N155TP MB-326 "Impala" Mishap – 05 March 2021 - front-seat pilot report

The objective of the flight was to evaluate the departure susceptibility, spin characteristics and spin recovery procedures of the MB326 Impala.

We took off from KMHV and climbed to 18000 ft MSL in a left-hand 270° turn for control agency coordination prior entering R-2515. Altitude checks at 10000ft MSL and 15000ft MSL, roll rate and g's verifications were performed with the Telemetry Room.

We performed the following tests in the West spin Area in R-2515:

Event#	FTT	Phase	Start speed (KIAS)	Start altitude (ft MSL)	Config.	Fuel tip tanks	Power setting	Bleed rate to stall (kias/sec)	Input at stall	Number of spin turn prior recovery	Spin Recovery input	Spin back-up recovery (performed if not recovered with spin recovery input in 2 turns)
1	Departure suscept. eval	A	115	18000	Flaps UP – Gear UP	Not EMPTY	Idle	1	None		N/A	N/A
2								5				
3			200					Left-hand wind- up turn at 1g/sec				
4		В	115					1	full rudder left and stick full aft right during 1sec then controls neutral			
5	Left erect spin	N/A				EMPTY			Full rudder left and stick full aft	3	Rudder opposite yaw direction and after 1 sec stick neutral (AFM erect spin recovery)	
6	Departure suscept. eval	С							full rudder left and stick full aft right during 3sec then controls neutral	N/A	Rudder opposite yaw direction and after 1 sec stick neutral (AFM erect spin recovery)	
7		D		20000					full rudder left and stick full aft right during 3 turns or 15sec then controls neutral	2 additional turns after the first 3 turns	Rudder opposite yaw direction and after 1 sec stick neutral (AFM erect spin recovery)	

8	Left	N/A				Full rudder left and stick	3	Rudder opposite vaw	
	inverted	-				full forward right		direction and stick	
	spin					(maintained until spin		neutral (AFM inverted	
						recovery start)		spin recovery)	
9	Left erect					Full rudder left and stick		Rudder opposite vaw	Rudder opposite vaw
-	spin – 3					full aft (maintained until		direction and stick aft –	direction and after 1 sec
	turns – Nasa					spin recovery start)		when vaws stops.	stick neutral (AFM erect
	Standard							controls neutral	spin recovery)
	recovery								
10	Left erect							Budder and stick neutral	Budder opposite vaw
	spin - 3								direction and after 1 sec
	turns – Nasa								stick neutral (AFM erect
	Neutral								spin recovery)
	recovery								//
11	, Left erect							Controls released	
	spin – 3								
	turns –								
	controls								
	release								
12	Left erect						6	Rudder opposite yaw	N/A
	spin – 6							direction and after 1 sec	
	turns							stick neutral (AFM erect	
								spin recovery)	
13	Left		22000	1		Full rudder left and stick	3	Rudder opposite yaw	Rudder opposite yaw
	inverted					full forward right		direction and stick aft -	direction and stick
	spin – 3					(maintained until spin		when yaws stops,	neutral (AFM inverted
	turns –					recovery start)		controls neutral	spin recovery)
	NASA								
	Standard								
	recovery								

The first 12 events were uneventful.

For clarity purpose, the entire process of the 13th event will be explained here under in details:

Once stabilized at 22000ft MSL and 115 KIAS, the power was set to IDLE and pitch up motion was initiated with a speed bleed rate of 1KIAS/sec. At stall (characterized by heavy buffeting and uncommanded pitch down motion), front-seat pilot activated rudder fully left and stick full forward right. The aircraft departed and entered a left inverted spin. The controls were maintained as such during 3 spin turns. After 3 spin turns, front-seat pilot activated fully right rudder and stick fully aft centered. After two turns, the aircraft was not showing any sign of recovery; therefore, the front-seat pilot reverted to the AFM recommended recovery procedure by positioning the stick at neutral position and keeping full right rudder. The aircraft did not show any sign of recovery during approximately 2 turns. The back-seat pilot took the controls and tried to recover the aircraft. A call from the Telemetry room of "15000ft" was heard. Front-seat pilot called "13000ft" and "12000ft". Back-seat pilot ordered "EJECT, EJECT, EJECT" just after "12000ft" call. At the second EJECT word, front-seat pilot pulled the lower ejection handle and the ejection sequence started.

