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INVESTIGATION REPORT

Accident to the CESSNA 525A "CitationJet CJ2+" registered D-IULI

on 06 June 2018
at La Môle (Var)

Time	Around 13:05[1]
Operator	ProAir
Type of flight	Own-account transport
Persons on board	Pilot and one passenger
Consequences and damage	Pilot and passenger injured, aeroplane destroyed
This is a courtesy translation by the BEA of the Final Report on the Safety Investigation published in April 2021. As accurate as the translation may be, the original text in French is the work of reference.	

[1] Except where otherwise indicated, times in this report are local.

Runway overrun during landing run on wet runway, collision with an obstacle

1 - HISTORY OF THE FLIGHT

Note: the following information is principally based on the AReS maintenance recorder data, statements, radio communication recordings and radar data.

The pilot, accompanied by a passenger sat in the cockpit, took off at around 12:15 on an IFR flight plan from Figari airport (Corsica), bound for La Môle airport.

At 12:30, during the aeroplane's descent, the pilot contacted the Nice approach controller and asked for clearance to carry out an approach via point EM[2]. The controller contacted the Nice Info controller by telephone to inform him of the arrival of the aeroplane. After making this phone call, he informed the pilot that there was heavy rain, visibility was four kilometres at the destination airport, and he asked him for his intentions. The pilot replied that he was reducing speed to the minimum and asked for an avoidance heading. The controller accepted and asked him to contact the Nice Info controller.

[2] Dyke southeast of Grimaud, RDL 355° 2.7 NM of VOR STP.

The latter told the pilot to continue in accordance with the previous clearances and to keep him informed of his intentions. The pilot replied that he was waiting for the showers to finish at La Môle and that he would carry out an approach via point EM. The controller responded by asking him to call back when he was ready to turn towards point EM and asked him to descend to FL60.

A few minutes later, the pilot told the controller that he had not managed to contact the AFIS officer at La Môle and asked him to tell him when the showers were over. The controller accepted and contacted the La Môle AFIS officer by telephone to ask him to keep him informed of shower developments.

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*Liberté
Égalité
Fraternité*

Three minutes later, although he had not received information about weather developments, the pilot asked to turn towards point EM. In the minutes that followed, the pilot asked to change heading several times in order to avoid clouds.

A few minutes later, the pilot indicated that he had point EM in sight. The controller authorized him to carry out a visual approach for runway 24 and then asked him to contact the La Môle AFIS officer.

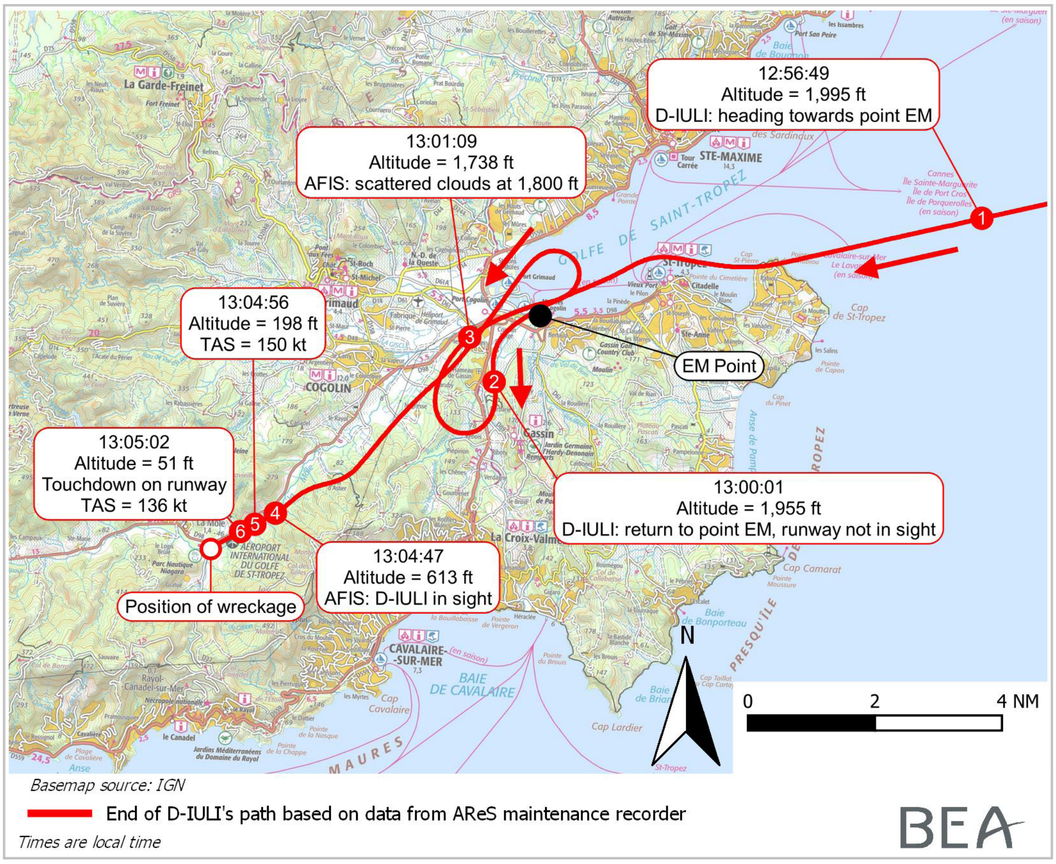

Figure 1: Approach path

The latter told the pilot that he was the sole aircraft in the airport circuit, asked him to call back on final approach and gave him the wind conditions (030°, 3 kt).

The pilot carried out a first approach which he aborted as he could not see the runway due to the clouds❷. He informed the AFIS officer that he was returning to point EM. The latter gave him the wind conditions again (040°, 4 kt) and asked him to call back on final approach. He then specified the cloud cover (scattered clouds at 1,800 ft) as the aeroplane headed to point EM❸.

Two minutes later, the pilot asked for the visibility on the final path. The AFIS officer told him that visibility was 4 to 5 km, before informing him that he had him in sight ❹ and giving him the latest wind conditions (070°, 3 kt). Between points ❹ and ❺, the aeroplane's TAS[3] varied between 145 kt and 150 kt[4].

[3] True Air Speed..

[4] The reference speed on approach, at the maximum landing weight is 111 kt and the reference speed for a steep slope approach is 123 kt.

