

DATA SUMMARY

LOCATION

Date and time	Monday, 11 February 2008; 18:29 local time¹
Site	Valencia Airport

AIRCRAFT

Registration	PH-DMQ	EC-KLL
Type and model	De Havilland Canada DHC-8-315Q	Gulfstream G200
Operator	Air Nostrum	Executive Airlines

Engines

Type and model	PRATT & WHITNEY 123A	PRATT & WHITNEY 306A
Number	2	2

CREW

	Pilot	Copilot	Pilot	Copilot
Age	50 years old	30 years old	35 years old	37 years old
Licence	ATPL	CPL	ATPL	ATPL
Total flight hours	7,350 h	369 h	3,300 h	4,037 h
Flight hours on the type	2,000 h	199 h	100 h	108 h

INJURIES

	Fatal	Serious	Minor/None	Fatal	Serious	Minor/None
Crew			4			3
Passengers			28			3
Third persons						

DAMAGE

Aircraft	Minor	Minor
Third parties	None	None

FLIGHT DATA

Type of operation	Commercial passenger transport	Commercial passenger transport
Phase of flight	Taxiing	Taxiing

REPORT

Date of approval	28 October 2009
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¹ The reference time used in this report is local time. To obtain UTC, subtract 1 hour from the local time.

1. FACTUAL INFORMATION

1.1. History of the flight

On Monday, 11 February 2008, aircraft EC-KLL, inbound from Torrejón airport, landed on runway 30 of Valencia airport at 18:24² with 6 persons onboard. It left the runway via taxiway H6 and was cleared to taxi to the H5 runway holding point, where it had to stop. A signalman was waiting for it there to guide it across the runway and on to the south apron (Figure 2).

Three minutes after aircraft EC-KLL landed, aircraft PH-DMQ, inbound from Seville airport, landed with a total of 32 people onboard. It left the runway via taxiway H7 and was cleared to taxi on taxiway N, perpendicular to H5, to gate B, where a signalman was waiting for it (Figure 2).

At 18:29, as aircraft PH-DMQ was transiting on taxiway N with aircraft EC-KLL stopped at H5, the right wingtip of the former struck the vertical stabilizer of the latter, resulting in minor damage to each (Figure 1). Aircraft PH-DMQ continued taxiing until it reached the signalman's car, which guided it to its parking stand on the north apron. Aircraft



Figure 1. Damage to aircraft EC-KLL and PH-DMQ

² The reference time used in this report is the local time as recorded by the control tower.

