine airplanes. The operator added that of the total hours, the pilot had accumulated 1,476 hours in Beech 1900s with the company since 2006. The operator further reported that the pilot had accumulated

additional Beech 1900 experience prior to employment, but they did not have information as to the number of hours.

The co-pilot held a Venezuelan pilot and medical certificate. He also held an FAA airline transport pilot certificate and first-class medical certificate, dated November 14, 2014. According to logbook excerpts and information from the operator, the co-pilot had accumulated a total flight experience of approximately 9,529 hours; of which 5,184 hours were in multiengine airplanes. The operator added that of the total hours, the co-pilot had accumulated 152 hours in Beech 1900s with the company since 2012. The operator further reported that the co-pilot had accumulated additional Beech 1900 experience prior to employment, but they did not have information as to the number of hours.

AIRCRAFT INFORMATION

The 21-seat, twin-engine, low-wing, retractable gear airplane, serial number UC-47, was manufactured in 1988. It was powered by two Pratt and Whitney Canada PT6A-65B, 1,100 horsepower engines, equipped with four-blade, controllable-pitch, Hartzell HC-B4MP-3A propellers. The airplane was maintained under a manufacturer's approved inspection program. Review of maintenance records revealed that the airplane's most recent inspection was completed on February 2, 2015. At that time, the airframe had accumulated 35,373 total hours of operation. The left engine had been operated for 2,305 hours since overhaul and the right engine had been operated for 3,449 hours since overhaul.

On February 9, 2015, the left engine propeller was removed for overhaul and replaced with another overhauled propeller. The accident flight was the first flight after the overhauled propeller was installed on the left engine.

During an interview, the aviation maintenance technician (AMT) that removed and replaced the left engine propeller stated that the pilots reported problems with the left engine propeller on February 7, 2015. Specifically, the pilots reported that the propeller was not achieving the correct power setting or pitch angle. The AMT further stated that he completed the propeller removal and replacement in about 6 hours, which was normal. He followed the airplane maintenance manual and only needed to disconnect the beta arm to perform the work. The AMT subsequently checked his own work and concluded with an operational check of power and performance, which included verifying correct power settings and corresponding blade angles.

METEOROLOGICAL INFORMATION

The recorded weather at KTMB, at 1453, was: wind from 030 degrees at 5 knots; sky clear; visibility 10 miles; temperature 23 degrees C; dew point 10 degrees C, altimeter 29.96 inches of mercury.

FLIGHT RECORDERS

Cockpit Voice Recorder

The airplane was equipped with a Fairchild model A-100S CVR. The CVR recorded a minimum of 30 minutes of digital audio stored on solid state memory modules. Four channels were recorded: one channel for each flightcrew, one channel for a cockpit observer, and one channel for the cockpit area microphone. The channel for a cockpit observer did not record any audio, nor was it required to. The other three channels recorded audio of poor quality; however, a CVR Group convened at the NTSB Vehicle Records Laboratory, Washington, DC, on April 28,

2015 and was able to prepare a transcript of the recording. The transcript included 12 minutes, 26 seconds of the audio recording, which began as the flightcrew was preparing to start the engines and ended after impact (for more information, and a copy of the transcript, see CVR Group Chairman's Factual Report of Investigation in the NTSB public docket).

Flight Data Recorder

The airplane was equipped with a Loral/Fairchild Model F1000 flight data recorder (FDR). Data were successfully downloaded at the NTSB Vehicle Recorders Laboratory, Washington, DC. The following parameters were recorded and plotted: autopilot engage; engine No. 1 propeller reverse; engine No. 1 propeller speed; engine No. 1 torque; engine No. 2 propeller reverse; engine No. 2 propeller speed; engine No. 2 torque; indicated airspeed; longitudinal acceleration; magnetic heading; microphone No. 1 keying; pressure altitude; and vertical acceleration.

Review of the plotted data revealed that engine torque and propeller rpm increased slightly about 10 seconds after the flight was cleared for takeoff, consistent with the airplane taxiing onto the runway for takeoff. At 1437:20, the engine torque increased to approximately 3,000 foot-pounds (ft-lbs) and the propeller rpm increased to 90 percent, consistent with takeoff power. At 1437:54, which was 2 seconds after one of the pilots stated "rotate," the left engine propeller rpm decreased to 60 percent while the left engine torque increased off-scale (beyond 5,000 ft-lbs), consistent with the left propeller travelling to the feathered position and the engine torque increasing in an attempt to maintain propeller rpm. The left engine propeller rpm and torque decreased to 0 at 1438:28 and 1438:34, respectively, consistent with the engine being shut down. At that time, the right engine propeller rpm remained at 90 percent and right engine torque remained between 3,000 to 5,000 ft-lbs until the end of the data, which was approximately 50 seconds later. During that time, the indicated airspeed decayed from about 110 knots to 100 knots and the magnetic heading indicated a 40-degree left turn (for more information, see FDR Specialist's Factual Report of Investigation in the NTSB public docket).

