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INVESTIGATION REPORT

Incident

to the Airbus A320-200 registered **F-HBNJ**
and to the Boeing B737-800 registered **UR-PSB**
on 11 November 2018
in climb-out from parallel runways 26R and 27L of
Paris-Charles de Gaulle airport[1] (Val-d'Oise)

Time	13:54[2]
Operators	Air France and Ukraine International Airlines
Type of flights	Commercial air transport
Persons on board	**F-HBNJ**: Captain (PM[3]); first officer (PF[4]); 4 cabin crew; 160 passengers **UR-PSB**: Captain (PM); first officer (PF); 4 cabin crew; 168 passengers
Consequences and damage	None

This is a courtesy translation by the BEA of the Final Report on the Safety Investigation published in November 2019. As accurate as the translation may be, the original text in French is the work of reference.

[1] Paris-CDG.

[2] Unless otherwise stated, all times given in this report are in local time.

[3] Pilot Monitoring.

[4] Pilot Flying.

Loss of separation during simultaneous take-offs from two parallel runways

1 - HISTORY OF THE FLIGHT

On Sunday, 11 November 2018, the crew of the Boeing B737 registered UR-PSB operated by Ukraine International Airlines were getting ready to perform flight call sign "*AUI 3SD*" from Paris-CDG bound for Kiev Boryspil. During flight preparation, the crew listened to the ATIS P which indicated that runways 27L and 26R associated with departures 2A, 2B and 2Z were being used for take-off. They selected the RANUX2B SID[5], corresponding to runway 26R of the south twin runways, on the FMC[6]. The first officer was flying.

The Paris-CDG north LOC, south LOC, north DEP and south DEP control positions were open. The controllers were geographically located at different places, the north LOC controller was in the north control tower, the south LOC controller in the south control tower and the north and south DEP controllers in the approach room. They coordinated with each other by telephone and, in the case of an emergency, there was an emergency interphone with several buttons to contact all the controllers at the same time or to select the controllers in the Roissy LOC, departure, arrival or Le Bourget tower positions.

[5] Standard Instrument Departure.

[6] Flight Management Computer.

At 13:17:10, the crew contacted the pre-flight frequency and were given the RANUX2A SID departure clearance from runway 27L of the north twin runways. This departure procedure was different to that initially selected by the crew on the FMC. The controller announced a slot at 13:47 and a target start-up approval time at 13:29. The crew replied that they needed more time. The controller said that this was not a problem, repeated the slot and target start-up approval times and asked them to call back when they were ready. However, the air traffic control services did not receive a request from the operator to modify the start-up time and consequently, the time slot was maintained.

The crew said that they did not modify the SID on the FMC and did not carry out a cross-check as they were interrupted by a ramp agent bringing them the load sheet. They reported that they entered the load parameters on the FMC and then started the take-off briefing during which the selected departure procedure is checked. However, they said that they did not finish it due to the time pressure created by the take-off slot.

At 13:35:20, the crew told the pre-flight controller that they were ready. They were transferred to the apron frequency and the push-back started. At 13:42:39, they were transferred to the ground frequency, continued taxiing to holding point Q4 of runway 27L and were then transferred to the north tower frequency.

At 13:52:36, they were cleared to take-off from runway 27L.

At 13:52:56, the crew of the Airbus A320 registered F-HBNJ operated by Air France, call sign "*AF 48KZ*" and bound for Bordeaux were cleared to take off from runway 26R. They were in contact with the south LOC controller.

At 13:53:54, a few seconds after the take-off of the B737 registered UR-PSB, the latter's flight management system changed to the LNAV lateral navigation mode. At 13:54:00, the aeroplane flew over the opposite runway threshold (point ❹ on figure 1). The first officer started a left turn to follow the flight director which indicated a deviation to the left to join the path of the selected RANUX2B SID and corresponding, in particular, to the axis of runway 26R. At 13:54:10, (point ❺ of figure 1), the aeroplane was correctly identified on the radar and the crew were transferred to the north DEP controller frequency. The aeroplane was still practically on the runway axis in the climb-out at a height of around 750 ft.

