



**INTERSTATE AVIATION COMMITTEE
AIR ACCIDENT INVESTIGATION COMMISSION**

**INTERIM REPORT
(PRELIMINARY REFERENCE INFORMATION)
ON ACCIDENT INVESTIGATION**

Reporting organization	Interstate Aviation Committee
Type of occurrence	Accident
Aircraft	Airplane, Boeing 737-800
Registration	A6-FDN
Owner	Celestial Aviation Trading 38 Limited, Shannon, County Clare, Ireland
Operator	Flydubai, United Arab Emirates
Place of occurrence	Russia, Rostov Region, Rostov-on-Don Airport, coordinates: N 47° 15 ' 54.7"; E 039° 49' 43.8"
Date and Time	19.03.2016 00:42 UTC, nighttime

In accordance with the Standards and Recommended Practices of the International Civil Aviation Organization this Report has been issued with the sole objective to prevent aviation accidents.

The investigation held within the framework of this Report does not aim to apportion blame or liability.

This interim report (preliminary reference information) has been issued in compliance with 2.4.12 of the Rules of Investigation of Accident and Incidents Involving Civil Aircraft in the Russian Federation as well as 7.4 of ICAO Annex 13. The report contains factual information currently available to the investigation team.

The investigation is underway, including collection and analysis of information related to crew training, assessment of crew actions and psycho-emotional status in the course of the accident flight as well as evaluation of the aircraft systems and components operability.

The investigation will be completed with a Final Report.

The information presented in the Interim Report is preliminary and can be subject to clarification and amendment based on the pertinent examinations.

The Report is published in the Russian and English languages. If there is a difference in interpretation between the Russian and English versions, the Russian version will prevail.

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Introduction

On March 19, 2016 a Boeing 737-800 aircraft registered A6-FDN operated by Fly Dubai, while executing a recurrent approach at nighttime in IMC at Rostov-on-Don Airdrome with landing heading 218° the crew went around from the height of 220 m. From the height of about 1000 m the aircraft turned into descent and hit the runway about 120 m from the threshold.

The accident destroyed the aircraft and killed the crew and passengers.

The accident investigation is conducted by a team of investigators assigned by Order № 9/765-P of the Chairman of the Air Accident Investigation Commission, IAC of 19.03.2016.

Notifications of the accident were duly sent to the NTSB (USA), BEA (France), Air Accident Investigation Sector of GCAA (UAE) as well as States whose citizens had been killed in the accident.

1. Factual information

1.1. Flight history and event description

On March 18, 2016 a Boeing B737-800 aircraft registered A6-FDN operated by Flydubai was conducting Flight FDB 981 en route Dubai - Rostov-on-Don. The crew consisted of a pilot-in-command and a first officer.

The cabin crew included 5 persons to serve the passengers in flight. The preflight briefing was conducted by the PIC on his own.

The weather forecast and actual weather along the flight route, at Rostov-on-Don airdrome and alternate airdromes of Krasnodar and Volgograd was not inhibitory for the flight and was consistent with the IFR conditions.

According to the data from the load sheet as well as the calculations done by the investigation team the aircraft takeoff weight on departure from Dubai was 68 tons with 17,3% center of gravity, which was within the AFM limitations (MTOW = 79 tons, CG range 10 - 31%).

The crew took a justified decision to depart.

At 18:37 the crew took off from Dubai Airport.

The cruise flight en route Dubai - Rostov-on-Don was at FL 360 as per flight plan.

Before starting descent the crew requested actual weather at Rostov-on-Don Airdrome and runway in use from the ATC.

At 22:42 as the crew of Flight FDB 981 was conducting the approach at Rostov-on-Don Airdrome with heading 218 magnetic, they informed the ATC officer of windshear on final (based on the on-board windshear warning) and went around climbing to FL 50 (1500 m), then climbing again to FL 80 (2450 m) to hold. While they were holding the crew reported moderate icing to the ATC and requested clearance to climb to FL 150 (4550 m).

The Radar and Approach ATC officers made numerous reports on the current actual weather to the crew of Flight FDB 981 as they were holding including the windshear data.