Additionally, FDR data recorded between the end of the previous flight and the accident flight were consistent with an approximate 12-minute postmaintenance engine run; however, there was no evidence of a torque check, overspeed governor test, low pitch solenoid test, primary governor check or autofeather check.

WRECKAGE INFORMATION

The airplane came to rest upright in a field against several trees, oriented about a magnetic heading of 110 degrees. The beginning of a debris path was observed near a severed utility pole and scrape marks across the adjacent road were consistent with left wingtip contact. Additionally, sections of the left propeller blades were located near the utility pole and along the debris path, consistent with the left propeller impacting the utility pole as the left wingtip was scraping the ground. The debris path extended about 240 feet, on a magnetic heading of 240 degrees, to the main wreckage.

A postcrash fire consumed a majority of the cockpit and cabin. The horizontal stabilizer, vertical stabilizer, elevator, and rudder remained intact and were charred. The left and right outboard sections of the horizontal stabilizer and elevator were separated consistent with impact damage. The left wing mid-section had been consumed by fire. The left wing inboard flap was retracted and partially consumed by fire. The left wing outboard flap was charred and

partially separated. The left aileron separated from the left wing and the left main landing gear was retracted.

The right wing was also partially consumed by fire and the right main landing gear was retracted. The right inboard flap, right outboard flap and right aileron were consumed by fire. The nosegear was also retracted. The elevator trim actuator measured 2 inches, which equated to greater than 15 degrees (off scale) trim tab down. The rudder trim actuator measured 3 inches, which equated to approximately 15 degrees trim tab left (full right rudder). The aileron trim actuator measured 1.93 inches, which corresponded to an approximate neutral setting.

Control continuity was confirmed from the ailerons to the bellcrank at the left wing root. That bellcrank had partially melted and one of the two cables leading to the cockpit had released where the bellcrank melted. The other cable remained attached. Rudder control continuity was confirmed from the rudder pedals, to the wing root area where the cables were cut by recovery personnel, to the rudder. Elevator continuity was confirmed from the control column, to the wing root area where the cables were cut by recovery personnel, to the elevator. Rudder and elevator trim cable continuity was confirmed from their respective trim tabs to the cockpit area.

The right propeller remained attached to the right engine and all four composite propeller blades separated at the hub. The right engine exhaust duct exhibited torsional bending and compression. The right engine was partially disassembled. The power section was separated from the gas generator case. Rotational scoring was observed between the compressor turbine disc and the first stage power turbine stator and baffle. Rotational scoring was also observed on the first stage power turbine blades and shroud. Continuity was confirmed from the compressor turbine disc to the accessory gearbox.

Teardown examination of the right propeller did not reveal any preimpact mechanical malfunctions and the propeller blades were found to be within the normal operating range at the time of impact.

The left propeller remained attached to the left engine and two of the four composite propeller blades had separated at the hub. One blade separated about 1 foot from the hub and the fourth blade remained attached and twisted. The propeller governor was in place, but the propeller speed control lever was separated and missing. The propeller governor reversing lever (beta arm) was found above the guide pin and the beta carbon block was separated and missing. The propeller governor cable rigging was attached; however, the sleeve nut that connects to the clevis was fractured, adjacent to the cambox. The cambox was fractured and the connecting rod between the fuel control and the cambox was bent. The pressure sensing line from the propeller governor to the fuel control was intact. The propeller overspeed governor was in place, but its cannon plug was severed.

The left engine exhaust duct exhibited some compression. Teardown examination of the left engine revealed that the compressor turbine (CT) was intact and all blades on the CT disk were complete and did not exhibit thermal damage or deformation. The CT disk had rub marks over a 90-degree section on the blade tips and blade attachments. A 360-degree rub was also present on the CT disk center bore and a coincident rub on the turbine baffle center dome between the 12 and 6 o'clock positions (for more information, see Powerplant Group Chairman's Factual Report in the NTSB public docket).

Teardown examination of the left propeller did not reveal any preimpact mechanical

anomalies. Impact (witness) marks on the piston dome corresponded to the blades being in the feathered position at the time of impact. One propeller blade appeared to have been rotated 180 degrees from the normal operating range, consistent with impact forces. Although the beta arm was found above the guide pin, rather than below it, subsequent metallurgical examination of the guide pin revealed scrapes and bending consistent with the beta arm being forced above the guide pin by impact forces, propeller removal or wreckage recovery (for more information, see Materials Laboratory Factual Report in the NTSB public docket).

