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PRELIMINARY REPORT

Serious incident to the AIRBUS A320
Registered 9H-EMU
On 23 May 2022
On approach to Paris-Charles de Gaulle airport (95)

Time	Around 11:40[1]
Operator	Airhub Airlines (Maltese operator)
Type of flight	Commercial air transport, scheduled flight
Persons on board	Captain (PF), co-pilot (PM), 4 cabin crew, 172 passengers
Consequences and damage	None

Incorrect QNH information, RNP approach with LNAV/VNAV minima conducted below the descent profile, near CFIT, go-around performed at low height before the runway without visual references, second approach performed below descent profile

Note: a glossary is available in appendix of the report.

1 HISTORY OF THE FLIGHT

Note: the following information is based on the radio-communication recordings, the radar data, the data from the recorder DAR, flight crew and air traffic controller statements. The CVR data was not preserved.

The crew of the Airbus A320, performing scheduled flight NSZ4311[2], took off on 23 May around 09:30 from Stockholm Arlanda airport (Sweden) bound for Paris-Charles de Gaulle airport (CDG). The captain was the PF, the co-pilot was the PM.

[1] Except where otherwise indicated, the times in this report are in Coordinated Universal Time (UTC). Two hours should be added to obtain the legal time applicable in Metropolitan France on the day of the event.

[2] The aircraft was operated under a wet lease contract between Airhub Airlines (the lessor) providing an Aircraft with Crew, Maintenance and Insurance (also known as ACMI) and Norwegian Air Sweden (the lessee). The aircraft was operated under the AOC of the lessor.

Before descent, the flight crew prepared for a RNP approach with LNAV/VNAV minima[3] to CDG runway 27R[4]. The meteorological conditions indicated in the ATIS Q used by the flight crew when preparing the approach were the following: transition level 70, wind 280 / 10 kt, visibility 10 km, broken clouds at 1,500 ft, few cumulonimbus (CB) at 5,000 ft, temperature 19 °C, dew point 14 °C, QNH 1001.
The crew stated that during all the approach they remained in clouds, without visual references. They experienced moderate turbulence and flew through heavy rain, using the wipers at high speed.

First approach: incorrect QNH given by the controller to the crew, RNP approach with LNAV/VNAV minima conducted around 280 ft below the descent profile

At 11:32:24, on approach to CDG, the Intermediate (ITM) controller instructed the flight crew to descend to 6,000 ft with an incorrect QNH (1011 instead of 1001 valid at the time[5]), "*Red Nose 4 3 1 1, descend … descend 6,000 ft, 1 0 1 1.*"
The PM read back with this QNH, "*6,000 ft, 1 0 1 1 … 1 … 0 1 1, Red Nose 4 3 1 1.*"

At 11:34:28, she instructed the crew to descend to 5,000 ft, repeating the incorrect QNH, "*Red Nose 4 3 1 1, descend 5,000 ft, 1 0 1 1, cleared full RNP 2 7 R.*"
The PM read back the information, "*Descend 5,000 ft, QNH 1 0 1 1, cleared full RNP approach 2 7 R, Red Nose 4 3 1 1.*"

At 11:35:37, the ITM instructed an easyJet flight crew to descend to 5,000 ft with the same incorrect QNH, "*Easy 7 5 Mike Alpha direct Papa Golf 6 5 0 … and descend 5,000 ft 1 0 1 1, cleared RNP approach 2 7 R.*" The easyJet crew read back giving the valid QNH, namely 1001, without asking for confirmation of the QNH value, "*Direct to Papa Golf 6 5 0 descent 5,000 ft QNH 1 0 0 1 Easy 7 5 Victor Alpha.*" This was not noticed by the controller.

At 11:36:04, the ITM instructed an Air France flight crew, in French, to descend to 5,000 ft, with the correct QNH 1001. The Air France crew read back with the correct QNH 1001.

At 11:36:55, the crew of the NSZ4311 flight reached the final descent point (FDP) at an indicated altitude of 4,889 ft QNH 1011 (4,623 ft QNH 1001), and at 14.3 NM from the runway threshold. The indicated airspeed was 185 kt and the aircraft was in configuration CONF 2.

At 11:37:56, the ITM instructed the flight crew to contact the north tower (LOC N controller).

<u>NOTE:</u> the flight crew stated that they conducted the altitude-distance checks every mile during the approach, which led them to believe that they were on the descent profile. However, in such a situation where the altimeter setting is incorrect, during a RNP approach with LNAV/VNAV minima, altitude-distance checks do not detect that the flight path has deviated.
Due to the incorrect QNH setting (1011 instead of 1001), the altitude value displayed on the aircraft

[3] See § 2.3
[4] At the time of the incident, the ILS of runway 27R was out of service.
[5] The meteorological conditions indicated in the ATIS S information in force were: wind 280°/ 9 kt, visibility 10 km, scattered clouds at 1,600 ft, broken clouds at 2,800 ft, few CB 5,000 ft, temperature 18 °C, dew point 15 °C, QNH 1001.

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instruments was around 280 ft above the real aircraft altitude. The flight crew were thus conducting a RNP approach with LNAV/VNAV minima around 280 ft below the published approach descent profile.

At 11:38:44, the aircraft was descending through a Radio-Altimeter (RA) height of 2,500 ft. The RA height values were now displayed on the primary flight displays (PFD).