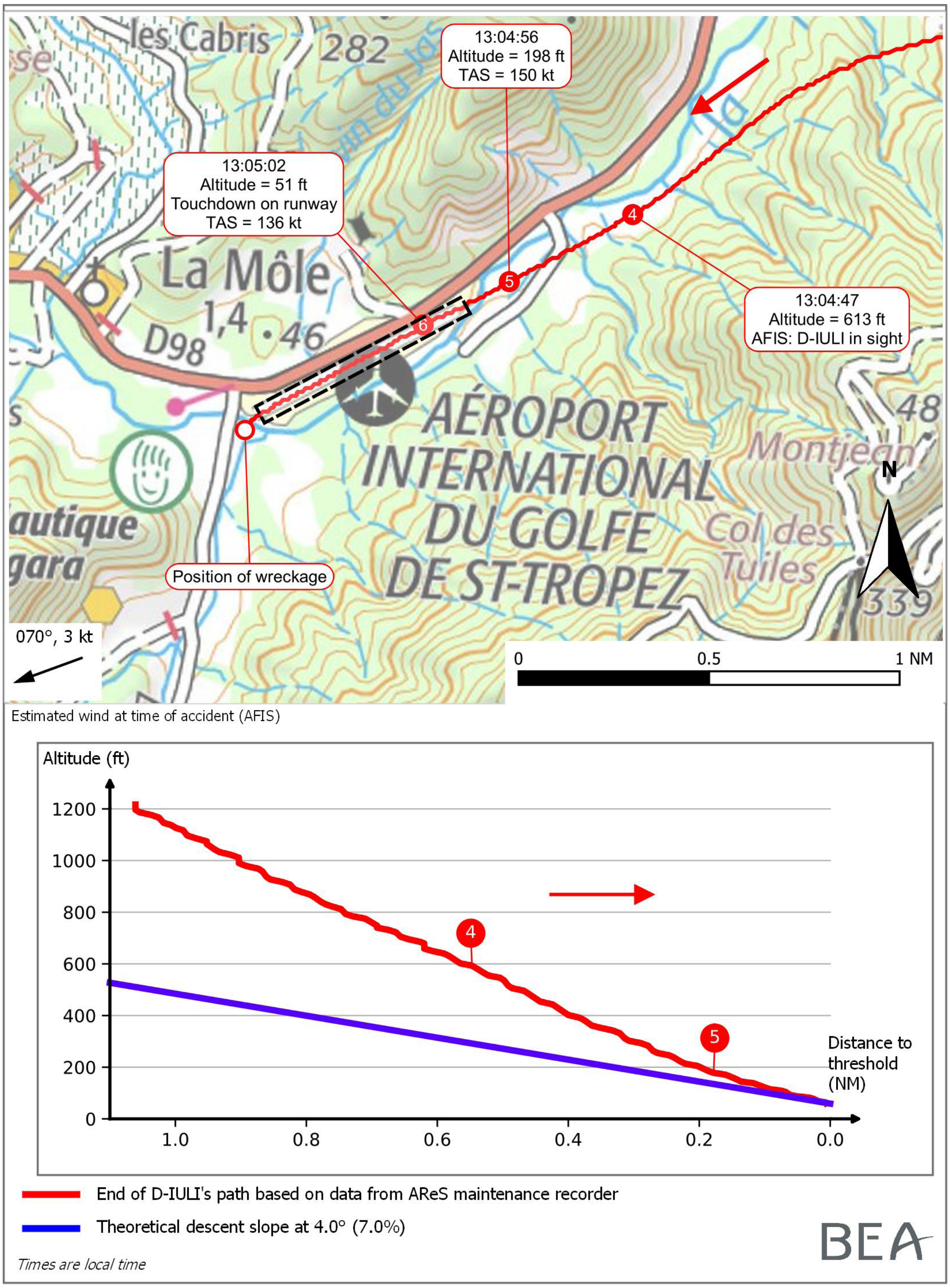

Figure 2: Final approach path

The aeroplane touched down on the runway 200 m after the runway threshold ❻, at a true airspeed of 136 kt. The pilot set the flaps to the "*full ground*" position and the spoilers were deployed. The aeroplane reached the taxiway B intersection[5] 13 s later at a true airspeed of 77 kt. It continued its run over the paved strip situated after the end of runway 24 and deviated left. It left the paved surface at a true airspeed of 41 kt and descended into the river situated at the bottom of a small bank. The aeroplane's nose violently struck the opposite bank.

[5] Corresponding to the displaced threshold of runway 06.

The pilot managed to evacuate the aeroplane through the emergency exit on the rear right side of the aeroplane. The emergency services then helped the passenger blocked in the cockpit to evacuate the aeroplane.

2 - ADDITIONAL INFORMATION

2.1 Examination of site and wreckage

The wreckage was positioned in the riverbed at around 100 m from the end of runway 24, on the left side of the runway centreline. The lower central section of the fuselage and the main landing gear were partially submerged in the river. The aft section of the fuselage was lying on the bank on the airport's side and the forward section on the opposite bank. All of the damage observed was the consequence of the aeroplane's runway excursion and collision with the bank. No debris from the aeroplane was found before the wreckage or on the runway.

Figure 3: Views of wreckage

The main access door situated on the forward left side of the aeroplane was closed and locked. There were deformations in the structure.

The visual examination of the wheels and brake units did not find signs of excessive braking. The anti-skid system was set to "*ON*" on the instrument panel in the cockpit. An in-depth examination of this system was not carried out.

The flaps were in the landing position and the speedbrakes were extended.

It was not possible to precisely evaluate the remaining quantity of fuel inside each wing at the time of the accident.

There was equipment in the aft hold for a total weight of 140 kg. The equipment was not secured and had severely damaged the aeroplane's structure during the collision.

2.2 Meteorological information

A southeasterly to east-southeasterly oceanic regime near the ground was present. Showers associated with towering cumulus (TCU) had crossed the site in the hour preceding the accident, with a low ceiling varying between 1,600 and 3,000 ft in height and quite a significant reduction in visibility, without any storm activity. The disappearance of nearly all the low cloud layer had been observed between 12:50 and 13:20 with an improvement in visibility and a slight surface wind.

The estimated meteorological conditions at the site at the time of the accident were as follows:

- ❒ mean wind 60°, 3 kt;
- ❒ visibility greater than 10 km;
- ❒ recent heavy rain (4 to 5 mm of rain on the airport and 12 to 20 mm of rain on the massifs situated to the south east);
- ❒ few clouds at 3,000 ft, scattered clouds at 9,500 ft;
- ❒ temperature 20 °C;
- ❒ slight turbulence.

The meteorological forecasts (based on the Nice Côte d'Azur and Cannes Mandelieu airport TAFs) which the pilot had before departing, mentioned rain showers and wind 090°, 5 kt at Nice and variable wind 2 kt at Cannes.

The La Môle airport operator is approved to supply a local report service for atmospheric pressure, temperature, wind, visibility and cloud base height measurements and to transmit these parameters via the SATP[6]. A station is situated on the airport's grounds for this purpose.

[6] Automatic parameter transmission system.

A video of the accident, recorded by the airport's video-surveillance cameras showed that it was raining at the time of the landing.

2.3 Aerodrome information

La Môle airport is a restricted-use airport. At the date of the accident, the conditions of use[7] depended on the aeroplane category ("*heavy*"[8] or "*light*") as well as the type of operation ("*commercial air transport*" or "*general aviation*"). The use of the airport by light aeroplanes was not subject to prior authorization being given. Furthermore, in the scope of general aviation operation, the AIP stipulates that the captain had to:

- ❒ "*have made a reconnaissance flight over the area in command of the ACFT with an instructor approved by the DACSE (*), within the last 2 months. If the pilot's capacity is approved by the instructor, it must be mentioned on the log-book;*
- ❒ *or be qualified for mountain flights;*
- ❒ *or have used the aerodrome as captain of the aircraft in command within the last 24 months.*"

The airport is situated in the river La Môle valley and is bordered by high ground.