At 00:23 at 19.03.2016 the crew requested clearance to descend for another approach.

Both approaches (from the height of about 600 m) were performed with autopilot and autothrottle disengaged in flight director mode without significant heading or altitude deviations from the glideslope.

As the crew were proceeding with the approach (as per the FDR and CVR readout), the crew decided to go around again at a height of 220 meters (4,5 km before the runway) and initiated climb with vertical speed of up to 20 mps setting the engines to maximum takeoff/go-around thrust of 101 – 102% (N1).

One of the probable causes of the go-around decision could have been the 20-knot increase of indicated speed to as much as 176 knots within 3 seconds, which might have been an indication of a windshear.

In the course of the go-around the crew set flaps to 15° and retracted the landing gear.

At the height of 1900 ft (approx. 600 m) after reaching the pitch angle of 18° the pilot flying pushed on the control column, which led to a decrease in vertical acceleration of up to 0.5, increase in forward speed and, consequentially, automatic retraction of flaps from 15° to 10° at a speed of over 200 knots.

The short-term decrease in engine thrust within 3 seconds resulted in decreasing speed and flaps extension to 15°, although the following crew inputs to regain maximum takeoff/go-around thrust led to speed increase and reiterated automatic flaps retraction to 10°. The flaps remained in the latter configuration until the impact.

The pilot flying, by pulling up the control column, continued climbing with a vertical speed of as much as 16 mps.

At a height of 900 m there was a simultaneous control column nose down input and stabilizer nose down deflection from -2,5 deg (6,5 units) to +2,5 deg (1,5 units) (the FDR recorded a nose down stabilizer input from the stabilizer trim switch of the control wheel lasting 12 seconds, while the CVR record contains a specific noise of rotation of the trim wheels located on both sides of the central pedestal), as a result the aircraft, having climbed to about 1000 m, turned into descent with negative vertical acceleration of -1g.

The following crew recovery actions did not allow to avoid an impact with the ground.

At 00:41:49 the aircraft hit the runway about 120 m from the threshold with a speed of over 600 kmph and over 50 degrees nose down pitch.

The impact killed all persons on board and totally destroyed the aircraft.