First approach: MSAW on final, near CFIT, go-around at low height around 1 NM before the runway without visual references and with runway approach lights OFF. Incorrect QNH read-back by the crew during the go-around, not noticed by the controller

At 11:38:09, the flight crew contacted the LOC N who replied, "*Bonjour Red Nose 4 3 1 1, you are number 1, wind 2 6 0°, 12 kt, runway 2 7 R, cleared to land.*" The crew correctly read back the clearance.

At 11:40:49, at an indicated altitude of about 1,392 ft QNH 1011 (1,123 ft QNH 1001, 837 ft RA), corresponding to the stabilization altitude for the crew (1,000 ft above aerodrome), and at 3.1 NM from the runway threshold, the aircraft was configured for landing (CONF FULL) at a speed of 139 kt IAS (Vapp was 139 kt) and with a vertical speed of -738 ft/min.

NOTE: aside from the fact that the aircraft's flight path was not on the correct descent profile, the approach could be considered as stabilized as per standard criteria for the crew.

At 11:41:32, the ground Minimum Safe Altitude Warning (MSAW) was triggered (Point 1 Figure **1**). The aircraft was at an indicated altitude of 891 ft QNH 1011 (617 ft QNH 1001, 200 ft RA), at 1.53 NM from the runway threshold.

NOTE: the controllers stated that the visibility and ceiling at the airport were sufficient not to implement LVP, but that locally in the east of the airport, the visibility was poorer due to clouds and rainfall. The controllers in the tower could not see the aircraft on short final because of the bad weather.

At 11:41:41, at 1.2 NM from the runway threshold, and with a vertical speed of -717 ft/min, the aircraft passed the indicated altitude of 802 ft QNH 1011 (537 ft QNH 1001, 122 ft RA), which corresponded to the Decision Altitude[6] (DA) for the crew (Point 2 Figure **1**).
The flight crew stated that arriving at the minima, they did not acquire visual references and consequently performed a go-around.
At the same time (11:41:41), nine seconds after the MSAW was triggered, the LOC N advised the crew, "*Red Nose 4 3 1 1, I just had a ground proximity alert, are you okay? Do you see the runway?*" (Point 2 Figure **1**).
The crew stated they did not hear this radio-communication. During the message from the controller, a second MSAW was triggered.

[6] The airline policy is to add 50 ft to the published minima for RNP approach with LNAV/VNAV minima. Therefore, according to the NavBlue chart used by the crew, their DA was 802 ft (752 ft + 50 ft).

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At 11:41:47 and during the controller's message, at an indicated altitude of 735 ft QNH 1011 (461 ft QNH 1001, 52 ft RA), and at 1 NM from the runway threshold, the AP was disengaged, and the captain pitched up (Point 3 Figure **1**).

Three seconds later, at 11:41:50, at an indicated altitude of 679 ft QNH 1011 (405 ft QNH 1001), the minimum radio-altimeter height was recorded at 6 ft above the ground. The aircraft was 0.8 NM from the runway threshold. At the same time, the captain moved the thrust levers forward into the TOGA detent (Point 4 Figure **1**).
No Terrain warning (TAWS) was recorded during the approach.

The two pilots stated that they did not hear any radio-altimeter Auto-Callouts other than the callouts at 2,500 ft and 1,000 ft[7].

At 11:42:00, the flight crew announced to the controller that they were going around (Point 5 Figure **1**). He replied, "*Roger Red Nose 4 3 1 1, turn right on heading 3 6 0 and climb altitude 5,000 ft, 1 0 0 1.*" The crew read back with the previous incorrect QNH, which was not noticed by the LOC N, "*3 6 0 and climb 5,000 ft on 1 0 1 1, Red Nose 4 3 1 1*" (Point 6 Figure **1**).

During these exchanges, the controllers in the tower could not yet see the aircraft. After a few seconds, they saw the aircraft coming out of the clouds, at low height, with a pitch up attitude.

At 11:42:05, the AP was reengaged at an indicated altitude of 1,203 ft QNH 1011 (930 ft QNH 1001, 593 ft RA), and at 0.3 NM before the runway threshold.
At the same time, and while the LOC N was transmitting the message to the flight crew, the LOC-S assistant[8] advised the LOC-N assistant that they had not switched ON the approach lights.

At 11:42:27 the LOC N controller switched ON the approach lights. Following the MSAW and the omission of switching ON the approach lights, the LOC N was replaced by his LOC-N assistant and a new LOC-N assistant took over.

[7] Specific system analysis will be performed to confirm the presence or absence of auto-callouts.
[8] At the time of the incident, each set of parallel runways (north and south) was worked by a pair of controllers as per SOPs: the LOC and the LOC assistant. The pair working on the northern runways is situated in the north tower, the pair working on the southern runways is situated in the south tower.