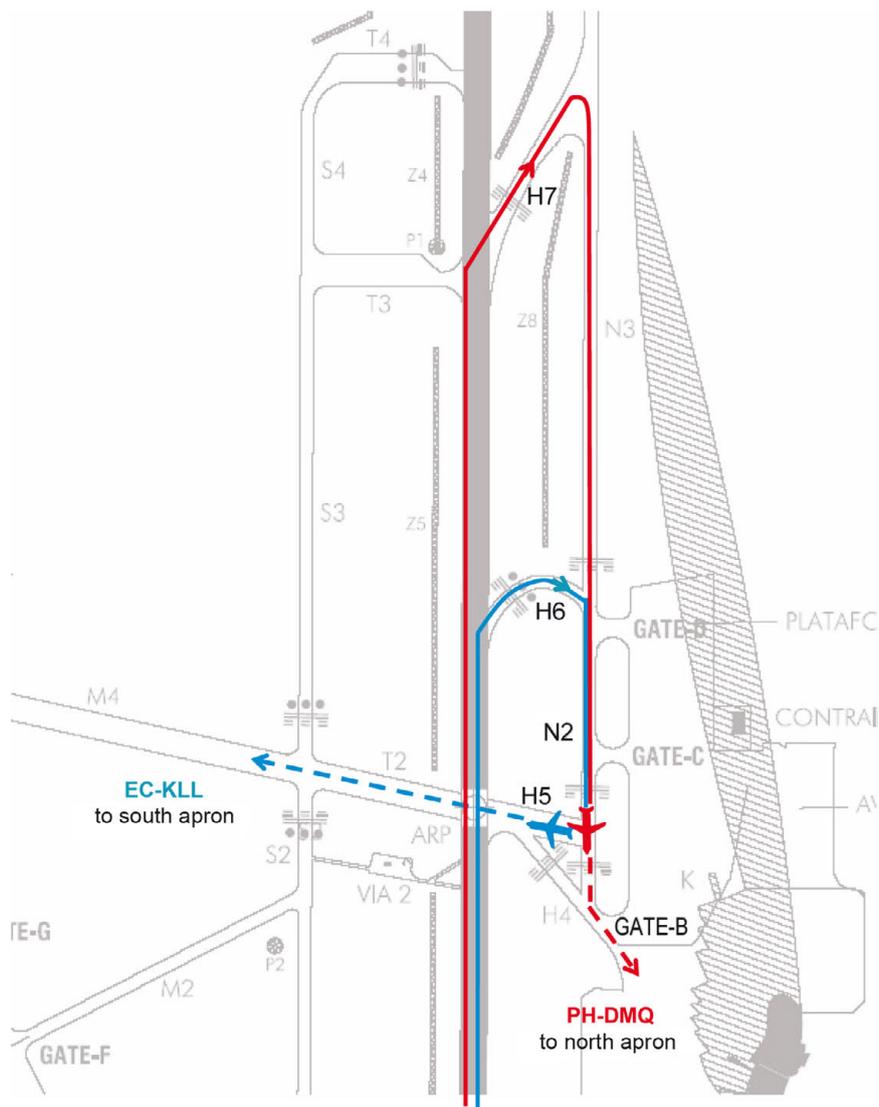


Figure 2. Taxi paths by aircraft EC-KLL and PH-DMQ

EC-KLL, after being informed by the marshal of the damage, taxied under its own power to its stand on the south apron.

Visibility conditions were good and under daylight, although it was close to sunset.

1.2. ATC information and flight recorders

ATC communications between the control tower at Valencia airport and the aircraft confirm the following sequence of events:

- 17:24:15 Landing of aircraft EC-KLL.
- 17:24:53 EC-KLL cleared by ATC to taxi to H5 and hold short of runway.

- 17:27:10 Landing of aircraft PH-DMQ.
- 17:27:28 EC-KLL reaches H5.
- 17:27:40 PH-DMQ cleared by ATC to taxi to gate B.
- 17:29:20 Impact between aircraft PH-DMQ and EC-KLL.

1.3. Aerodrome information

The published aerodrome map for ground movements in effect at the time of the incident showed the following configuration for the area where the impact occurred: two runway holding points on taxiway N2, one on taxiway H4 and none on H5 (Figure 3).

The actual airport configuration for the same area featured (Figure 3):

- A mandatory NO ENTRY marking at H4.
- A runway holding point and intermediate holding point at H5. The H5 runway holding point was equipped with stop bar lights and an inscription on the pavement with the characters H5 in yellow letters on a black background situated behind the dashed lines. There were no signs. The intermediate holding point had no lights.
- Two intermediate holding points at N2 (Figure 3), neither of which had lights.
- At the intersection of H5 with runway 12/30, a curved transition area had been built for the purpose of converting H4 into a rapid exit taxiway for runway 12.