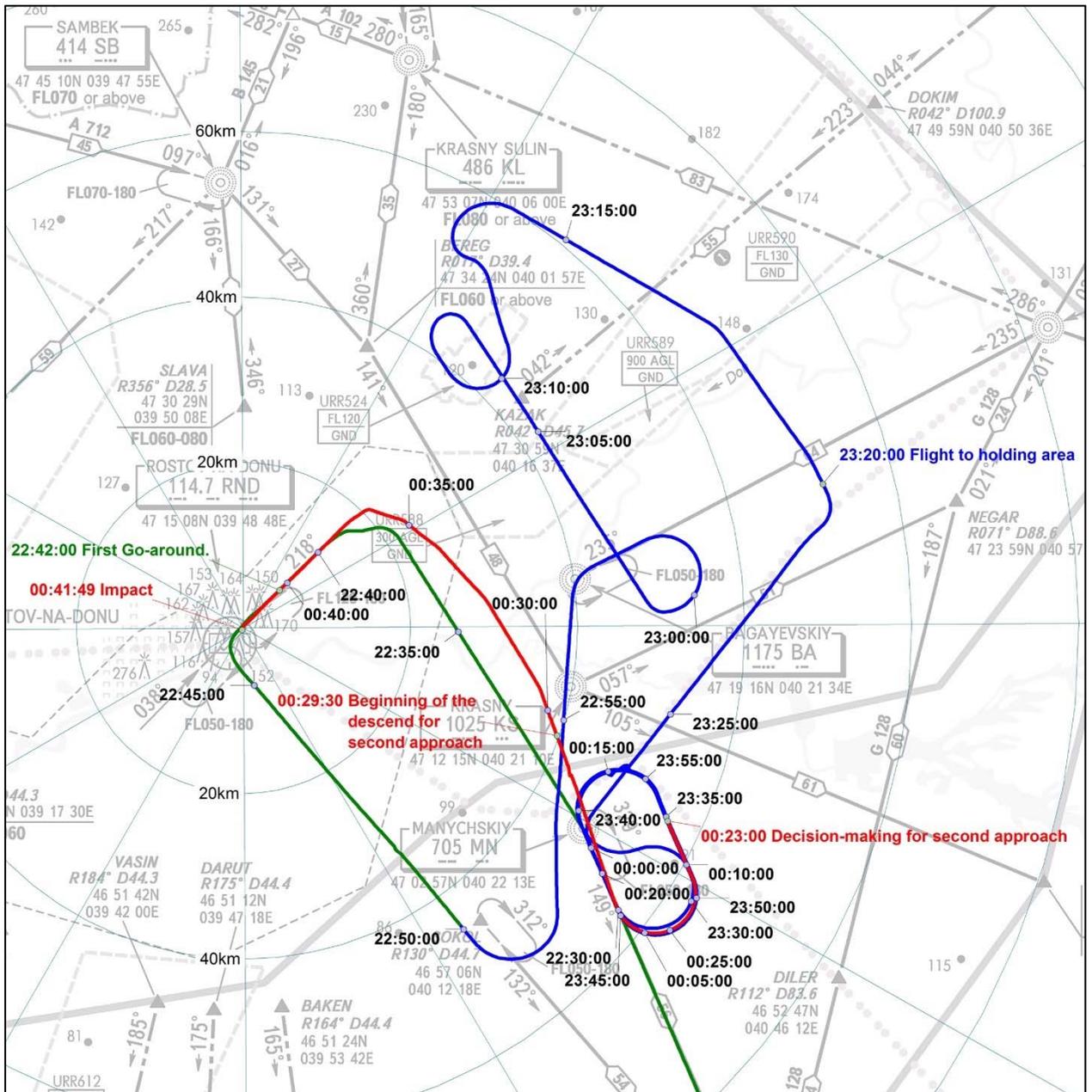


Figure 1. Aircraft flight path.

1.2. Injuries to Persons

Injuries to Persons	Crew	Passengers	Others
Fatal	7	55	0
Serious	0	0	0
Minor/None	0/0	0/0	0/0

1.3. Damage to Aircraft

The aircraft was totally destroyed on impact. The majority of airframe structures were highly fragmented.

The 2-d mockup made of the remaining aircraft fragments is shown in Figure 2. The mockup is being made in a hangar at the facilities of Rostov Civil Aviation Plant № 412.



Figure 2. Aircraft mockup in the hangar.

1.4. Other Damage

Lighting equipment on runway heading 218° between TWY D and C was destroyed (5 runway edge lights on the left and 2 runway edge lights on the right, 2 centerline low-voltage cables and 4 runway edge low-voltage cables).

332.5 sq. m of the runway surfacing was damaged.

1.5. Personnel Information

1.5.1 Crew Information

Position	Pilot-in-Command (male)	First officer (male)
ATPL	№ 51549 issued by the General Civil Aviation Authority (UAE) on 07.11.2012.	№ 66543 issued by the General Civil Aviation Authority (UAE) on 21.10.2014.
Total flight hours	5961 h	5767 h (CESSNA-421; ATR-42/72; A-320)
Flying time B-737-800 / as PIC	4905 h / 1056 h	1100 h / -
Weather minima	ICAO CAT III A	ICAO CAT III A

1.6. Aircraft

Aircraft type	Boeing B737-8KN	
Registration number	A6-FDN	
Serial number	40241	
Manufacturer	Boeing Company, Seattle, U.S.	
Manufacture date	19 January 2011	
Registration certificate	№ 06/11 dated 19.01.2011	
Airworthiness certificate	ARC-FZ-FDN-4 dated 10.01.2016, valid till 18.01.2017	
Time in service	21252 h, 9420 landings	
Overhauls	None	
Powerplant		
Engine (type)	CFM56-7B27/3B1F	CFM56-7B27/3B1F
Serial number	804660	804538
Manufacturer	CFM International Inc, USA	CFM International Inc, USA
Manufacture date	January 2011	January 2011
Maintainance date	12.06.2014	02.04.2014
Time in service	20283 h, 8977 cycles	20994 h, 9375 cycles
Service life time	20000 cycles	20000 cycles
Overhauls	None	None