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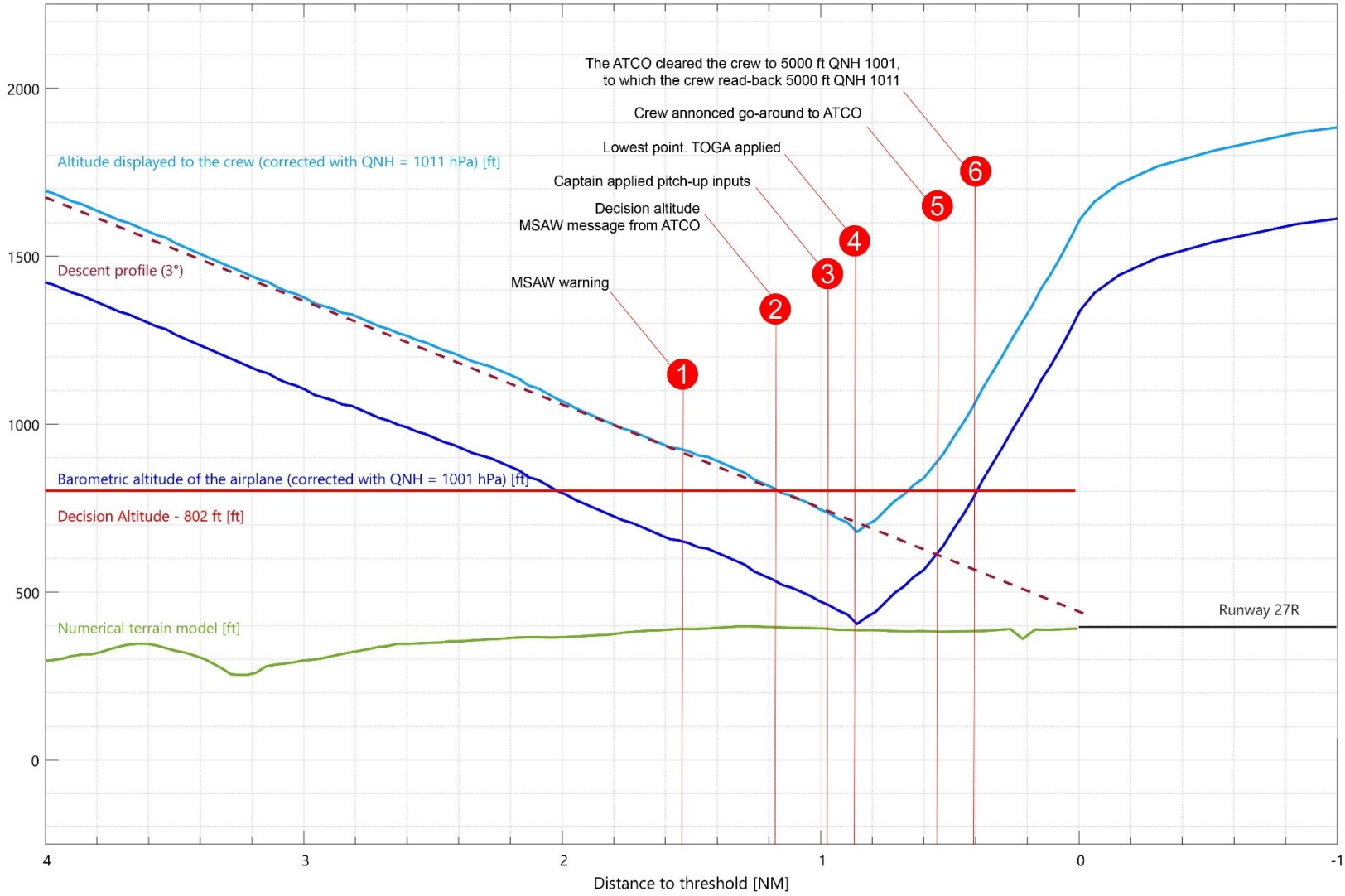

Figure 1: First approach profile, flight path computed from recorded flight parameters (source: BEA)

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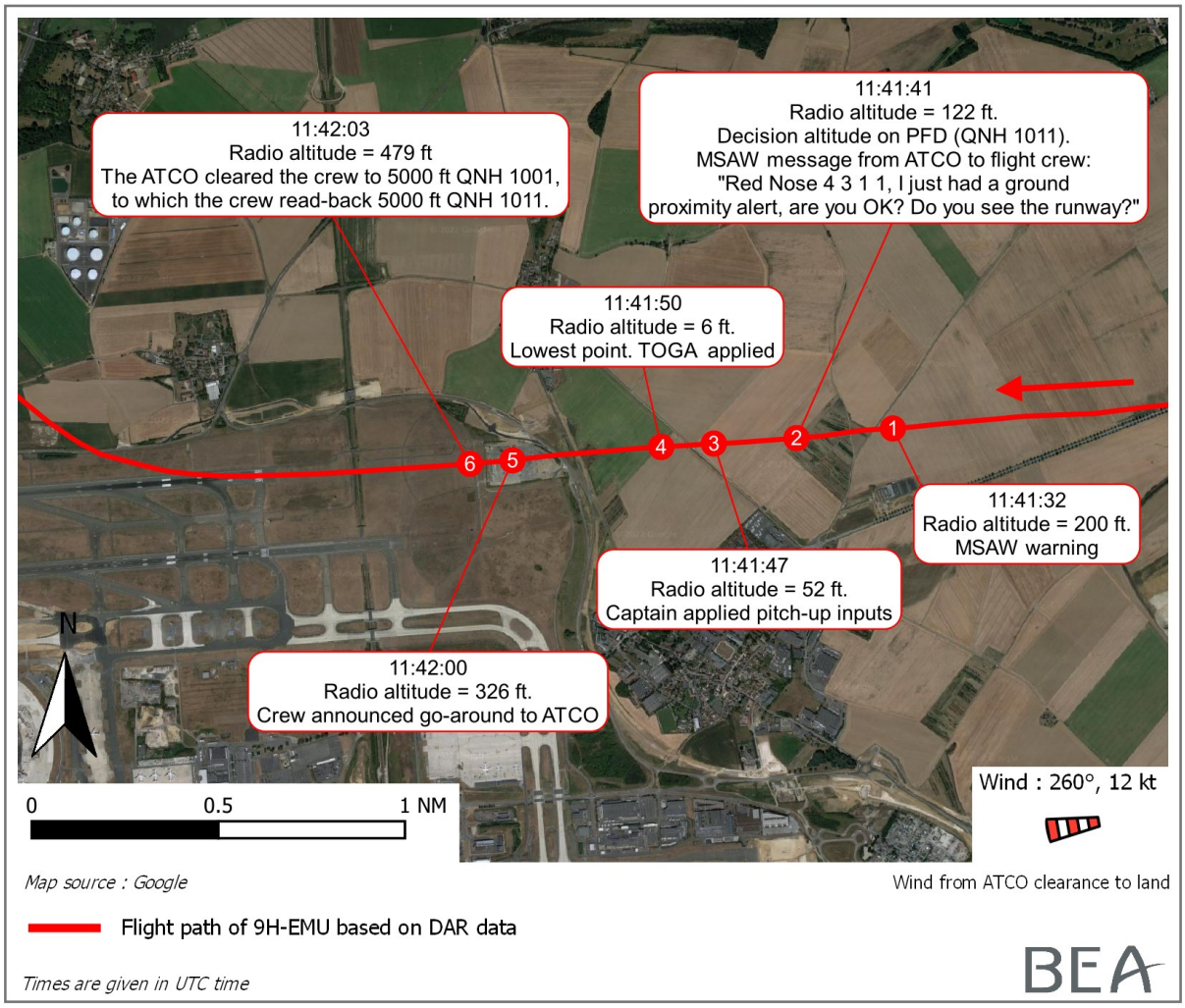