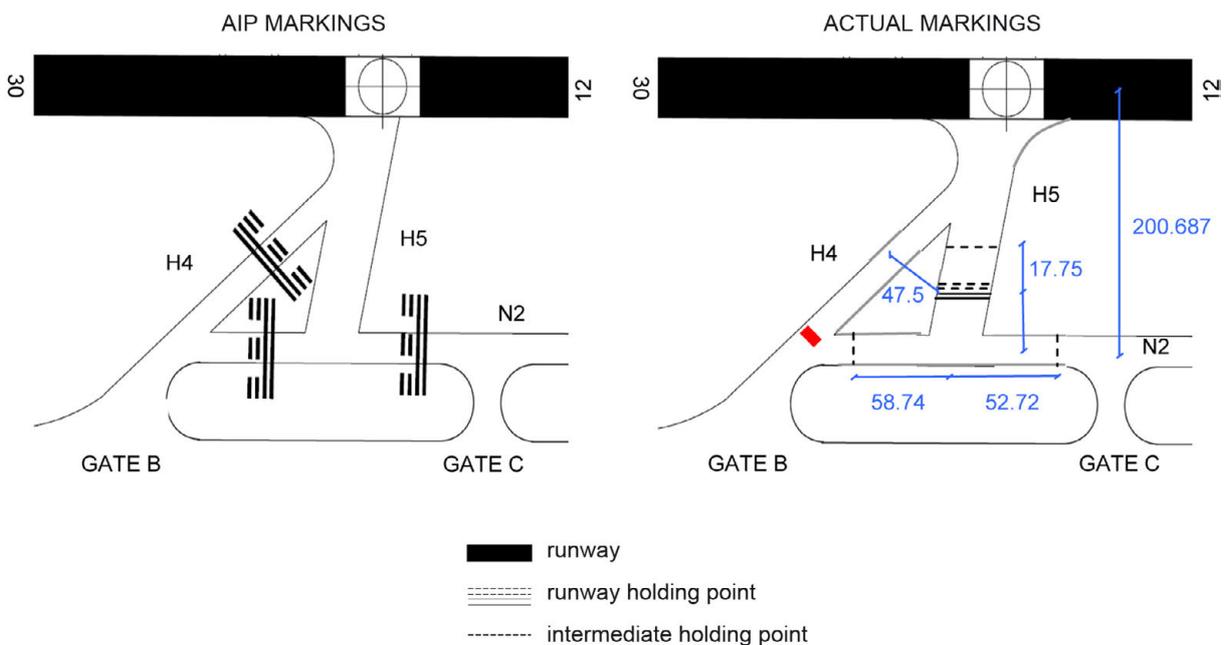


Figure 3. Markings in the impact area (distances in meters)

Valencia airport had undergone a major renovation in the spring of 2007, and minor construction was still ongoing at the time of the incident. As a result of this work, the aerodrome classification went from 4D to 4E, in accordance with ICAO specifications.

At the time of the incident, there were no published taxiing restrictions in the AIP for N2, either in normal or low visibility conditions. The general taxiing procedures specified that pilots were responsible for avoiding collisions with other aircraft while taxiing in the stand and in areas out of view of the control tower.

1.4. Tests and research

1.4.1. Statements

The crew of aircraft PH-DMQ stated that it saw aircraft EC-KLL stopped on H5. The captain, seated on the left, was the pilot flying. Both pilots were looking outside as they approached and thought there was enough room to pass. At the exact moment of the collision there was no visibility from the PH-DMQ's captain left seat with respect to the EC-KLL, which was to his right. Although night was falling, visibility was good.

The captain of aircraft EC-KLL stated that he felt an impact in the rear of the airplane and when they looked back, they saw aircraft PH-DMQ passing by.

The signalman for EC-KLL stated that the aircraft was properly positioned at the holding point, some two meters away at most from the marking. The signalman's vehicle was to the left of the aircraft, although they are generally positioned in front.

The controller stated that he watched both aircraft while they were taxiing without noticing anything out of the ordinary, and that he cleared PH-DMQ to gate B because there were no taxiing restrictions between H5 and taxiway N and he thought there was sufficient room. Visibility was good.

1.4.2. Distance calculation

Taking into account the length of aircraft EC-KLL (18.97 m), the wingspan of PH-DMQ (27.43 m), the actual distance between the runway holding point at H5 and the taxiway N2 centerline (35.45 m), and assuming the aircraft were positioned exactly at the holding point sign and taxiing on the centerline, respectively, the distance separating the two was 2.7 m.