At 13:54:27, flight AUI 3SD contacted the north DEP controller. At the same moment, the north LOC controller called the south LOC controller on the interphone to warn that the path of the aeroplane had deviated left. At 13:54:28, the south LOC controller ordered the pilot of AF 48KZ to immediately stop climbing. The aeroplane was at this point at an altitude of 1,610 ft.

At 13:54:28, the STCA[7] was activated on the controller radars. At this point, AUI 3SD, in climb, was at an altitude of 1,980 ft, with a heading of 206° and a speed of 189 kt (point ❻ of figure 1). AF 48KZ, in climb on the axis of runway 26R, was at an altitude of 1,650 ft (point C of figure 1). The distance between the two approaching aeroplanes was then 2.56 NM and the difference in altitude was 300 ft.

[7] Short Term Conflict Alert.

At 13:54:33, the north DEP controller ordered the pilot of AUI 3SD to immediately turn right to heading 270° and at the same moment, the north LOC controller asked the south LOC controller by interphone to stop AF 48KZ. At 13:54:39, the AUI 3SD crew selected heading 270 on the FCU and started turning right in the HEADING lateral navigation mode. The south LOC controller or his south LOC coordinator assistant advised the north LOC controller via the interphone that AF 48KZ had been stopped. At 13:54:43, the north DEP controller used the interphone to ask the south LOC controller to stop or turn AF 48KZ. The latter had reached the maximum altitude of 2,070 ft at this point and started descending to around 1,615 ft.

At 13:54:53, the vertical separation between the two aeroplanes reached 1,000 ft and was increasing (points❼ and D of figure 1). At 13:55:07, the south LOC controller used the general call function of the interphone to tell all the controllers that AF 48KZ was holding its altitude.