In the air, front-seat pilot saw the back-seat pilot under his parachute but not moving. Mask was removed, visor was put up and right side survival kit connection was detached. When on the ground, front-seat pilot joined the back-seat pilot to know his conditions and called NTPS to declare the situation. Emergency services arrived and pilots were evacuated to the hospital.

Accident Statement – Jason Paquin, NTPS

Aermacchi MB-326 Impala N155TP Operator: National Test Pilot School (NTPS) Owner: Flight Research International (FRI) Date of Accident: 05 March 2021 Time: Approximately 0930 local

Crew:

Front Seat: Captain Tanguy Fivé, Belgian Air Force, Test Pilot Student Rear Seat: Jason Paquin, NTPS, Flight Test Instructor Total Time: 4,300 hours

Background:

Jason Paquin:

- i) Civil Ratings:
 - (1) Transport Canada Airline Transport Pilot Licence
 - (2) Transport Canada Group 1 Instrument Rating
 - (3) EASA Flight Test Instructor
 - (4) FAA Commercial Certificate
 - (5) FAA Instrument Rating Airplane
 - (6) FAA CFI
 - (7) FAA MEI
 - (8) FAA Type / Experimental Endorsements:(a) L-29, L-39, MB-326, Sabreliner 65
- ii) 28 years, Royal Canadian Air Force
 - (1) F/A-18 Out-of-Control (OOC) and Departures Instructor Pilot
 - (2) 'A' Category Qualified Flying Instructor
 - (3) 8 years' experience conducting Qual Evals with USAF TPS in the Canadair Tutor, specifically focused on spins and spin chase
 - (4) Graduate, Empire Test Pilots' School professional course, 2009
- iii) 15 months, International Test Pilots School
 - (1) Chief Test Pilot
 - (2) Chief Flying Instructor, Fixed Wing
- iv) 15 months, National Test Pilot School

Narrative:

The sortie for N155TP, the test article of the day, was thoroughly briefed between the Test Pilot Student (TPS), the Test Pilot Instructor (TPI), the Telemetry Engineer Student (TMES), and a second TMES who would assist with data collection and sortie management. The two TMES were monitored by a staff telemetry engineer instructor (TMEI). As this was a data-collection flight, the TPI's involvement was meant to be as a safety pilot rather than offering full-time instruction. Primary items of interest during the pre-flight brief were: 1. Ensuring correct pilot control input techniques, 2. Spin behavior recognition and identification, and 3. Hazard mitigation and safe practices.

The strap-in to the aircraft was monitored per-cockpit with the groundcrew assisting to ensure straps were routed correctly and tightened securely.

Prior to the spin which precipitated ejection, numerous previous near-spins and spins exhibited expected entry and recovery behaviours. This also included an inverted spin with identical entry parameters and data requirement as the unrecoverable spin.

The unrecoverable inverted spin was entered in accordance with the briefed procedure, which was confirmed through the test cards in-cockpit and verbal direction from the TMES. The TPI also ensured the student followed the procedure correctly. Upon entry, the aircraft behaved normally throughout the incipient stage (1 revolution) and the subsequent 2 revolutions in the spin. At this point the TPI saw something move rapidly past the canopy in close proximity to the aircraft, however it was not obvious how close or what the object was. At this point the spin attitude began to steepen and increase in rate. The TPI directed the TPS to recover by stating, "Recover, recover" with the student replying, "I'm trying" but it was quickly obvious that the student could not recover. The TPI took control and attempted one final recovery input, however the spin rate was increasing with a subsequent increase in negative G forces resulting in the TPI being pushed out of the seat (suggesting the negative-G / centre hold-down strap loosening) preventing sufficient controls deflections and decreased useful consciousness. At the ejection decision altitude, the TPI directed ejection ("Eject, eject"). The student departed the aircraft after the second 'eject' call with an additional increase in spin rate and negative G forces. Once the TPI confirmed the student was clear of the aircraft he pulled his ejection handle. As the FTI was being partially thrown out of the seat, when the rocket catapult fired the seat slammed into his buttocks / lower spine, resulting in a significant spinal fracture. The subsequent descent and landing under the parachute occurred normally.