Figure 2: First approach - Horizontal flight path (source: BEA)

Second approach: RNP approach with LNAV/VNAV minima conducted around 280 ft below the descent profile, MSAW on final, correction of the flight path and landing

At 11:44:42 and after giving further radar vectors, the LOC N instructed the crew to contact the arrival (ITM controller) for the second approach. The aircraft was on the downwind leg for runway 27R.

At 11:45:00, the ITM controller indicated to the flight crew to expect RNP 27R.

At 11:49:09 and after further vectors, the ITM cleared the flight crew for a second RNP 27R approach.

At 11:53:40 and after being contacted by the crew, the LOC N cleared the crew for landing. The crew read back and asked if the approach lights were ON, which was confirmed by the controller.

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NOTE: following the clearance to climb after the go-around and until landing, the QNH was given neither to the flight crew nor to another aircraft in contact with ATC on the same radio frequency as the crew.

The aircraft continued to fly with an incorrect altimeter setting. Neither the crew nor the controllers were aware of the incorrect QNH setting which again put the aircraft around 280 ft below the published descent profile.

At 11:55:43, a new MSAW was triggered (Point 8 Figure **3**). The aircraft was at an indicated altitude of 1,403 ft QNH 1011 (1,131 ft QNH 1001, 842 ft RA), and at 3.1 NM from the runway threshold.

Four seconds later, the LOC N controller (who was the LOC-N assistant for the first approach) advised the crew of the MSAW warning, "*Red Nose 4 3 1 1, I just got a … a terrain alert, are you okay?*" (Point 9 Figure **3**).
The crew told the BEA that they did not understand the reason for this message. The PM answered, "*Red Nose 4 3 1 1, we are established on path and we have visual now*."

At 11:56:00 at an indicated altitude of 1,227 ft QNH 1011 (954 ft QNH 1001, 572 ft RA), and at 2.54 NM from the runway threshold, the PF applied a nose up input on his sidestick. Simultaneously, the AP disconnected. Flight Directors (FD) were switched off eight seconds later.
The crew stated that this time they had visual contact with the runway well above the minima. They described the PAPI lights as follows, "*One white, one pink, and two reds. Maybe three reds but not four."*

The PF corrected the flight path on final and then landed without further incident.