MEDICAL AND PATHOLOGICAL INFORMATION

Autopsies were performed on the pilot and copilot by the Miami-Dade County Medical Examiner Department, Miami Florida, on February 12, 2015.

Toxicological testing of the pilot and copilot was performed on the pilot by the FAA Bioaeronautical Science Research Laboratory, Oklahoma City, Oklahoma.

Review of the pilot's toxicological report revealed:

"Chlorpheniramine detected in Urine

Chlorpheniramine detected in Blood

Pseudoephedrine detected in Urine

Pseudoephedrine detected in Blood

Telmisartan detected in Blood

Telmisartan detected in Urine"

Chlorpheniramine was a sedating antihistamine; however, the levels detected were below reportable quantitative levels, consistent with levels that would not result in impairment. The detected Pseudoephedrine and Telmisartan were a decongestant and blood pressure medication, respectively. Both had an acceptable side effect profile consistent with no degradation in the pilot's performance during the accident flight.

Review of the copilot's toxicological report revealed:

"Diphenhydramine detected in Urine

0.061 (ug/ml, ug/g) Diphenhydramine detected in Blood (Cavity)

Losartan detected in Blood (Cavity)

Losartan detected in Urine"

Diphenhydramine was also a sedating antihistamine and the level detected was within the therapeutic range; however, a determination could not be made regarding impairment of the copilot due to the testing source being from cavity blood. Losartan was also a blood pressure medication with an acceptable side effect profile.

ADDITIONAL INFORMATION

Checklists

The "Before Takeoff (Runup)" checklist included:

"...7. Cockpit Voice Recorder (if installed).....Check

- a. Headset.....Check
 - b. CVR Test Button.....Press And Hold
 - Observe meter needle in green band.
 - Listen for test tone in headset...
- ...16...c. Power Levers.....Increase Until Props Are Stabilized at 1520 To 1610 RPM...
- ...17. Low Pitch Solenoid.....TEST
- a. Power Levers.....Idle (Note Prop RPM)
 - b. Prop Test Switch.....Hold To Low Pitch
 - c. Prop RPM.....Stabilized Approx 200 RPM Below Value in Step a....

- ...20. Autofeather.....Check
- a. Power Levers...Set Approximately 700 FT-LBS Torque
 - b. Autofeather Switch.....Hold In Test (Both Autofeather Annunciators – Illuminated)
 - c. Power Levers.....Retard Individually
 - 1) At approximately 550 ft-lbs- Opposite Annunciator.....Extinguished
 - 2) At Approximately 320 ft-lbs- Both Annunciators.....Extinguished..."

Data consistent with execution of these checklist items were not captured on the CVR or FDR.
Performance

Review of the Beech 1900C Airliner Emergency Procedures revealed:

"Engine Failure During Takeoff (At or Above V1) – Takeoff Continued

- 1. V1 Speed.....Rotate
- 2. Landing Gear (when positive climb established).....Up
- 3. Airspeed.....Maintain V2 to 400 Feet AGL
- 4. Propeller (inoperative engine).....Verify Feathered
- 5. Airspeed (at 400 feet AGL minimum).....Increase To Flaps Up Vyse
- 6. Flaps.....Up
- 7. Climb to 1000 feet AGL and Accomplish the Following Cleanup Procedures:..."

The airplane's maximum gross weight was 17,610 pounds. A weight and balance could not be computed due to the destruction of baggage/cargo; however, there was no evidence to indicate

the airplane was at or over gross weight. The airplane's published takeoff safety speed (V₂) was 120 knots (at 16,600 pounds and flaps up) and the single-engine best rate of climb speed (Vy_{se}) was 125 knots. The published single-engine rate of climb under the given conditions was approximately 500 feet per minute.

Propeller

Review of the Beech 1900C airliner maintenance manual, chapter 61, Propeller Maintenance Practices, C. Installation, revealed, "...(13) Check the propeller reversing linkage on the front end of the engine for proper rigging..."

Ground Fine Stop System

The airplane's ground fine stop system was designed to prevent the propeller from operating at too fine (flat) a pitch during flight, whereas such a pitch might be utilized during ground operations. It used an electrical solenoid mounted on the front of the reversing push/pull cable to limit the propeller blade angle to 0 to 7 degrees. The solenoid was connected to the propeller reversing lever by means of a slotted clevis, which allowed the reversing lever to be pulled aft, resetting the beta valve. The electrical solenoid could be energized by two ground paths. One was through the right landing gear squat (weight on wheels) switch. The other occurred by pulling the power levers to the ground idle fine switch. The solenoid in each case energizes and pulls the reverse lever of the beta valve aft to reset the blade angle.