Paved runway 06/24 measures 1,071 m long by 30 m wide. The preferred QFU for landing is QFU 241° due to the terrain. The landing distance available (LDA) for runway 24 is 1,071 m. A 60 m-long paved strip is situated after the end of runway 24 corresponding to taxiway A. Measurements were carried out on the runway on 23 January 2018 to study its adherence. The runway complies with regulatory requirements.

The AIP indicates that "*Reporting over EM is recommended for North and East inbound flights. Preferred altitude 2,500 ft due to heavy recommended HEL traffic up to 2,000 ft.*"

[7] Order of 29 May 1997 modifying order of 15 March 1973 with respect to the creation and approval of La Môle airport (Var) - https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000000749023/

[8] Under the regulation (order of 24 July 1991 regarding the conditions of use of civil aircraft in general aviation), "*heavy*" aeroplanes are those with a certified maximum take-off weight of more than 5.7 t or with a maximum certified capacity of tens seats or more, not including the pilot seats. The aeroplanes which do not meet this criteria are considered as "*light*".

The airport operator has an operations manual which defines, in particular, the flight information service: the AFIS provides information and alert services for aircraft in airport traffic, supplies, on request, a meteorological service for air navigation and transmits local reports and regional forecasts produced by Météo-France.

The manual specifies that the deterioration of the surface, momentary variations in the adhesion, the presence of contaminants and all events affecting the marshalling area known to the AFIS officer must be reported to users. Thus, in the case of rain, an AFIS officer is responsible for inspecting the runway, measuring the water level on it using a measurement instrument and of transmitting the water level to all users on the radio frequency. The runway is considered as being contaminated if the water level is more than 3 mm.

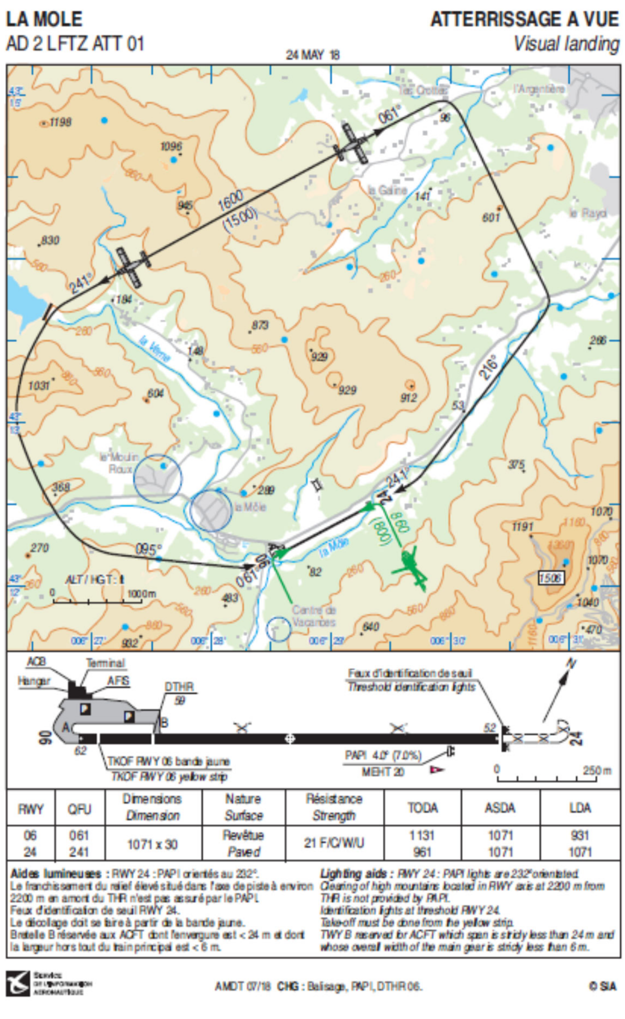

Figure 4: Excerpt from AIP[9] chart

[9] Aeronautical Information Publication.

2.4 Pilot information

The 30-year-old pilot held a Commercial Pilot License (aeroplane) (CPL(A)) issued on 17 June 2014, and had logged more than 2,500 flight hours of which at least 1,234 hours on type. He held the type rating as captain and the instrument rating. His medical fitness certificate was valid.

He had checked out the site on a Cirrus SR22 on 5 March 2017 and had used the airport as pilot flying on D-IULI on 15 May 2018.

He had followed a familiarization course for the use of the EFB[10].

[10] Electronic Flight Bag

2.5 Aircraft information

The aeroplane is equipped with two Williams International FJ44-3A-24 turbojets. It is also equipped with an anti-skid system but no thrust reverser.

It can be operated by a single pilot during non-commercial flights.

Its maximum take-off weight is 12,500 lbs (5,670 kg), and its maximum landing weight is 11,525 lbs (5,227 kg). The maximum certified capacity is seven seats not including the pilot seats.

It is not equipped with a flight recorder; this is not required by the regulations.

2.6 Landing performance calculation information

2.6.1 Operational regulations at date of accident

In commercial air transport[11]), the calculation of the landing performance of turbojet aeroplanes must show that the aeroplane can come to a complete stop within 60 % of the landing distance available for a dry runway. A penalty of 15% is added in the event of a wet runway. A shorter landing distance on a wet runway is accepted, without being less than the factored distance based on a dry-runway, if the flight manual contains specific additional information (i.e. operational margins) about landing distances on a wet runway.

[11] Regulation (EU) No 965/2012 "Air Ops", annex IV Part CAT, paragraph CAT.POL.A.230 a) and CAT.POL.A.235.

These regulatory margins were defined in order to take into account a set of variables and do not exactly correspond to operational realities.

For non-commercial flights with complex motor-powered aeroplanes[12], the calculation of the landing performance must show that the aeroplane can come to a complete stop within the landing distance available. Operational margins must be added by the operator if there are none in the flight manual. The calculation methods and the safety factors and margins used are indicated in the operations manual. No specific safety factor and margin are imposed.

[12] "Air Ops" regulation, annex VI Part NCC, paragraph NCC.POL.135.

The European Aviation Safety Agency (EASA) justifies this different approach in drawing up the commercial operation requirements and non-commercial operation requirements by the less prescriptive and more proportional nature of the regulatory requirements for non-commercial operations. EASA indicates that it is necessary to take into account the wide range of operational specificities which require a balance in the checks and oversight of the operators carried out by the civil aviation authorities.

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2.6.2 Weight and balance sheet

The estimated landing weight in the flight file (11,521 lbs, i.e. 5,225 kg) was less than the maximum landing weight. However, given the weight of the equipment in the aft hold not taken into account by the pilot when preparing the flights, the actual estimated landing weight was 25 kg more than the maximum landing weight. As the flight had been longer than planned, the aeroplane's landing weight was probably close to the maximum landing weight.