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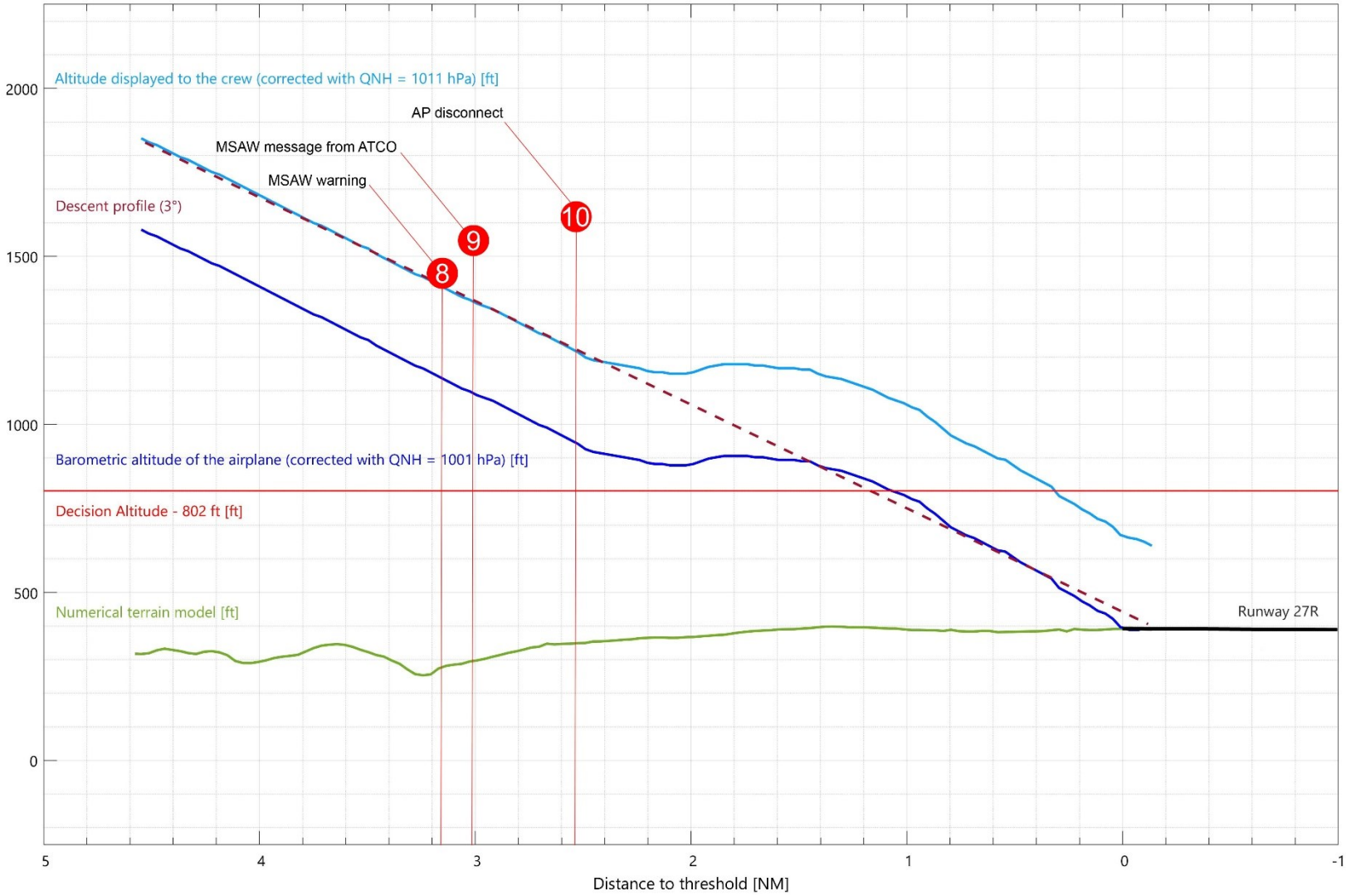

Figure 3: Second approach profile, flight path computed from recorded flight parameters (source: BEA)