1.4.3. DGAC verification

As a result of the incident, the DGAC was asked to verify the criteria for the location of the runway holding point at H5 with respect to the runway and taxiways H4 and N2.

Following its study, the DGAC confirmed that the layout complied with all of the regulations specified in ICAO Annex 14.

1.5. Additional information

1.5.1. *Aerodrome distances and markings*

There are no published directives in Spain for aerodrome design. The reference used in practice is Annex 14, Volume I, to the ICAO, which specifies that aircraft with a wingspan of 52 m up to but not including 65 m may operate in aerodromes with code elements 4E (Table 1.1, Annex 14).

In order to safeguard the runway, a minimum distance of 90 m is specified between the runway centerline and the runway holding point for aerodromes with code letter E and category I, II or III precision approaches (Table 3.2, Annex 14). The separation distance between a runway centerline and a taxiway centerline for an instrument runway at a 4E aerodrome must be 182.5 m (Table 3.1, Annex 14).

As regards taxiways, a separation distance of 47.5 m is specified between the centerline of a taxiway (that is not an aircraft stand taxilane) and any object (Table 3.1, Annex 14). This distance corresponds to the strip within which any taxiway that is not a stand taxilane must be situated, and inside which no other object should be placed that could endanger taxiing airplanes (3.11.1, 3.11.2 and 3.11.3, Annex 14).

When an intermediate holding point marking is situated at the intersection of two paved taxiways, it shall be placed at a sufficient distance from the edge of the intersecting taxiway so as to provide safe separation between taxiing aircraft (5.2.11.3, Annex 14). The intermediate holding point marking shall consist of a single broken line (5.2.11.5, Annex 14). Intermediate holding points, except for those that include stop bars, shall be equipped with intermediate holding point lights when they are intended for use in runway visual range conditions less than a value of 350 m (5.3.20.1, Annex 14).

A pattern "A" runway holding point marking (double unbroken line and double broken line) shall be supplemented with a runway designation sign (5.4.2.3, Annex 14) which, being a mandatory instruction sign, shall consist of an inscription in white on a red background (5.4.2.2 and 5.4.2.12, Annex 14).

If the appropriate authority deems it impractical to install an information sign where one would normally be installed, an information marking shall be displayed on the surface of the pavement (5.2.17.1, Annex 14). This marking shall be located so as to be legible from the cockpit of an approaching aircraft (5.2.17.5, Annex 14) and shall have a yellow inscription on a black background when it replaces or supplements a location sign (5.2.17.6, Annex 14).

1.5.2. *Aerodrome operation*

Annex 14 defines a runway holding point as a point intended to protect a runway and at which taxiing aircraft and vehicles shall stop and wait unless the control tower at the aerodrome authorizes otherwise. The intermediate holding point is defined as a designated point intended to control traffic and at which taxiing aircraft and vehicles shall stop until further cleared to proceed by the aerodrome control tower.

The Air Traffic Regulations (RCA², from its abbreviation in Spanish) defines taxiing holding points as those designated points at which taxiing aircraft and vehicles shall stop and wait unless otherwise authorized by the aerodrome control tower.

2. ANALYSIS

2.1. Relative positions of both aircraft

The impact between aircraft EC-KLL and PH-DMQ occurred as aircraft PH-DMQ was taxiing on taxiway N2 and aircraft EC-KLL was stopped at the runway holding point on taxiway H5.

Aircraft EC-KLL is considered to have been properly stopped, considering that the position of the aircraft cannot be exactly adjusted to the location of the markings. Moreover, under other circumstances the signalman's car could have been in front of the aircraft and equally properly positioned so aircraft EC-KLL had been further back than how it was positioned at the time of the incident. As for aircraft PH-DMQ, its movement on taxiway N2 was executed properly. No deviations from the centerline were detected. Even if they had, the design of the taxiways, due to their width and safety margins, allow certain deviations, since it is assumed that aircraft are not always going to taxi exactly over the centerline. It is therefore considered that the positions and motions of the aircraft involved in the incident were not influencing factors in the incident.