2.6.3 Landing performance described in the aircraft flight manual

General

The AFM[13] states that "*A runway is considered wet when there is sufficient moisture on the surface to appear reflective, but without significant areas of standing water.*"

(13) Aircraft Flight Manual.

The dry runway landing distance is calculated using the tables in section IV of the AFM.

The wet or contaminated runway landing distances are calculated using the tables in section VII of the AFM. Thus, the table in figure 7.11 of the AFM, based on the calculated landing distance on a dry runway, is used to determine the landing distances on a wet runway and on a runway contaminated by water or snow, according to the depth of the contaminant.

In section V of the AFM, information to calculate the wet[14] and contaminated[15] runway performance is provided for commercial air transport by aeroplanes with an EASA certification.

(14) Figure S19-9 for landing distances.

(15) Figure S19-12 for landing distances.

In the introduction to sections V and VII, there is a warning which specifies that, "*These distances and correction factors for contaminated runway conditions are approximate and are to be considered as minimums, as actual runway conditions may require distances greater than those determined.*"

Calculation of landing distance in conditions of day

In the temperature conditions of the day, with the maximum landing weight and Vref speed, the dry runway landing distance was 3,020 ft with zero wind and 3,590 ft with a tailwind component of 10 kt. Extrapolating this data makes it possible to estimate the dry runway landing distance in the conditions of the day at 3,190 ft (i.e. around 970 m).

WEIGHT = 11525 POUNDS VREF = 111 KIAS VAPP = 118 KIAS					
TEMP DEG C	TAILWIND 10 KTS	ZERO WIND	HEADWINDS 10 KTS	20 KTS	30 KTS
−25	3240	2700	2540	2390	2240
−20	3280	2730	2580	2420	2270
−15	3310	2770	2610	2450	2310
−10	3350	2800	2640	2490	2340
−5	3380	2830	2670	2520	2370
0	3420	2870	2710	2550	2400
5	3460	2910	2750	2590	2440
10	3500	2940	2780	2630	2470
15	3540	2980	2820	2660	2510
20	3590	3020	2860	2700	2540
25	3630	3060	2900	2740	2580
30	3670	3100	2930	2770	2620
35	3710	3140	2970	2810	2650
40	3750	3180	3010	2850	2690
45	3790	3210	3050	2880	2720
50	3830	3250	3080	2920	2760
54	3860	3280	3110	2950	2780

Figure 5: Calculation table for dry runway landing distance

In the same conditions, the wet runway landing distance was 4,450 ft with zero wind and 5,350 ft with a tailwind component of 10 kt. Extrapolating this data makes it possible to estimate the wet runway landing distance in the conditions of the day at 4,720 ft (i.e. around 1,440 m).

LANDING DISTANCE - FEET

FLAPS - LAND

AIRSPEED - V_{REF}

ADVERSE RUNWAY CONDITIONS (WITHOUT TAILWINDS, 50 FT SCREEN HEIGHT)

DRY RUNWAY	WET RUNWAY	WATER COVERED RUNWAY - INCHES *					SLUSH OR WET SNOW COVERED RUNWAY - INCHES *					DRY SNOW INCHES *		COMPACT SNOW	WET ICE **
		0.125	0.2	0.3	0.4	0.5	0.125	0.2	0.3	0.4	0.5	1.0	2.0		
1600	2350	4650	4450	4100	3800	3650	4750	4400	4200	3950	3700	4450	3900	2250	4600
1800	2700	4950	4700	4350	4050	3850	5050	4700	4450	4200	3950	4700	4100	2550	6200
2000	3050	5250	4950	4600	4300	4050	5350	5000	4700	4450	4200	4950	4300	2900	7800
2200	3300	5550	5200	4850	4550	4250	5650	5300	4950	4700	4450	5200	4500	3200	9400
2400	3550	5800	5450	5050	4750	4450	5900	5550	5200	4950	4700	5400	4700	3450	11200
2600	3850	6050	5650	5250	4950	4650	6150	5800	5450	5150	4900	5600	4850	3700	13800
2800	4150	6300	5850	5450	5150	4850	6400	6050	5650	5350	5100	5800	5000	4000	16400
3000	4450	6550	6050	5650	5350	5050	6650	6300	5850	5550	5300	6000	5150	4300	
3200	4750	6800	6250	5850	5550	5250	6900	6550	6050	5750	5500	6200	5300	4600	
3400	5050	7150	6550	6100	5800	5450	7200	6800	6250	5950	5700	6400	5450	4900	
3600	5350	7550	6950	6450	6100	5750	7550	7050	6500	6150	5900	6650	5650	5150	
3800	5650	8000	7450	6850	6500	6100	7950	7350	6850	6450	6150	6900	5900	5450	
4000	5950	8450	7900	7300	6900	6500	8350	7800	7250	6800	6450	7150	6150	5700	
4200	6250	8950	8400	7750	7300	6900	8800	8250	7650	7200	6800	7450	6400	6000	
4400	6550	9450	8900	8200	7700	7300	9300	8700	8050	7550	7150	7750	6650	6250	
4600	6850	9950	9350	8650	8100	7700	9750	9150	8450	7950	7500	8050	6900	6550	
4800	7150	10450	9850	9100	8500	8100	10250	9600	8900	8350	7850	8350	7150	6850	
5000	7450	11000	10350	9550	8950	8500	10750	10050	9350	8750	8250	8700	7400	7150	
5200	7750	11550	10850	10000	9400	8900	11250	10550	9800	9200	8650	9050	7650	7450	
5400	8050	12150	11400	10500	9900	9350	11800	11100	10300	9700	9100	9400	7900	7750	
5600	8350	12800	12000	11050	10450	9850	12400	11650	10800	10200	9600	9750	8200	8050	
5800	8650	13450	12600	11650	11000	10400	13000	12200	11300	10700	10100	10100	8500	8350	
6000	8950	14100	13200	12250	11550	11000	13600	12750	11800	11200	10600	10450	8800	8650	
6200	9250	14750	13800	12850	12100	11600	14200	13300	12300	11700	11100	10800	9100	8950	
6400	9550	15400	14400	13450	12650	12200	14800	13850	12800	12200	11600	11150	9400	9250	
6600	9850		15000	14050	13200	12800	15400	14400	13300	12700	12100	11500	9700	9550	
6800	10150		15600	14650	13750	13400		14950	13800	13200	12600	11850	10000	9850	
7000	10450			15250	14300	14000		15500	14300	13700	13100	12200	10300	10150	
7200	10750				14850	14600			14800	14200	13600	12550	10600	10450	
7400	11050				15400	15200			15300	14700	14100	12900	10900	10750	
7600	11350									15200	14600	13250	11200	11050	
7800	11650										15100	13600	11500	11350	
8000	11950											13950	11800	11650	
8500	12700											14850	12550	12400	
9000	13450											15700	13300	13150	
9500	14200												14050	13900	
10000	14950												14800	14650	
10500	15700												15550	15400	

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Figure 6: Calculation table for wet runway landing distance

The landing distance available (LDA) for runway 24 is 1,071 m (3,514 ft). The CitationJet CJ2+ could only land on a dry runway here.