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2 ADDITIONNAL INFORMATION

2.1 Approach chart used by the flight crew

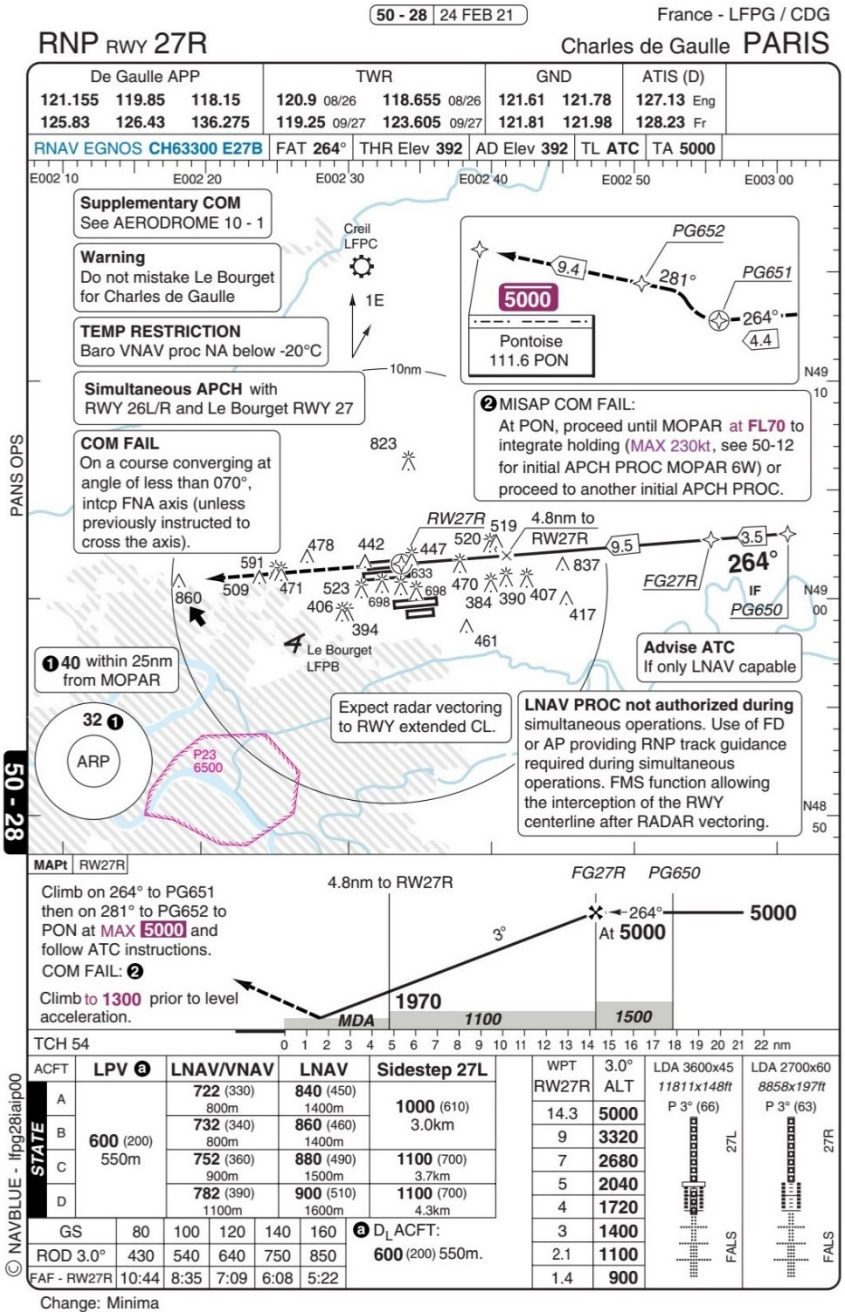

Figure 4: Approach Chart (source: NAVBLUE)

2.2 Meteorological information

The CDG METAR of 11:30 and 12:00 UTC were as follows:

- LFPG 231130Z 26008KT 9999 SCT016 BKN028 18/15 Q1001 RESHRA TEMPO 3500 SHRA SCT060CB=

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At 11:30 UTC at LFPG: wind direction 260°, wind speed 8 kt, visibility above 10 km, scattered clouds at 1,600 ft AAL, broken clouds at 2,800 ft, temperature 18 °C, dew point 15 °C, QNH 1001 hPa, recent rain showers, temporary changes visibility 3,500 m, rain showers, scattered clouds at 6,000 ft with cumulonimbus.

- LFPG 231200Z 29010KT 5000 SHRA FEW010 BKN015 BKN028 FEW050CB 16/15 Q1001 TEMPO 3500 SHRA SCT060CB=

At 12:00 UTC at LFPG: wind direction 290°, wind speed 10 kt, visibility 5,000 m, rain showers, few clouds at 1,000 ft, broken clouds at 1,500 ft, broken clouds at 2,800 ft, few clouds at 5,000 ft with cumulonimbus, temperature 16 °C, dew point 15 °C, QNH 1001 hPa, temporary changes visibility 3,500 m, rain showers, scattered clouds at 6,000 ft with CB.

According to Météo-France's[9] post incident analysis, between 11:35 and 11:45, the satellite visible imagery shows the presence of CB with strong vertical development. The weather surveillance radar precipitation images show the passage of a heavy rain shower over CDG. Observations made by the Météo-France observer present at CDG and the measurements made by an automatic station on runway 27R, confirmed the passage of this rain shower and the associated decrease in visibility.

At the time of the second approach, around 11:55, the Météo-France observer and the automatic weather station on runway 27R confirmed that a rain shower under CB with strong vertical development was still in progress and reduced the visibility.

2.3 RNP approaches with LNAV/VNAV minima

RNP approaches with LNAV/VNAV minima[10] are one type of GNSS approach. They are classified as approaches with vertical guidance (APV). In the design of APV baro-VNAV approaches, the baro-VNAV performance of the aircraft is taken into account when determining the obstacle clearance protection criteria. APV baro-VNAV approaches are not considered as precision approaches due to the performance of the baro-VNAV function. The OCH for these kinds of approaches cannot be below 250 ft.

For a RNP approach with LNAV/VNAV minima, lateral guidance relies on the RNAV/GNSS system and is mainly based on GNSS positioning. Vertical guidance uses the baro-VNAV function, based on the aircraft barometric altitude. This type of approach, as for all approaches using the baro-VNAV function, can be affected by altimeter setting errors. These errors cannot be detected by altitude-distance cross-checks against values provided on the approach chart. On the other hand, vertical guidance satellite-based approaches, such as the RNP (LPV), use vertical guidance based on GNSS positioning and the GNSS augmentation system. They are not sensitive to QNH errors.

[9] French met office.

[10] See the Operational guidelines to conduct RNAV(GNSS) approaches with LNAV, LNAV/VNAV and LPV minima published by the French Civil Aviation Authority (DGAC) https://skybrary.aero/sites/default/files/bookshelf/2315.pdf (EN, old edition) / https://meteor.dsac.aviation-civile.gouv.fr/meteor-externe/api/file/attachment/f38850da-2e65-4196-890b-a46240ad5ac4 (FR, current edition)
And the Performance Based Navigation Guide published by EASA

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When a RNP approach is available for a QFU, a RNP approach chart is published in the AIP. A flight crew may be cleared for a RNP approach, but the clearance does not indicate the type of RNP approach (LNAV, LNAV/VNAV or LPV for example). The acceptance of a RNP approach and the choice between the available types of RNP approach is determined by the flight crew's qualification, operator approbation and aircraft's capability. The crew are not required to inform the controller about the specific type of RNP approach they will conduct[11].

In the case of this serious incident, as the ILS for runway 27R was inoperative, the controller cleared the flight crew for a RNP approach. As the aircraft was not equipped to perform RNP (LPV) approaches, the flight crew opted for a RNP approach with LNAV/VNAV minima.