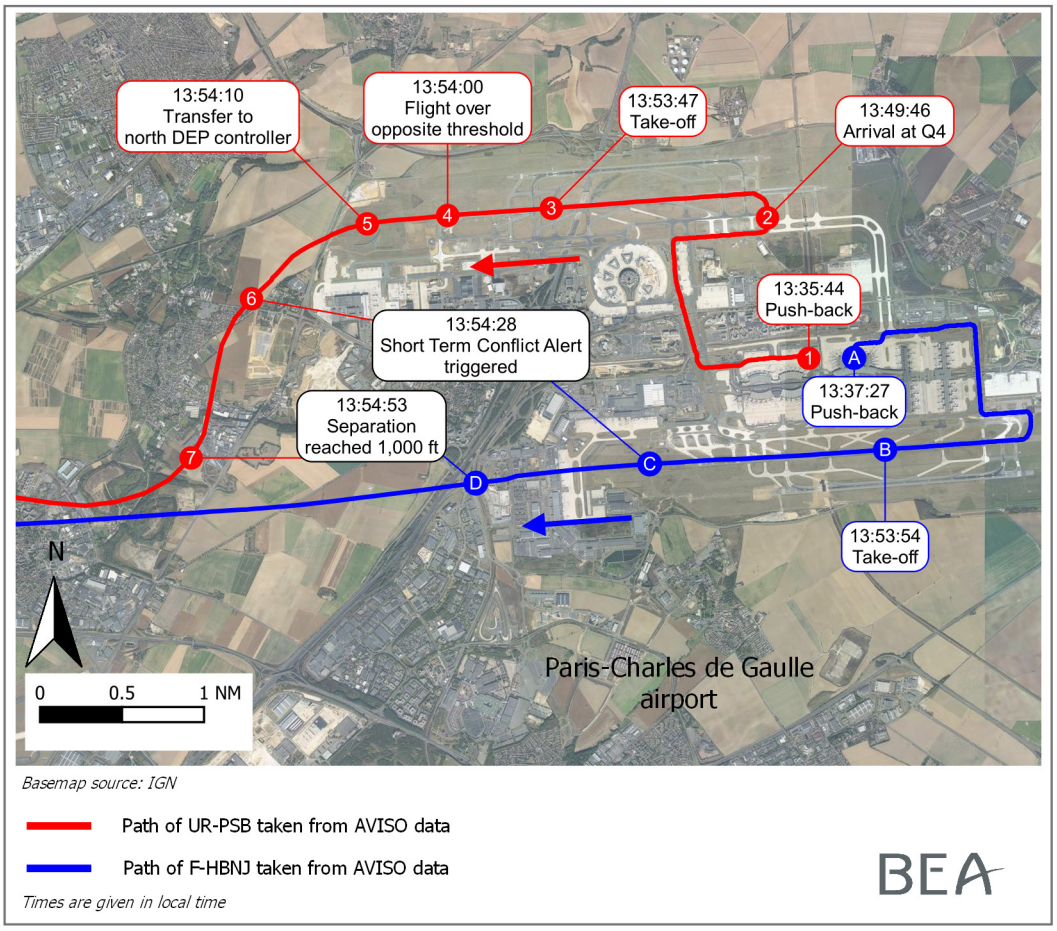

Figure 1: flight paths of both aeroplanes

2 - ADDITIONAL INFORMATION

2.1 Flight AUI 3SD: captain's report

The captain said that RANUX 2B SID had been entered on the FMC during flight preparation. After receiving the departure clearance, he did not have time to check if RANUX 2A SID was on the FMC as a ramp agent had brought him the weight and balance sheet. Subsequently, the briefing was broken off as the slot assigned by the ATM had been brought forward. Lastly, he added that after taking off, he did not check the SID on the ND[8] [9] when the FD[10] deviated to the left.

2.2 Flight AUI 3SD: first officer's report

The first officer said that RANUX 2B SID had been entered on the FMC during flight preparation. He added that this SID had been chosen as runway 26R was the closest to their parking position. When they received clearance for RANUX 2A SID, he did not modify the data on the FMC and no cross-check was carried out as at this point, a ramp agent brought them the weight and balance sheet. After entering the load data on the FMC, the briefing was broken off as the take-off slot had been brought forward. He added that after take-off, the FD requested a left turn to follow RANUX 2B SID and that the crew had followed the FD without checking the consistency of the FMC data with the charts.

2.3 Information taken from statement by crew of flight AF 48KZ

Just after take-off, at a height of around 1,400 ft, the aeroplane entered a layer of cloud and visibility was zero. The controller than asked them to stop climbing using the emergency phraseology. The PF made stick and then power lever inputs and stabilized the aeroplane at an altitude of 2,000 ft after having temporarily climbed to 2,100 ft. The crew saw traffic on the right, 200 ft above them on the NDs.

The first officer said that the stabilization was difficult as the aeroplane was not heavy and had a high pitch attitude due to the noise-abatement procedure. He indicated that he had been hampered by not being able to hear the emergency communications with the conflicting traffic due to the separation of frequencies. He also added that for a short time, the aeroplane symbol was displayed over the top of the TCAS[11] information for flight AUI 3SD and that he could not read the difference in altitude.

2.4 Information taken from occurrence reporting form from north LOC controller

The controller saw that flight AUI 3SD was turning although he had transferred it to the departure frequency. He spoke to the south LOC controller by interphone to tell him to immediately stop the climb of flight AF 48KZ.

In retrospect, the controller thought that the coordination could have been improved by using the interphone's general call function which would have allowed the DEP controllers to hear his emergency call.

[8] Navigation Display.

[9] A comparison of the ND indications with the SID chart could have alerted the pilot to the fact that the incorrect SID had been selected on the FMC. The direction of the first turn on the ND did not correspond to that on the SID.

[10] Flight Director.

[11] Traffic alert and Collision Avoidance System.

2.5 Meteorological information

The following information was provided by Météo - France.