2.6.4 Operator's calculation methods

The operator, ProAir, uses tools developed by APG to calculate the performance of each aeroplane based on the information in the AFM. These tools are used by the Operations Control Centre (OCC) to produce the flight file and/or by the crew on their EFB when preparing the flight.

For the EFB, in order to obtain the dry runway landing distance, the pilot enters the aeroplane's configuration and weight along with the temperature and wind conditions, and then chooses the factored increase that he wants to apply according to the type of flight: no factor, 60% factor (corresponding to commercial air transport rules) or 80% factor[16]. To obtain the wet runway landing distance, the pilot then chooses the calculation method that he wishes to use by selecting one of the two boxes: "*WET RWY – 15%" or "WET RWY – AFM ADVISORY*".

[16] It is not explained what this factor corresponds to in the operations manual. It corresponds to the new requirement of paragraph CAT.POL.A.255 of the Air Ops regulation, in force from 12 August 2021, regarding the approval of reduced landing distances.

- In the first case, 15% is added to the dry runway landing distance.
- In the second case, the wet runway distance provided by the application is that indicated in section VII of the AFM.

In the flight file, the landing performance for a given configuration is presented in the form of pdf tables for a dry runway and a wet runway (see example in Figure 7). The input data items are the wind and temperature conditions and the factored increase, the output data items are the aeroplane's weight and landing distance. Whatever the chosen factored increase based on a dry runway, the wet runway landing distance is calculated by adding a 15% increase, corresponding to the first case described for the EFB above.

2.6.5 Flight file available to crew

The following applications, among others, were open on the EFB:

- The Jeppesen application used to consult the en-route charts, the approach charts and information regarding the departure, arrival and alternate airports.
- The navigator open in a ProAir flight file containing, notably:
  - a flight log with the reporting points,
  - fuel load, weight and balance information,
  - the aeroplane's reference speeds,
  - a weather file for the occurrence flight, including en-route wind information, METARs, TAFs and WINTEMs for the departure, arrival and alternate airports,
  - pdf tables of the landing and take-off performances for dry and wet runways (cf. Figure 7).

The ProAir application for the performance calculation was not open.

Cessna Citation CJ2+
Engine: FJ44-3A-24
AFM: 525AFMA-04

LANDING PERFORMANCE
FLAPS 15/LAND

LTT / LFTZ
LA MOLE
LA MOLE, FRA
Elevation: 59

Configuration:

- NO OPTIONS SELECTED

Approach Climb Limits:

Approach Flaps 15

GRAD	-20	-10	0	10	20	25	30	35	40	45	53
2.1%	11525	11525	11525	11525	11525	11525	11525	11525	11525	11525	11525

Field Length Weight Limits/Distances:

Landing Flaps LAND

RWY: 24
LDA: 3514FT
SLOPE: 0.23%
COND: DRY

WIND	OAT	60% FACTOR		80% FACTOR		UNFACTORED	
(KT)	(°C)	WEIGHT	DIST	WEIGHT	DIST	WEIGHT	DIST
-10	-5	NA	NA	8299	3514	11525	3387
	5	NA	NA	8028	3514	11525	3466
	15	NA	NA	NA	NA	11328	3514
	25	NA	NA	NA	NA	10884	3514
	35	NA	NA	NA	NA	10469	3514
0	-5	NA	NA	11362	3514	11525	2838
	5	NA	NA	10923	3514	11525	2911
	15	NA	NA	10482	3514	11525	2989
	25	NA	NA	10077	3514	11525	3066
	35	NA	NA	9700	3514	11525	3143
10	-5	8115	3514	11525	3348	11525	2679
	5	NA	NA	11525	3439	11525	2751
	15	NA	NA	11434	3514	11525	2827
	25	NA	NA	10995	3514	11525	2902
	35	NA	NA	10586	3514	11525	2977
30	-5	9785	3514	11525	2965	11525	2372
	5	9407	3514	11525	3052	11525	2442
	15	9039	3514	11525	3142	11525	2514
	25	8704	3514	11525	3232	11525	2586
	35	8407	3514	11525	3321	11525	2657

RWY: 24
LDA: 3514FT
SLOPE: 0.23%
COND: Wet [115%]

WIND	OAT	60% FACTOR		80% FACTOR		UNFACTORED	
(KT)	(°C)	WEIGHT	DIST	WEIGHT	DIST	WEIGHT	DIST
-10	-5	NA	NA	NA	NA	9596	3514
	5	NA	NA	NA	NA	9225	3514
	15	NA	NA	NA	NA	8854	3514
	25	NA	NA	NA	NA	8512	3514
	35	NA	NA	NA	NA	8238	3514
0	-5	NA	NA	9123	3514	11525	3263
	5	NA	NA	8779	3514	11525	3348
	15	NA	NA	8448	3514	11525	3437
	25	NA	NA	8171	3514	11466	3514
	35	NA	NA	NA	NA	11038	3514
10	-5	NA	NA	10049	3514	11525	3080
	5	NA	NA	9654	3514	11525	3163
	15	NA	NA	9276	3514	11525	3251
	25	NA	NA	8923	3514	11525	3337
	35	NA	NA	8597	3514	11525	3424
30	-5	8142	3514	11525	3410	11525	2728
	5	NA	NA	11525	3510	11525	2808
	15	NA	NA	11089	3514	11525	2891
	25	NA	NA	10665	3514	11525	2974
	35	NA	NA	10275	3514	11525	3056

NA = No valid maximum weight found. *Data may be invalid after 28 days from: 06Jun18*
Maxium allowed weight is the minimum of the Approach Climb Limit, Field Length Limit, and the Structural Limit of the aircraft.
System Version: 2.5.1.0

APG
www.flyapg.com
(303)539-0410

Figure 7: Flight file landing performance

In the ProAir flight file, the landing distance values for a dry runway corresponded to those in the AFM (first table of Figure 7); the landing distance values for a wet runway corresponded to those for a dry runway increased by 15% (second table of Figure 7).

The second table, corresponding to wet runway conditions, gives a wet runway landing distance, with zero wind and a temperature of 15°C as being 3,437 ft. For a temperature of 25°C, landing with the maximum weight is not possible: the landing weight must be reduced to 11,466 lbs, a value below the estimated landing weight in the flight plan. According to this data (and contrary to the AFM data), there is no landing limitation on a wet runway with zero wind and a temperature of 20°C. With a tailwind of 10 kt, landing with the maximum weight is not possible, the landing weight must be reduced. It is not possible to easily calculate the performance with a tailwind of 3 kt and a temperature of 20 °C using the table.

BEA

2.7 ProAir information

The operator carries out both commercial and non-commercial flights, in particular on behalf of the owners of the aircraft which it operates. The occurrence flight was carried out on the owner's request, it was thus a non-commercial flight[17].