1.7. Meteorological Information

Weather forecast for Rostov-on-Don Airdrome, valid at the time of the first go-around at 22:24 on 18.03.2016:

“... surface wind 250°, 7 mps, gust 13 mps, visibility 3000 m, light shower rain, mist, scattered clouds (3-4 oktas), cloudbase 300 m, broken (5-7 oktas) cumulonimbus, cloudbase 600 m, tempo from 18.03. 21:00 till 19.03. 06:00 surface wind 250°, 13 mps, gust 20 mps, visibility 1000 m, light shower rain, mist, clouds scattered (3-4 oktas), cloudbase 150, broken (5-7 oktas) cumulonimbus, cloudbase 600 m... “.

Actual weather at Rostov-on-Don Airdrome at the time of the first go-around as per ATIS information:

“... wind 230 degrees, 10 mps gust 17 mps, visibility 2900 m, light shower rain, clouds scattered at 480 meters, broken cumulonimbus at 990 m, temperature 6 degrees, dewpoint 3 degrees, QFE 742 mm/990 hPa, QNH 1000 hPa, moderate turbulence from surface to 1000 m; moderate icing in clouds at 900-1500 m, tempo wind 250 degrees 13 mps gust 18 mps, visibility 1000 m, shower rain, mist, clouds scattered cloudbase 90 m, broken cumulonimbus cludbase 600 m... “.

Weather forecast for Rostov-on-Don Airdrome, valid at the time of the accident on 19.03.2016:

“... surface wind 250°, 7 mps, gust 13 mps, visibility 3000 m, light shower rain, mist, scattered clouds (3-4 oktas), cloudbase 300 m, broken (5-7 oktas) cumulonimbus, cloudbase 600 m, tempo from 19.03. 00:00 till 19.03. 06:00 surface wind 250°, 13 mps, gust 20 mps, visibility 1000 m, light shower rain, mist, clouds scattered (3-4 oktas), cloudbase 150, broken (5-7 oktas) cumulonimbus, cloudbase 600 m...”

Actual weather at Rostov-on-Don Airdrome on 19.03.16 at 00:30 as per ATIS Information Echo:

“... surface wind 230 degrees, 12 mps gust 19 mps, visibility 3800 m, light shower rain, clouds scattered at 540 meters, broken cumulonimbus at 1080 m, moderate turbulence from surface to 1000 m; moderate icing in clouds at 900-1500 m, tempo wind 250 degrees 17 mps gust 25 mps, visibility 1000 m, shower rain, mist, clouds scattered cloudbase 90 m, broken cumulonimbus cludbase 600 m... “.

Actual weather at the time of the accident as per KRAMS-4 weather station data at 00:42:

“... surface wind magnetic 230° - 13 gust 18 mps, visibility 7000/7000/3700 m (heading in use/middle/back track), light shower rain, clouds scattered (4 oktas) cloudbase 420 m broken (5-7 oktas) cumulonimbus cloudbase 1080 m, overcast (8 oktas) cloudbase 3000 m, temperature +6,3 °C, dewpoint +3,6 °C, moisture content 84%, QNH 998,0 hPa, QFE 742 mm mercury/988

hPa, magnetic heading 218, RWY status R22/290046, moderate icing in clouds at 900-1500 m, moderate turbulence from surface to 1000 m; forecast for landing: tempo wind 250°-17 gust 25 mps, visibility 1000 m, shower rain, mist, clouds scattered cloudbase 90 m, broken cumulonimbus cloudbase 600 m... ”.

1.8. Aids to Navigation, Landing and ATC

At the time of the accident the ILS, outer and inner markers, the lighting system and PAPI lights were operative and operated as per design. The aircraft flight recorders did not record any evidence of improper operations of navigation and landing aids.

According to preliminary information, all aids subject to certification were holding valid operational certificates and were fit for operation in terms of assigned life and service time. Flight tests of aids subject to testing had been conducted in due time.