A sometimes unstable atmospheric disturbance gave rise to intermittent rain. The lowest forecast and reported ceilings were at 1,000 ft; there was no mention of towering cumulus clouds or cumulonimbus in the report of 13:00 UTC. There was a moderate south-westerly wind.

2.6 Licences and experience of crew of flight AUI 3SD

Captain

Male, 34 years old.

Qualifications

- Airline Transport Pilot License - Aeroplane (ATPL (A)) issued by the Ukrainian Civil Aviation Authority on 28 December 2012;
- B737 300-900 type rating.

Experience

- Total: 5,719 flight hours, including 2,163 as captain;
- On type: 1,019 flight hours, including 1,019 as captain;
- In the previous seven days: 18 hours, 9 landings, 10 take-offs.

First officer

Male, 29 years old.

Qualifications

- Airline Transport Pilot License - Aeroplane (ATPL (A)) No TA 012781 issued by the Ukrainian Civil Aviation Authority on 6 November 2017;
- B737 300-900 type rating.

Experience

- Total on type: 2,998 flight hours;
- In the previous seven days: 16 hours, 9 landings, 10 take-offs.

2.7 Information about RANUX 2A and 2B departure procedures

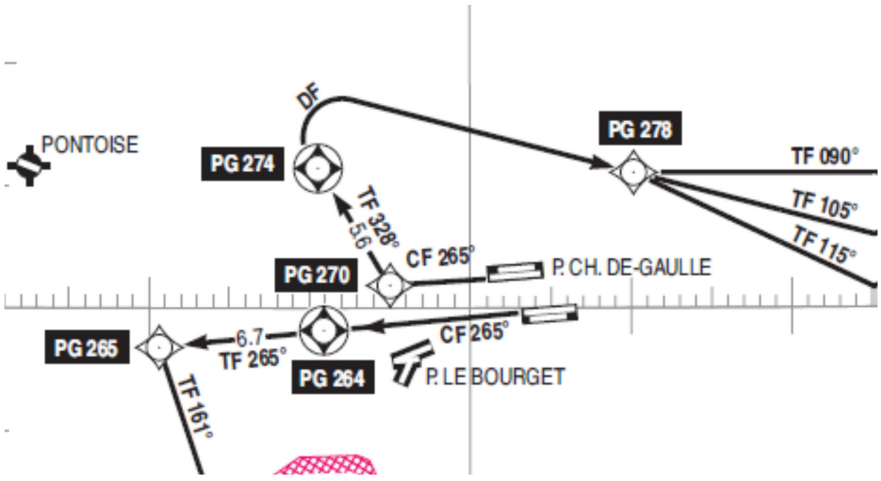

Figure 2: excerpt from AIP France AD 2 LFPG SID RWY26R-27L-RNAV-EAST chart

The paths to be followed after take-off for the RANUX 2A and 2B SID are described below.

RANUX 2A SID (departure from north twin runways towards north of airport): runway 27L, PG 270, PG 274, PG 278.
RANUX 2B SID (departure from south twin runways towards south of airport): runway 26R, PG 264, PG 265.

When taking off from runway 26L, the RANUX 2B SID procedure requires that the aircraft joins the 26R departure at D6.3 PGS (see JEPPESEN chart below). The path followed by flight AUI 3SD seems to join this point.