Review of the Beech 1900C airliner maintenance manual, chapter 76, Controls – Maintenance Practices, 8 Propeller Ground-Fine Solenoid, A. Rigging revealed:

"(1) Install the solenoid in the supporting bracket with the aft surface of the solenoid flush with the aft portion of the support bracket.

(2) Connect the solenoid arm to the propeller reversing lever

(3) Position the solenoid bracket on the beta cable housing so that the distance between the forward surface of the solenoid and the center of the clevis pin through the end of the solenoid plunger is 0.5-inch.

(4) Assure that all hardware is tight and that the safety wired are installed at the beta cable end as appropriate."

The section also contained a warning, "Warning: Misadjustment of the beta valve can cause unplanned feathering of the propeller. Resulting in a possible hazard to airplane operation and overtorque damage to the engine"

The rigging on the accident airplane could not be verified due to impact damage.

History of Flight

Takeoff	Miscellaneous/other (Defining event)
Initial climb	Loss of control in flight
Uncontrolled descent	Collision with terr/obj (non-CFIT)

Pilot Information

Certificate:	Airline Transport	Age:	54, Male
Airplane Rating(s):	Multi-engine Land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	Airplane Multi-engine	Toxicology Performed:	Yes
Medical Certification:	Unknown	Last Medical Exam:	
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	
Flight Time:	19053 hours (Total, all aircraft), 1476 hours (Total, this make and model)		

Co-Pilot Information

Certificate:	Airline Transport	Age:	49, Male
Airplane Rating(s):	Multi-engine Land	Seat Occupied:	Right
Other Aircraft Rating(s):	None	Restraint Used:	
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	Airplane Multi-engine	Toxicology Performed:	Yes
Medical Certification:	Class 1 With Waivers/Limitations	Last Medical Exam:	11/14/2014
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	
Flight Time:	9529 hours (Total, all aircraft), 152 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Manufacturer:	BEECH	Registration:	YV1674
Model/Series:	1900 C	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Transport	Serial Number:	UC-47
Landing Gear Type:	Retractable - Tricycle	Seats:	21
Date/Type of Last Inspection:	02/02/2015, AAIP	Certified Max Gross Wt.:	16660 lbs
Time Since Last Inspection:		Engines:	2 Turbo Prop
Airframe Total Time:	35373 Hours	Engine Manufacturer:	Pratt & Whitney
ELT:	C126 installed, not activated	Engine Model/Series:	PT6A-65B
Registered Owner:	Aeropanamericano, C.A	Rated Power:	1100 hp
Operator:	Aeropanamericano, C.A	Air Carrier Operating Certificate:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	KTMB, 10 ft msl	Observation Time:	1453 EST
Distance from Accident Site:	3 Nautical Miles	Direction from Accident Site:	70°
Lowest Cloud Condition:	Clear	Temperature/Dew Point:	23°C / 10°C
Lowest Ceiling:	None	Visibility	10 Miles
Wind Speed/Gusts, Direction:	5 knots, 30°	Visibility (RVR):	
Altimeter Setting:	29.96 inches Hg	Visibility (RVV):	
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Miami, FL (KTMB)	Type of Flight Plan Filed:	IFR
Destination:	Providenciales, FN (MBPV)	Type of Clearance:	IFR
Departure Time:	1438 EST	Type of Airspace:	

Airport Information

Airport:	Miami Executive Airport (KTMB)	Runway Surface Type:	Asphalt
Airport Elevation:	10 ft	Runway Surface Condition:	Dry
Runway Used:	27L	IFR Approach:	None
Runway Length/Width:	5999 ft / 150 ft	VFR Approach/Landing:	None

Wreckage and Impact Information

Crew Injuries:	2 Fatal	Aircraft Damage:	Destroyed
Passenger Injuries:	2 Fatal	Aircraft Fire:	On-Ground
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	4 Fatal	Latitude, Longitude:	25.631944, -80.480556

Administrative Information

Investigator In Charge (IIC):	Robert J Gretz	Adopted Date:	06/27/2016
Additional Participating Persons:	Arlander D Barker; FAA/FSDO; Miramar, FL Ricardo Asencio; Textron Aviation; Wichita, KS Dan Boggs; Hartzell Propeller; Piqua, OH		
Publish Date:	06/27/2016		
Note:	The NTSB traveled to the scene of this accident.		
Investigation Docket:	http://dms.nts.gov/pubdms/search/dockList.cfm?mKey=90714		

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