1.9. Communication Aids

In the course of the flight and approaches there was stable two-way radio communication between the crew and ATC. There were no complaints concerning the quality of communication.

The crew to controller exchange as well as radio and telephone exchange between various services were recorded by flight and ground recorders, readout and used for the purposes of the investigation.

1.10. Airdrome Information

Rostov-on-Don Airdrome YPPP/URRR/ROV (Russian/ICAO/IATA code) is a Class C civil airdrome (ICAO Class 4D). In accordance with the Airdrome State Registration and Operational Certificate № 57 as of 16.07.1993 (extended till 21.05.2017) the airdrome is suitable for aircraft operations at day and night time, all year round.

Based on Certificate № 010 A-M as of 22.10.15 (valid till 20.05.2017) the airdrome complies with the certification requirements of Aviation Rules AR-139, is suitable for international flights and equipped for instrumental approaches including ICAO CAT I for RWY heading 38°, 218°, ICAO CAT II for RWY heading 38°.

According to Acts of flight and ground testing the lighting equipment on the runway of Rostov-on-Don Airdrome complies with AR-139 requirements for international airdromes and is suitable for ICAO CAT I and II operations at RWY heading 38° and CAT I at RWY heading 218°.

1.11. Flight Recorders

The aircraft was equipped with a Honeywell SSFDR P/N 980-4700-042, S/N 35907 and an L3 CVR FA2100 2100-1020-00.

The flight recorders were found at the accident site with substantial mechanical damage (Figures 3, 4). The flight recorders were delivered to IAC where they were examined and the status of memory modules was assessed including X-ray examinations.

As a result of the operations including recovery of memory unit information cables conducted in the laboratory of the IAC with participation of investigators from the UAE and France, the data from the FDR and CVR were successfully downloaded and read out.

At the time of the Report publication the investigators are completing the hearing out and transcript of all of the recorded CVR information that constitutes 2 hours of record.



Figure 3. FDR picture.



Figure 4. CVR exterior.

1.12. Wreckage Information

The aircraft was totally destroyed as a result of the accident (Figure 5). The aircraft wreckage pattern was spread along the runway. The maximum spread distance was 904,5 meters length and 185 meters width (Figure 6). The investigation team has prepared a detailed wreckage plot.



Figure 5. A general view of the accident site with the marks of initial touchdown.