The distance separating the two aircraft was 2.7 m (assuming they were located exactly at the holding point and the taxiway centerline). This small separation distance was reduced by the inexact position in the actual displacement of both aircraft and led to the right wingtip of the taxiing aircraft impacting the vertical stabilizer of the stopped aircraft. The slight depth of the impact on aircraft EC-KLL confirms that the deviation with respect to nominal positions was minimal for both aircraft and rules out a location outside of the normal tolerance margins for either.

The physical characteristics of aircraft EC-KLL and PH-DMQ were not limiting as regards the largest dimension airplane that can operate at the airport. If both aircraft had been of the critical size in terms of wingspan and length, the right wingtip of the aircraft

² Royal Decree 57/2002, of 18 January, which approved the Air Traffic Regulation and subsequent amendments.

taxiing on N2 would have been 3 m away from the runway holding point marking on H5, and the aircraft located at the H5 holding point would have completely occupied taxiway N2. In this extreme case, even had an ATC clearance been granted, the taxiing aircraft would have stopped given the impossibility of continuing to taxi. In the case at hand, the size of the aircraft left room for doubt as to the space available to pass.

2.2. Meteorological conditions

The weather conditions present at the time of the incident were not a contributing factor since, even though twilight was approaching, neither the crews, signalmen or controller reported any visibility problems. Both the controller and the crew of aircraft PH-DMQ were aware of the presence and position of aircraft EC-KLL.

2.3. ATC clearances

The communications records from the Valencia airport control tower revealed that aircraft EC-KLL was in a position that had previously been authorized by ATC. Aircraft PH-DMQ was moving in accordance with a previous clearance to taxi to gate B and which exempted it from having to stop at the intermediate holding point prior to reaching H5. We can therefore dismiss the possibility that either aircraft was in a position that was contrary to ATC instructions.

The purpose of the two intermediate holding points on N2 is to protect aircraft that are going to cross or exit the runway via H5 or H4, since it is easier to stop an aircraft taxiing at low speed on N2 than one that has just exited the runway via rapid exit taxiway H4, for example. The purpose of the intermediate holding points is precisely this, to protect other aircraft taxiing on a crossing taxiway. It may have been more appropriate for aircraft PH-DMQ to have remained at the intermediate holding point before the intersection with H5 until aircraft EC-KLL had left its position. Bearing in mind the nature and purpose of holding points, it would have been considered unnecessary to publish any taxiing restriction or warning for N2.

The controller was aware of the position of aircraft EC-KLL when he cleared PH-DMQ to taxi behind it. He had a direct line of sight to both and was in fact watching them during the taxi run. To reiterate, had the dimensions of both aircraft been greater, such a clearance would not have been issued and the need for the taxiing aircraft to stop at the intermediate holding point would have been more apparent.

2.4. Airport design

The actual configuration of Valencia airport in the area of the impact has the following objectives:

- (Figure 4A-1) To protect aircraft on the runway from any obstacle, an aircraft stopped at runway holding point H5 being such an obstacle. To achieve this, the separation between the two exceeds the 90 m specified in Annex 14.
- (Figure 4A-2) To protect aircraft taxiing on N2 from runway traffic with a separation of 200.6 m, in excess of the 182.5 m specified in Annex 14.
- (Figure 4A-3) To stop an aircraft at the H5 runway holding point so as to allow an aircraft to leave the runway via H4. To achieve this, the separation distance between H4 and an obstacle, in this case an aircraft stopped at runway holding point H5, complies with the 47.5 m specified in Annex 14.