Onboard an Airbus A320, vertical guidance during a RNP approach with LNAV/VNAV minima is displayed on the PFD using a vertical deviation indicator (V/DEV). Guidance is also provided by the flight director (FD) bars, as for an ILS.
Airbus' operational procedures for this aircraft, as well as the operator's one, integrate some specific items for RNP approaches with LNAV/VNAV minima. Altimeter settings are mentioned twice in the documentation:

- "*For RNAV (GNSS) approach with LNAV VNAV minima, use of QNH from a remote station is Prohibited.*"
- "*The vertical guidance requires a precise BARO setting.*"

The flight crew operational documentation regarding a RNP approach with LNAV/VNAV minima mentions the risks of the cockpit altimeters having different settings, but it does not specifically mention the risk of having the same incorrect QNH setting on both altimeters.
In addition, there is no dedicated item concerning a specific cross-check of the QNH with another source of information such as the ATIS or METAR, or confirmation of the QNH with ATC.

2.4 MSAW system at CDG

The Minimum Safe Altitude Warning (MSAW) is a safety net that advises controllers when an aircraft's descent rate is such that there is a risk of collision with the terrain in the short term.

At CDG, the MSAW is active in a 64 NM x 64 NM square centered on CDG, in which the terrain and the main artificial obstacles are modelized in 0.5 NM x 0.5 NM squares.

An obstacle clearance margin (MFO) of 300 ft is applied. If the rate of descent of an aircraft is going to bring it inside this margin within 34 s, then the MSAW is triggered.

[11] At CDG and according to the AIP, the flight crew is required to indicate to the controller if they are only able to perform a LNAV approach.

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Figure 5: MSAW logigram (source: CDG Operating Manual)

When the MSAW system detect a conflict, two warnings are generated:

- a visual warning on the radar display at all air traffic controller positions: "MSAW" flashing in amber
- an aural warning, "*Biiip biiip, alerte relief*" [terrain alert]

These warnings are visible and audible at all air traffic controller positions.

According to the Operating Manual of CDG air navigation services, the procedure in case of a MSAW is that the controller who is in contact with the aircraft's crew acknowledges the warning by clicking on it. The visual and aural warnings are then deactivated at all air traffic controller positions.
The procedure in case of a MSAW, for an aircraft not being vectored, is to:

- immediately advise the flight crew that a terrain alert has been generated,
- instruct the flight crew to immediately check their flight level or altitude,
- and give them the QNH.

For instance, and according to the CDG OM, the phraseology to be used is "*AFR 3 2 4 5, terrain alert, check your altitude immediately, QNH 1 0 1 2.*"

3 NEXT STEPS OF THE INVESTIGATION

The validation and the analysis of the parameters as well as the analysis of the event as a whole are continuing.
Particular attention will be given, but not limited, to the analysis of the following points:

- non-activation of TAWS alert,
- triggering of radio-altimeter auto-callouts in the aircraft,
- settings and configuration of MSAW at CDG,
- MSAW phraseology,
- flight crew and air traffic controller training and procedures,
- flight crew and air traffic controller performance,
- additional ground and onboard systems to prevent CFIT during approaches using the baro-VNAV function,
- safety impact assessments associated with the ICAO Performance Based Navigation (PBN) plan and its regional and national adaptations,
- similar events,
- manufacturers operational documentation regarding approaches using the baro-VNAV function.

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4 RECOMMENDATIONS

Note: in accordance with the provisions of Article 17.3 of Regulation No 996/2010 of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation, a safety recommendation in no case creates a presumption of fault or liability in an accident, serious incident or incident. The recipients of safety recommendations report to the issuing authority in charge of safety investigations, on the measures taken or being studied for their implementation, as provided for in Article 18 of the aforementioned regulation.

In this serious incident, during the first RNP approach with LNAV/VNAV minima, an incorrect QNH was provided by a controller:

- Twice to the flight crew, and each time the crew read back the incorrect QNH provided,
- Once to another flight crew, who did not read back the QNH given but read back the valid QNH at the time, without this being noticed by the controller.

The QNH given to the flight crew differed by 10 hPa from the valid QNH at the time and included in the ATIS information, leading to an approach carried out around 280 ft below the descent profile.
When the crew was transferred to the tower frequency, as per standard procedure, the controller gave the landing clearance without giving them the QNH value.
The approach resulted in a near Controlled Flight Into Terrain (CFIT), without visual references, at a minimum height of 6 ft. Not having acquired visual references, the crew performed a go-around.

Before the second RNP approach with LNAV/VNAV minima, the flight crew only received the QNH during the go-around phase. This time the QNH given to the crew was correct but the read-back by the crew was incorrect and the error was not noticed by the controller. Therefore, the crew continued to fly with an incorrect QNH setting which resulted in the aircraft remaining at an altitude around 280 ft below the expected flight path.
During the second approach, the flight crew acquired visual references before reaching the minima and were able to correct the flight path and to land without further incident.

The Air Traffic Control operational procedures require the controller to give the QNH to the flight crew at the first altitude clearance, but there is no obligation to repeat the QNH before landing.
Initial interviews conducted as part of the investigation suggest that the importance of the QNH for approaches using the baro-VNAV function, with respect to the risk of CFIT, may be underestimated and not clearly understood by controllers.