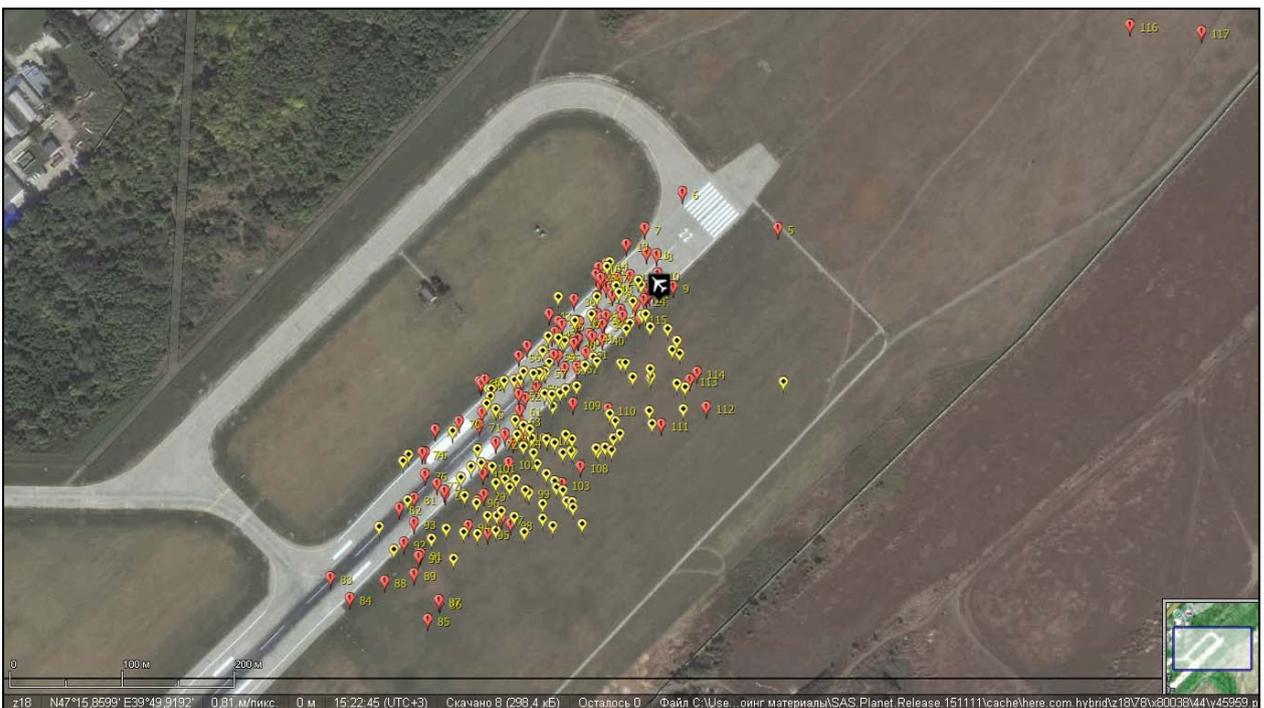


Figure 6. Wreckage plot.

1.13. Medical and Pathological Information

Due to high fragmentation of the bodies the medical and pathological examinations have not been completed yet.

1.14. Survival Aspects

The accident killed all persons on board the aircraft.

1.15. Search and Rescue. Fire Fighting Operations

The accident occurred at Rostov-on-Don Airdrome. The alarm was declared at 00 h 42 min. For the purpose of a rapid conduct of the field investigation cooperation was established between teams from the IAC, the Inquiry Board of the Russian Federation, the Emergency Service, airdrome services and the aircraft Operator.

As a result of the search and rescue operations:

- 4295 samples of biological matter were found and recovered from the accident site, which were sent to the Russian Center of Forensical Expertise for DNA examinations;
- the aircraft wreckage was recovered from the accident site;
- the aircraft fragments were identified and a 2-d mockup aircraft was made in the hangar;
- the runway was cleaned and restored.

A total of 840 persons and 107 vehicles were engaged to eliminate the consequences of the accident.

At 06 h 00 min on 21.03.2016 the search and rescue operations at Rostov-on-Don Airdrome were completed and the airport was open for normal operations.

1.16. Tests and Research

Units and components of the accident aircraft selected for tests and examinations were transported to the Interstate Aviation Committee. At the time of the Report publication the facilities and organizations to conduct the pertinent examinations are being discussed.

Currently the investigation team has planned, among others, for the following activities:

- clarifying the content of the CVR transcript, translating it from English and Spanish and identifying the speakers at IAC laboratory facilities (with participation of investigators from the UAE, USA and Spain);
- mathematic simulation of the aircraft flight and assessment of the control system operability;
- examination of the psycho-emotional and physiological status of the crew taking into consideration the data about the crew work and rest time;

- expertise of the aircraft control system architecture and ergonomic in the longitudinal channel including the stabilizer trim control.

2. Prompt Safety Recommendations

For the purpose of preventive measures the investigation team recommends to:

1. Inform the flight and maintenance personnel operating Boeing B737-800 airplanes on the accident.
2. Have additional training on elements of go-arounds in various conditions, in manual control mode with two engines operative from various heights and with insignificant flight weights.
3. To study the possibility of introduction into the FFS training program scenarios of go-arounds in various conditions, in manual control mode with two engines operative from various heights.
4. Repeatedly study and analyze the implementation of safety recommendations issued by investigation teams of accidents involving the [Boeing 737-500 aircraft registered VQ-BBN on 17.11.2013 at Kazan Airport](#) and the [A320 aircraft registered EK 32009 on 3.05.2006 near Sochi Airport](#).
5. Repeatedly analyze the applicability of recommendations to prevent accidents and incidents during go-around, developed by the BEA based on the safety study related to [Aeroplane state awareness during go-round \(ASAGA\)](#). Depending on the results of the analysis, take applicable safety measures.