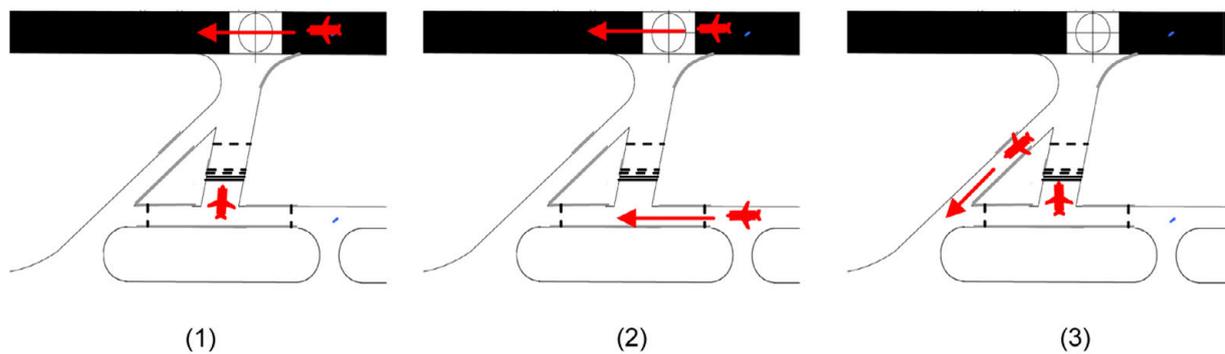


Figure 4A. Traffic flow in area N2-H5

- (Figure 4B-4) To protect aircraft taxiing on H5 by having aircraft stop at the N2 intermediate holding points, maintaining a distance in excess of 47.5 m between the centerline of H5 taxiway and the nose of any airplane (considered an obstacle). This is essentially the situation that arose in the incident described in this report, in which aircraft EC-KLL should have been considered as taxiing on H5.
- (Figure 4B-5) To protect aircraft taxiing on N2 by stopping aircraft at the H5 intermediate holding point, maintaining a distance in excess of 47.5 m. The H5 holding point stops those aircraft proceeding from N2 from crossing the runway. This point does not impose any obligations on aircraft proceeding from the runway to N2, however, hence the location of the intermediate holding point on H5.

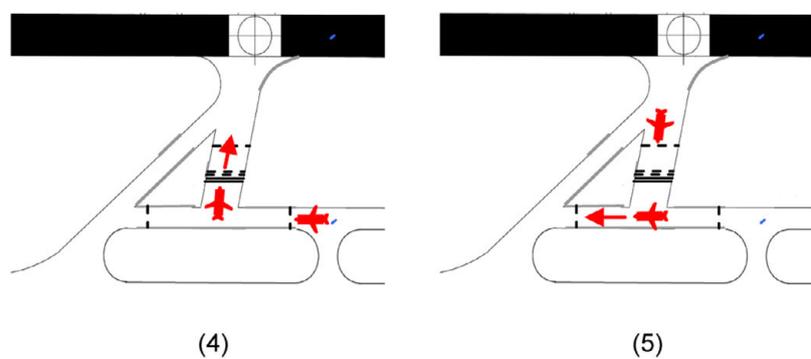


Figure 4B. Traffic flow in area N2-H5

As this last configuration explains, the H5 holding point closest to the runway is not marked as a runway holding point, but rather as an intermediate holding point whose sole purpose is to protect the intersection of H5 and N2 for traffic moving toward N2. This configuration requires a stoppage of operations on the runway since a critical aircraft (of maximum dimensions) stopped at intermediate holding point H5 would violate the 90-m clearance for category I, II and III operations. The existence of an intermediate holding point closer to the runway than the runway holding point could create confusion, since it is not typical for the second to be closer to the runway than the first. This scenario is the object of a safety recommendation aimed at studying other possible solutions for taxiing on H5 and N2, or to issue an explanatory note on the traffic flows in this area.