The flight crew operational documentation regarding a RNP approach with LNAV/VNAV minima mentions the risks of the cockpit altimeters having different settings, but it does not specifically mention the risk of having the same incorrect QNH setting on both altimeters.
In the case of a RNP approach with LNAV/VNAV minima, vertical guidance uses the baro-VNAV function. Therefore, in this case, QNH setting errors are critical. These errors cannot be detected by altitude-distance cross-checks against values provided on the approach chart. In addition, there is no dedicated item requiring a specific cross-check of the QNH with another source of information such as the ATIS, METAR or confirmation of the QNH with ATC.
This type of issue is common to all approaches using the baro-VNAV function.

A Minimum Safe Altitude Warning (MSAW) system could be considered as one of the last barriers

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to avoid a CFIT event when available.
At Paris-Charles de Gaulle airport, the standard procedure for a controller in case of a MSAW when the aircraft is not not being vectored is to:

- immediately advise the flight crew that a terrain alert has been generated,
- instruct the flight crew to immediately check their flight level or altitude,
- and give them the QNH.

During this serious incident, the MSAW was triggered on both approaches and the standard MSAW phraseology was not applied by the controllers. In particular, the crew were not instructed to check their altitude nor were they given the QNH.
Initial interviews conducted as part of the investigation suggest that the emergency phraseology associated with a MSAW is not perfectly known nor understood by controllers.

4.1 Air Traffic Control risk awareness and operational procedures

The BEA recommends:

- ***Whereas in the short time span of this event, an incorrect QNH was provided to two flight crews by one controller,***
- ***Whereas in the short time span of this event, two controllers did not notice the read-back of an incorrect QNH,***
- ***Whereas the MSAW system, when available, can be considered as one of the last barriers to avoid CFIT,***
- ***Whereas the MSAW phraseology was not used, and the QNH information was not repeated,***

That Paris-Charles de Gaulle Air Traffic Services:

- **Ensure without delay, that controllers are aware of the importance of the QNH for approaches using the baro-VNAV function, with respect to the risk CFIT**

[Recommendation FRAN-2022-005]

- **Ensure without delay, that controllers are aware of the importance of checking that the information read back by flight crews is correct**

[Recommendation FRAN-2022-006]

- **Ensure without delay, that controllers strictly use the standard phraseology in case of a MSAW, and provide the QNH information**

[Recommendation FRAN-2022-007]

- **Implement without delay a procedure for controllers to mitigate the risk of an incorrect QNH being used by flight crews during approaches using the baro-VNAV function, possibly by repeating the QNH at an appropriate time during the approach.**

[Recommendation FRAN-2022-008]

4.2 Flight crew risk awareness and operational procedures

The BEA recommends:

- ***Whereas there was a difference of 10 hPa between the QNH provided by the ATIS and the controller during the approach, which is higher than what might be expected from atmospheric pressure fluctuations, and was not noticed by the crew,***

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- ***Whereas the operational documentation of the airline does not highlight the importance of the QNH for approaches using the baro-VNAV function, with respect to the risk of CFIT,***
- ***Whereas the airline operational procedures regarding approaches using the baro-VNAV function are not robust against altimeter QNH setting errors affecting both altimeters,***

that Airhub Airlines:

- **Ensure without delay, that the flight crews are made aware of the importance of the QNH setting for approaches using the baro-VNAV function, with respect to the risk of CFIT**

[Recommendation FRAN-2022-009]

- **Implement without delay, a procedure to mitigate the risks of an incorrect QNH setting affecting both altimeters during approaches using the baro-VNAV function, possibly by crosschecking the QNH with another source of information, in particular with the ATIS information when available or by asking the controller for confirmation of the QNH**

[Recommendation FRAN-2022-010]

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APPENDIX 1: GLOSSARY

Acronyms	English version
AAL	Above Aerodrome (Airport) Level
ACMI	Aircraft Crew Maintenance and Insurance
AIP	Aeronautical Information Publication
AOC	Air Operator's Certificate
AP	Automatic Pilot
APV	APproach with Vertical guidance
ATC	Air Traffic Control
ATCO	Air Traffic Control Operator / controller
ATIS	Automatic Terminal Information Service
CB	Cumulonimbus
CDG	Paris-Charles de Gaulle Airport
CFIT	Controlled Flight Into Terrain
CVR	Cockpit Voice recorder
DA	Decision Altitude
DAR	Digital ACMS Recorder
EASA	European Aviation Safety Agency
FD	Flight Director
FDP	Final Descent Point
GNSS	Global Navigation Satellite System
IAS	Indicated Air Speed
ICAO	International Civil Aviation Organization
ILS	Instrument Landing System
ITM	Intermediate controller (approach)
LNAV	Lateral Navigation
LOC	Local controller (tower)
LPV	Localizer Performance with Vertical guidance
LVP	Low Visibility Procedure
METAR	Aerodrome routine meteorological report
MFO	Obstacle clearance margin
MSAW	Minimum Safe Altitude Warning
NM	Nautical Mile
OCH	Obstacle Clearance Height
OM	Operating Manual
PBN	Performance Based Navigation
PF	Pilot Flying
PFD	Primary Flight Display
PM	Pilot Monitoring
QFU	Magnetic orientation of runway

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Acronyms	English version
QNH	Altimeter sub-scale setting to obtain elevation when on ground
RA	Radio-Altimeter
RNAV	aRea NAVigation
RNP	Required Navigation Performance
SNA	Navigation air services
TOGA	Take-Off Go-Around
TAWS	Terrain Awareness and Warning System
UTC	Universal Time Coordinated
V/DEV	Vertical DEViation
VNAV	Vertical Navigation

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