The operator held an Air Transport Certificate (ATC) and an operations manual approved by the German civil aviation authority (LBA[18]). This manual defines, in particular, the procedures and rules that the crew must comply with when preparing and performing flights, whatever the type of flight. It is specified therein that the captain is responsible for checking the take-off and landing performance calculations and that he must refer to the AFM in the event of a take-off or landing on a contaminated runway. The calculation rules for commercial air transport are specified. For non-commercial flights, it is simply indicated that the increases to calculate the landing distances in accordance with commercial air transport rules do not apply. No calculation method, safety factor or safety margin is defined.

[17] However, the indication N was recorded on the flight plan which corresponds to a commercial flight.

[18] Luftfahrt Bundesamt.

The operations manual also defines the role and responsibilities of the OCC. No flight may be undertaken without a flight order prepared by the OCC. The OCC files the flight plan and prepares the flight file for the crew.

The performance calculation is not indicated in the list of flight file items described in the operations manual.

Furthermore, it is indicated in the operations manual that the flight operations manager is "*...responsible for ensuring that all aerodromes which are selected as destinations or alternates are adequate and suitable in all respects for the types of aeroplane which are intended to use them. In this context, 'adequate' infers that the runway dimensions and significant obstacles in the local area are such that the performance requirements for the nominated aeroplane type will invariably be met at the weights at which the aeroplane is planned to land and take off, and in the conditions (including contaminated runways) which may be expected to exist at the time of the operation*."

No limitation is mentioned in the manual for the CitationJet CJ2+ for La Môle airport.

Lastly, the operations manual states that the captain can only authorize admission to the cockpit if the person holds a valid cockpit permit issued by the operations manager.

2.8 Data from AReS maintenance recorder

An AReS maintenance recorder was recovered during the examination of the site and wreckage. As the BEA does not have the software required to read out the data contained in this computer, it asked Textron Aviation (Cessna), via the NTSB accredited representative, for it. Cessna argued that this was exclusive data, refused to provide the decoding software required and proposed to convert the parameters.

The data was sent to Cessna on 20 June 2018. On 2 August 2018, the latter sent 15 parameters of its choosing to the BEA which included the true airspeed, altitude and aeroplane configuration parameters (speedbrakes, flaps, etc.). Other parameters such as the attitudes, although necessary to understand the occurrence, were recorded but not supplied, without any justification. The BEA then asked for the exhaustive list of recorded parameters, the conversion table and the data from the preceding flight for comparison. Cessna reiterated that the conversion table (which can be used to obtain the equivalence between the parameter and the selected mode or position for example) was exclusive data and could not be provided.

The BEA then proposed travelling to Cessna's premises to read out the data in order to understand the conversion logic and clarify its demands. This offer, initially accepted, was refused by Cessna three days before the appointed date. The latter finally sent the complete list of parameters on 24 October 2018 and part of the data from the preceding flight on 11 January 2019.

Aware that the data analysis would not be exhaustive due to the absence of certain data, the BEA asked Cessna to carry out this analysis. This request has remained unanswered.

Consequently, it was not possible to carry out an exhaustive analysis of the data.

2.9 Statements

2.9.1 Pilot's statement

The pilot indicated that he had carried out with the same plane, two days previously, a non-commercial flight bound for Figari with the aircraft's owner and another passenger. The owner had than travelled to Saint-Tropez alone by another means of transport.

The morning of the occurrence, the pilot had received a message from the owner asking him to fly to La Môle airport. He telephoned the operator's flight planning, and asked them to file the flight plan. These flights, along with the planned return flight to Frankfort-sur-le-Main airport (Germany) were non-commercial flights (operated for the benefit of the owner) and were therefore carried out in a single-pilot configuration.

The pilot loaded the flight documents from the operator's server using his mobile phone and checked all the information regarding the flight. He observed that the meteorological conditions at Nice Côte d'Azur and Cannes Mandelieu airports, close to La Môle, were good. The pilot loaded the flight documents onto the EFB, carried out the pre-flight inspection and prepared the aeroplane for take-off.

At 11:45, the pilot called the La Môle airport operator to enquire about the weather conditions at the airport. There was no wind but a few clouds were present in the La Môle valley. The meteorological conditions were, at this time, good but a deterioration in the weather was forecast for later in the day. The recommendation was to go there as soon as possible. The pilot called again at 11:53 to confirm that he had correctly understood these indications.

During the flight, just before reaching the coast, there were towering cumuli based at around 2,500 ft. The pilot asked for avoidance headings. When he had returned to VMC conditions, he completed the approach check-list and the controller transferred him to La Môle.

On his first contact with the AFIS officer, the latter had provided him with meteorological information, but had not reported the condition of the runway. From point EM, the pilot followed the standard visual approach for runway 24. He realised that he was a little to the south of the route and that a cloud on the mountain prevented him from seeing the runway. He returned to point EM to carry out a new approach. Having the runway in sight this time, he started the final approach.

(19) 110 kt, speed selected by pilot.

The pilot considered that the aeroplane was stabilised on the PAPI approach path, passed the threshold at the reference speed Vref[19] and touched down at the beginning of the runway. He used the "*ground flaps*" on touchdown. He observed that the braking was ineffective and felt the wheels continuously sliding on the runway. He did not carry out a go-around as on this short runway, surrounded by dangerous terrain, with the flaps completely extended, he thought that this represented too great a risk. The braking system was only effective at the end of the runway, then the aeroplane overran the runway.

The pilot indicated that it was not raining during the approach and landing.

He declared that he had forgotten to enter the weight of the hold luggage when filling in the weight and balance sheet.

2.9.2 Chief pilot's statement

When questioned about the method used by the operator to calculate wet runway landing performance, namely by adding a factor of 15% to the dry runway data, the chief pilot indicated that this method complied with section V of the AFM.

According to him, the tables in section VII of the AFM show the performance on contaminated runways only, with considerably increased landing distances, but such conditions had not been reported the day of the accident.

2.9.3 Aerodrome operator statement

The director of the airport specified that there was never standing water on the runway because the runway surface was very absorbent and water drained off very quickly. Runway contamination may be observed when the river floods: in this case, the airport is closed. The exchanges with the AFIS officers confirmed this information. Consequently, the water level on the runway was never measured.

2.10 Previous events

On 8 December 2017, the Cessna Citation CJ3 registered LX-WEB, performing a non-commercial flight (own-account transport), made a runway excursion at Annecy Meythet (Haute-Savoie) after an erroneous calculation of landing performance on a snow-covered runway.

BEA

[20] https://www.bea.aero/fileadmin/uploads/tx_elydbrapports/BEA2017-0698.pdf

The investigation[20] showed that the method used by the EFB application to calculate the landing distance on a wet runway, was to increase the distance on a dry runway by 15% instead of taking the value indicated in the AFM. However, the aeroplane's landing performance was not compatible, whatever the thickness or type of snow present on the runway, with the runway length available on Annecy Meythet airport.

2.11 Survival aspects

[21] Rescue and fire fighting vehicle holding 2,400 l of water and 250 kg of powder.

[22] Powder rescue and fire fighting vehicle holding 250 kg of powder.

Three firemen were present at the airport. The AFIS officer had warned them of the inbound aeroplane two minutes before the landing. During the landing run, thinking that the aeroplane was going to make a runway excursion, they immediately put the rescue resources into action. After donning their equipment, two firemen went to the accident site in a VIM24[21], and a third fireman in a VIP[22].