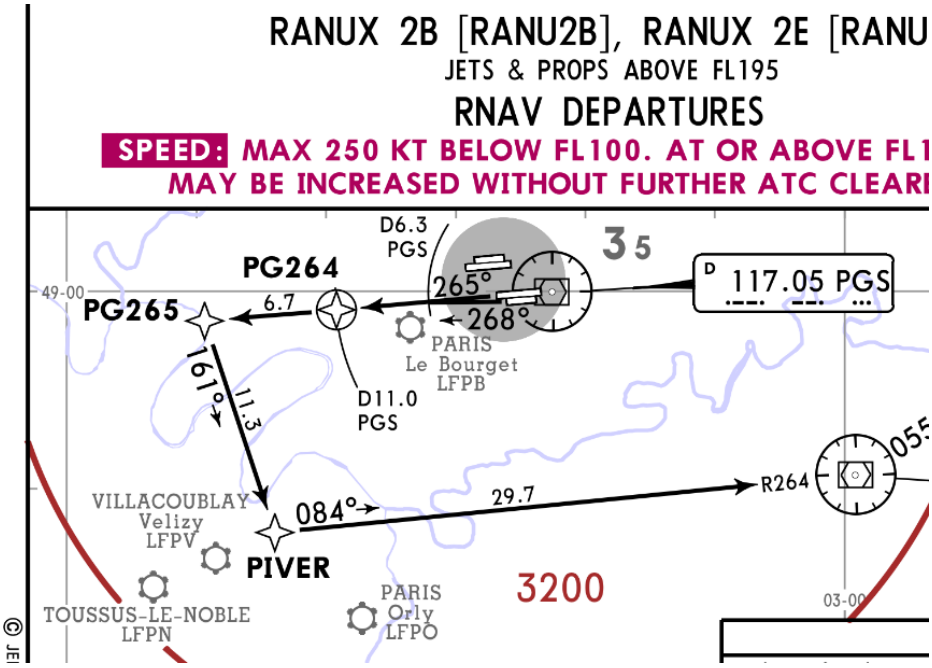

Figure 3: excerpt from JEPPESEN LFPG/CDG SID RANUX 2B chart

2.8 Traffic Collision Avoidance System (TCAS)

Neither TCAS of the two aeroplanes was activated. The analysis of the paths of the two aeroplanes shows that the TCAS triggering criteria were not reached during the incident.

During this flight phase, the TCAS warnings would have been triggered if the time (TAU) before reaching the Closest Point of Approach (CPA) was less than:

- twenty-five seconds for a Traffic Advisory (TA) - altitude with respect to CPA less than 850 ft;
- fifteen seconds for a Resolution Advisory (RA) - altitude with respect to CPA less than 600 ft.

In the event, the TAU was estimated at approximately 60 s.

3 - LESSONS LEARNED AND CONCLUSION

While preparing the flight, the crew of flight AUI 3SD had envisaged taking off from runway 26R and selected the corresponding SID on the FMC. When they received clearance for runway 27L, they did not modify the FMC data. After taking off, they followed the FD indications without realising that this path led to the aeroplane aligning with the axis of runway 26R. The risk of collision with flight AK 48KZ which was taking off from runway 26R was quickly detected by the air traffic controllers who used the emergency phraseology to separate the two traffic.

Several elements contributed to the crew not modifying the SID on the FMC:

- they were interrupted by the arrival of a ramp agent the moment they were about to modify it;
- they had not completed the briefing before taking off, under the time pressure of a departure slot.

The actions of the air traffic services were quick and effective. This event illustrated the operation of various means to identify the deviation of an aircraft from its axis during simultaneous take-offs from parallel runways:

- radar surveillance;
- visual surveillance from control tower (ineffective in IMC conditions);
- triggering of STCA.

It also highlighted the importance of using the interphone between controllers in the event of an emergency.

The longitudinal offset between the thresholds of runways 27L and 26R naturally ensures a vertical separation, in the climb-out, between two aeroplanes with similar performance taking off simultaneously. However, this separation is not guaranteed in all cases, in particular for an aeroplane with lower climb performance, taking off from runway 26R. During the loss of separation, the two aeroplanes were in IMC conditions and could not ensure a visual separation. A modification in the take-off temporality could have led to a much more serious loss of separation and the TCAS would have probably been the only barrier available to prevent a mid-air collision.

4 - SAFETY ACTIONS

Ukraine International Airlines has modified the Paris-CDG airport briefing by adding information concerning take-offs from parallel runways. It published Quality and Safety Alert Ref No QSA 06-2018 in which it describes the circumstances of the event. It reminds crews that for take-offs from parallel runways, crew cross-checks must be carried out and SOPS must be strictly complied with. It also asks for increased and constant vigilance as to the position of the aircraft with respect to its planned path.