The application of a 47.5 m separation value between the centerline of taxiway N2 and an aircraft stopped at holding point H5, this being understood as an object, is considered unclear. The application of this criterion would mean that the 47.5 m should be ensured between the centerline of the taxiway and the tail of the longest length aircraft that could operate at the airport. Supposing a wingspan similar to the length, this would mean that the marking for the runway holding point should be 112.4 m away from the centerline of the taxiway that crosses it. If the 90-m minimum clearance between runway and runway holding point for categories I, II and III is added, the conclusion is that a separation distance between the taxiway and the runway above the minimum specified in Annex 14 would be required. As a result of its enquiry, the DGAC agrees that this criterion is not applicable between N2 and the H5 holding point.

2.5. Other aspects of airport design

Although it is irrelevant to the incident, some discrepancies were noted between the actual configuration in the area of the incident and that published in the AIP (aerodrome map for ground movements), with differences both in the location and type of holding points at N2 and H5 as well as in the direction of traffic on H4.

The H5 and N2 intermediate holding points did not have lights even though both taxiways are used in low-visibility conditions. In these cases, Annex 14 requires that the intermediate holding points be equipped with stop bars or intermediate holding point lights. This requirement is particularly important given that under low-visibility conditions, the markings are not visible from the cockpit and only the presence of lights can indicate the stopping point. Failing to stop at these points could allow aircraft to continue moving toward the intersection of taxiways H5 and N2, where there could be other taxiing aircraft.

Lastly, the H5 runway holding point did not have associated with it any runway designator marking as specified in Annex 14. These markings are usually accompanied by an information sign that, in the case of Valencia airport, had been replaced by a pavement marking.

These marking deficiencies noted in the impact area, as well as the inaccuracy of the information published in the AIP with respect to existing conditions, are the object of a safety recommendation.

3. CONCLUSIONS

3.1. Findings

- Visibility was not an influencing factor in the incident.
- Aircraft EC-KLL was stopped at the H5 runway holding point, in accordance with an ATC instruction.
- Aircraft PH-DMQ was moving on taxiway N2 in accordance with an ATC instruction that exempted the requirement to stop at the intermediate holding point prior to the intersection with H5.
- The controller and PH-DMQ crew were aware of the presence of aircraft EC-KLL on H5.
- The impact between the right wingtip of aircraft PH-DMQ and the vertical stabilizer of aircraft EC-KLL was very slight.
- The aerodrome map for ground movements published in the AIP had erroneous information on the location and types of holding points and on the direction of traffic on taxiways H4, H5 and N2.
- The markings, signs and lighting at the runway holding points and intermediate holding points were not in accordance with ICAO Annex 14 guidelines.

3.2. Causes

The cause of the incident is considered to be an inadequate clearance issued to aircraft PH-DMQ by ATC to continue moving on taxiway N2 when it should have been told to stop at the N2 holding point.

This clearance to continue taxiing was carried out by aircraft PH-DMQ, whose crew believed there was sufficient room to pass. This assessment proved incorrect, resulting in the impact.

If the aircraft involved in the incident had been of larger dimensions, the one stopped on H5 would have completely occupied taxiway N2, which would have evidenced the need to stop.

4. SAFETY RECOMMENDATIONS

Although not considered relevant to the incident, irregularities were noted in the contents of the aerodrome map for ground movements at Valencia airport, both as

regards the location and type of holding points on taxiways H4, H5 and N2, and the direction of traffic on H4. Deficiencies were noted with respect to the ICAO Annex 14 guidelines as regard the markings, lights and signs at the runway and intermediate holding points on taxiways H5 and N2. The configuration of the intermediate and runway holding points on H5 with respect to taxiing on N2 is considered confusing in that it does not reflect a standard configuration. The following safety recommendation is issued as a result:

REC 30/09. It is recommended that, for Valencia airport, AENA:

- Adapt the contents of the aerodrome map for ground movements to reflect reality at the airport.
- Review the markings, signs and lights associated with the intermediate and runway holding points on H5 and N2.
- Analyze other possible solutions to the traffic direction and hold point problems present on H5 in relation with N2, or remind all affected parties of the traffic directions and requirements in said area.

This recommendation has been accepted by AENA, which is studying measures intended to resolve the deficiencies addressed by this recommendation.