On arriving on site, they observed that the door situated on the forward left side of the aeroplane's fuselage was on the other side of the river and could not be accessed from the airport's grounds. Two firemen then travelled by road to the opposite bank situated outside the airport in order to assist the occupants, while the third fireman secured the site, provided fire protection and called for reinforcements.

[23] The flash point temperature of Jet A1 is +30 °C.

The latter observed a large fuel leak and sparks in the left wing area. Due to the high fire risk[23], he deployed the fire hose and sprayed the aeroplane with foam. No smoke was observed.

Unable to open the forward left door which was blocked, the two firemen returned to the airport and went to the emergency exit situated on the rear right side of the fuselage. The pilot had by this time opened this exit, evacuated the aeroplane and indicated that the passenger was blocked by the instrument panel in the cockpit. A fireman entered the aeroplane via the rear exit after removing part of his protective equipment due to the narrowness of the opening. Once the passenger had been removed from the cockpit, he was joined by another fireman and they evacuated the passenger together through the emergency exit.

3 - CONCLUSIONS

The conclusions are solely based on the information which came to the knowledge of the BEA during the investigation. They are not intended to apportion blame or liability.

Scenario

The aeroplane's landing distance on a wet runway as defined in the performance tables of the aircraft flight manual (AFM) was not compatible with the runway length available at La Môle airport.

While preparing the flight, the pilot used the flight file provided by ProAir to determine the landing performances. The landing distance on a wet runway given in this file was the landing distance on a dry runway increased by 15%. The 15% increase for a wet runway can only be used in association with the 60% increase imposed in commercial operation; without this, it may not be appropriate. The result of the calculation, in the present case, was erroneous and less than the value indicated in the aircraft flight manual.

The pilot probably used neither the EFB application to calculate performance nor the flight manual to check this value.

The pilot thus undertook the flight on the basis of erroneous performance values, not knowing that he could not land on this airport if the runway was wet.

Furthermore, during the final approach, the aeroplane's speed was higher than the approach reference speed and the approach slope was also steeper than the nominal slope, which increased the landing distance.

During the landing run, the aeroplane overran the runway at a speed of 41 kt. The pilot did not manage to stop the plane before it violently struck the obstacles at the end of the runway.

If the pilot had checked the landing distance calculation on the software application installed on the EFB, he would have had the possibility of either applying a factor of 15% or of using the data from the flight manual. The ergonomy of the EFB is misleading because firstly, it gives the impression that the calculation method using the 15% factor can be used in non-commercial operation without the 60% increase applicable for commercial air transport and secondly, the wording "WET RWY - AFM ADVISORY" gives the impression that the AFM data is supplied for information purposes only.

The AFIS officer on duty at the time of the occurrence considered that the runway was not contaminated. He probably did not think it useful to tell the pilot that the runway was wet as the latter had already been warned of heavy rain on the airport during the descent.

Contributing factors

The following factors may have contributed to the runway excursion:

- The operator using the same operations manual for two different types of operation.
- The absence of calculation methods, safety factors and safety margins in the operations manual to calculate non-commercial transport performance.
- The pilot's and operator's ignorance of the landing performance calculation method for non-commercial transport.
- The absence of an indication in the operations manual that a wet or contaminated runway restricts the landing performance at La Môle airport.

4 - ACTIONS TAKEN SINCE THE ACCIDENT

4.1 Actions taken by the operator

The operator now prohibits all flights to La Mole when the runway is wet or contaminated and all flights to La Mole on the Cessna 525.

The list of captains who are qualified to use La Mole aerodrome is given in part C of the operations manual.

The operator indicated that it has modified the calculation method used during the preparation of the flight by the OCC and with the EFB.

4.2 Actions taken by EASA

4.2.1 Calculation of Performance

Regulation (EU)) No. 965/2012 "*Air Ops*" has been recently modified by amendment 2019/1387[24]. The paragraph concerning the calculation for the wet runway performance is now as follows:

[24] https://eur-lex.europa.eu/legal-content/FR/TXT/?uri=CELEX%3A02012R0965-20200814

"*(a) When the appropriate weather reports or forecasts, or both, indicate that the runway at the estimated time of arrival may be wet, the LDA shall be one of the following distances:*
(1) a landing distance provided in the AFM for use on wet runways at time of dispatch, but not less than that required by point CAT.POL.A.230(a)(1) or (a)(2), as applicable;
(2) if a landing distance is not provided in the AFM for use on wet runways at time of dispatch, at least 115 % of the required landing distance, determined in accordance with point CAT. POL.A.230(a)(1) or (a)(2), as applicable;
(3) a landing distance shorter than that required by point (a)(2), but not less than that required by point CAT.POL.A.230(a)(1) or (a)(2), as applicable, if the runway has specific friction-improving characteristics and the AFM includes specific additional information for landing distance on that runway type;
(4) by way of derogation from points (a)(1), (a)(2) and (a)(3), for aeroplanes that are approved for reduced landing distance operations under point CAT.POL.A.255, the landing distance determined in accordance with point CAT.POL.A.255(b)(2)(v)(B)."

Thus, in commercial operation, the landing distance for use on wet runways is the landing distance specified in the aircraft flight manual for use on wet runways at time of dispatch, including the operational margins[25]. If such a landing distance is not provided in the flight manual, a penalty of 15% is added to the factored distance based on a dry runway.

[25] Such as the *factored landing distance* given in certain flight manuals.

The requirements for non-commercial flights with complex motor-powered aeroplanes have not been modified. The pilot must refer to the flight manual to obtain the landing distances on a dry runway and on a wet runway and apply the margin, defined by the operator in the operations manual, to them. This investigation and the one into the serious incident to the Cessna Citation CJ3 registered LX-WEB show that operators are unfamiliar with the performance calculation method. The latter increase the dry runway landing distance by 15% to calculate the landing distance on a wet runway. However, there is no relationship between the distance on a dry runway and that on a wet runway. Thus, this method does not guarantee the exactitude of the calculated distance, as the 15% increase for a wet runway can only be used in association with the 60% increase imposed in commercial operation.

The modification of the method to calculate the landing distance on a wet runway in commercial operation implies that the operators will from now on use the landing distance on a wet runway specified in the flight manual when it exists. We can imagine that this will reduce the possibility of confusion in the calculation method for non-commercial flights.

Furthermore, on 18 January 2018, EASA published a Safety Information Bulletin (SIB) No 2018-02 "*Runway Surface Condition Reporting*", to enhance awareness of air operators and pilots of the risks associated with incorrect or unreliable runway surface condition reporting, and to provide recommendations for the purpose of mitigating the associated risks. It includes a recommendation to operators and pilots on making conservative assumptions in terms of aeroplane performance calculations in case of uncertainty on runway surface condition reporting.

In addition, preparations are underway by EASA for rolling out webinars with stakeholders in 2021 to support implementation of the rules for the global reporting format (the new ICAO methodology for assessing and reporting runway surface conditions) which should help to improve the assessment of landing performance. This will naturally cover landing performance calculation methodology for all types of operations.

BEA

4.2.2 EFB application approvals

EASA, in December 2018, amended regulation (EU) No 965/2012[26] regarding EFBs (SPA.EFB), applicable from 9 July 2019.

[26] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32018R1975

Type B EFB applications now have to be approved for commercial air transport. However, the approval is not mandatory for non-commercial air transport. Nevertheless, paragraph NCC.GEN.131, applicable to non-commercial air transport by complex aircraft (such as the CitationJet CJ2+) incorporates the majority of the content of part SPA.EFB and asks operators to carry out a risk analysis for the use of EFBs.

4.3 Actions taken by DGAC

Following the accident, the DGAC modified the conditions of use of La Môle airport. Orders[27] were published in this respect and the AIP amended accordingly.

[27] Order of 25 July 2019 modifying order of 15 March 1973 with respect to the creation and approval of La Môle airport (Var), Order of 25 July 2019 with respect to the approval of La Môle airport(Var) and Order of 23 July 2020 modifying the order of 25 July 2019 with respect to the approval of La Môle airport (Var).

[28] Maximum Operational Passenger Seating Configuration of an aircraft, excluding crew seats.

The aeroplane categories have been modified as follows:

A group 1 aircraft is:

- *"A turboprop multi-engine aircraft with a MOPSC greater than 9 or a maximum take-off weight greater than 5700 kg or;*
- *A turbojet multi-engine aircraft or;*
- *A turbojet single-engine aircraft or;*
- A *piston-engine aircraft with a MOPSC[28] greater than 9 or a maximum take-off weight greater than 5700 kg ".*

A group 2 aircraft is "*An aircraft which does not meet the criteria of a group 1 aircraft."*

The conditions of use have been modified as follows:

For all flights performed by group 1 aeroplanes, the aircraft's operating procedures and certified data guarantee compliance with the take-off and landing performance requirements in commercial air transport, or when they exist, those applicable to aeroplanes powered by a single-turbojet engine for the aircraft concerned.

For flights other than those for commercial air transport, the operator may adopt alternative provisions to the regulatory requirements regarding commercial air transport, which must have been drawn up by the holder of the aircraft's type certificate and must be incorporated in the operations manual. If these alternative measures are complied with, take-offs and landings are only authorized on a dry runway. These alternative provisions are composed of specific performance data for operation at La Môle for an aeroplane type, associated with operating procedures and training programmes defined for the same type of aeroplane

For all flights carried out by group 1 aeroplanes, the operator must lodge a file demonstrating compliance with the above provisions, with the DSAC/SE at least one month before the start of operations.

This file shall include the crew training and recurrent training programme.

The conditions of use for the pilots have also changed.

"*The captain must have attended the training course described in the order and performed, within the six months prior to the first flight at La Môle as captain, an aerodrome reconnaissance flight as pilot on the type or class of aircraft concerned, with an instructor."* The instructor shall himself comply with these requirements as captain, and shall record the pilot's qualification in the pilot's logbook.

The DSAC/SE director may name a DGAC inspector pilot to supervise the reconnaissance flight.

"This aptitude is maintained if, during the last twelve months, the captain:

- *has taken off from and landed on the aerodrome as captain [on the type or class of aeroplane concerned]; or*
- *has attended the competence maintenance course on an FSTD[29] of the type of aircraft concerned equipped with an image representative of the aerodrome and its environment, issued by an instructor qualified on the type or class of aircraft and for which the operator can certify that he is familiar with the aerodrome characteristics and use procedures."*

[29] Flight Simulation Training Device.

The CitationJet CJ2+ falls in group 1 and is subject to more restrictive conditions of use than previously.

4.4 Actions taken by NTSB

The NTSB agrees with the BEA that the support related to the download of the AReS maintenance recorder and associated analysis was lacking from Textron Aviation. As a result, the NTSB has worked closely with Textron Aviation to understand and address the shortcomings and to establish assurances for support in future investigations As a result, Textron Aviation has provided two letters as acknowledgement of the issues and its commitment for supporting investigative requests in the future (see appendix).

APPENDIX

Cessna letters

Cessna | Beechcraft
BY TEXTRON AVIATION

[redacted]

IN REPLY REFER TO:
L-175-20-104

[redacted]
Aircraft Safety Investigator
Central Regional Office
Office of Aviation Safety
National Transportation Safety Board
Denver, CO

RE: BEA Draft Report BEA2018-0335; 2013 525A, 525A-0514, D-IULI, St. Tropez, France

After reviewing the BEA Draft Report BEA2018-0335 involving the 2013 525A runway overrun at La Mole Airport, St. Tropez, France, on June 6, 2018, I would like to express my regrets for any misunderstandings in our communications regarding Textron Aviation's ability to satisfy the BEA and the NTSB's AReS Data requests to your satisfaction.

Since this investigation, Textron Aviation's Air Safety Investigation's team have had the opportunity to work with our engineering staff to obtain a better understanding of the AReS System, its capabilities and limitations. We are committed to continue improving our processes, so that, going forward, the investigating authorities also have a better understanding of what can be expected from the data that is capable of being recovered from the AReS Systems.

If there is anything, I can do to assist you, do not hesitate to contact me.

Sincerely,

[redacted]

Senior Air Safety Investigator

[redacted]

Textron Aviation | One Cessna Blvd. | Wichita, Kansas 67215 USA | txtav.com

Cessna | Beechcraft
BY TEXTRON AVIATION

December 17, 2020

IN REPLY REFER TO:
L-175-20-105

National Transportation Safety Board
490 L'Enfant Plaza SW
Washington, DC 20024

RE: Textron Aviation Proprietary AReS Data

To whom it may concern,

Textron Aviation, Inc. (TAI), as a company, understands the importance of using correct data during an incident or accident investigation and, while our AReS system records a multitude of data, it was designed for use as a secondary aid in maintenance diagnostics and troubleshooting, not as an accident investigation tool, such as a Flight Data Recorder (FDR), and should not be considered as a primary source of incident or accident data. Further, the AReS system is not required by regulation and its data is not collected, stored, or standardized pursuant to any regulatory requirements.

TAI's AReS system, its software, and the data it records of the aircraft and its operations are considered proprietary. The AReS System has seen several iterations over its lifespan, the type and amount of data recorded has changed and the data recorded by the AReS system can vary even within aircraft model groups. Because of this and the complexity of the data recorded, we strongly recommend that a TAI experienced diagnostic technician under the investigating authority's supervision be allowed to analyze and interpret the AReS data.

TAI would be happy to provide an analysis of the parameters recorded by the AReS system that you request in a format that can be read by commonly available programs. It should be known, however, that this process takes a significant amount of manpower and time to complete.

If further assistance is required, please contact me or any members of our Air Safety Investigations Department.

Sincerely,

[redacted]

Manager, Air Safety Investigations
Textron Aviation Inc.

Textron Aviation | One Cessna Blvd. | Wichita, Kansas 67215 USA | txtav.com