

No. 11

IBERIA, Convair 440, EC-ATH, accident at Tangier, Morocco on 31 March 1965.
Report undated released by the Ministry of Public Works, Morocco

1. - Investigation1.1 History of the flight

The aircraft took off from Malaga, Spain, at 0733 hours GMT, on a non-scheduled international flight to Tangier, Morocco, and return. Meteorological conditions were good as far as Gibraltar; however, the aircraft encountered conditions which were below the general minima north-west of Tangier. The crew first contacted Tangier control tower at 0755 hours, estimating Tangier at 0805 hours. The 0720 hours weather observation was then passed to the crew. At 0758 hours the crew was informed that the Tangier VOR was inoperative and two minutes later they were requested to report at 2 500 ft over the TW locator or field in sight. At 0802 hours they were provided with the 0750 hours weather observation together with the latest QNH (1 024 mb) and QFE (1 022 mb). This was acknowledged by the crew at 0803 hours. All subsequent calls from Tangier control tower remained unanswered. It was subsequently found that the aircraft had crashed at about 0804 hours into the sea, approximately 10 NM off the Moroccan coast.

1.2 Injuries to persons

Injuries	Crew	Passengers	Others
Fatal	5	45	
Non-fatal		3	
None			

1.3 Damage to aircraft

The aircraft was destroyed.

1.4 Other damage

There was no other damage.

1.5 Crew information

The pilot-in-command, aged 33, held a commercial pilot's licence valid until 24 July 1965. He had flown a total of 6 140 hours. He was especially familiar with the terrain at Tangier because he performed as many as 50 flights per month between Malaga and Tangier.

The co-pilot, aged 42, held a commercial pilot's licence valid until 4 September 1965. He had flown a total of 13 355 hours, the majority of these as flight engineer.

The third flight crew member, aged 38, held a flight engineer's licence valid until 20 May 1965.

Also aboard were a regular hostess and a hostess in training.

1.6 Aircraft information

The aircraft's certificate of airworthiness was valid until 13 September 1965. It had flown a total of 9 015 hours, including 98 hours since the last overhaul.

The weight and centre of gravity of the aircraft at take-off were within the prescribed limits.

The amount of gasoline aboard (2 088 kg) was twice the normal quantity for the route.

1.7 Meteorological information

The first portion of the flight was in visual meteorological conditions. According to the survivors' statements, the weather deteriorated progressively as the aircraft approached Tangier.

At 0750 hours, the Tangier observer noted a deterioration in the weather conditions and transmitted the following:

Wind:	calm
Visibility:	1 500 m
Cloud base:	8/8, stratus at 150 m
Present weather:	mist
QFE:	1 022.7 mb

The situation was unchanged at 0802.

1.8 Aids to navigation

When the accident occurred, the TB beacon and the TW Locator were operating normally. The Tangier VOR was not operating on that day. There were 2 ILS and 2 VOR receivers aboard the aircraft.

1.9 Communications

The aircraft remained in contact with the Tangier tower until 0803 hours and up to the last contact the exchange of messages was completely normal and failed to disclose anything which might have indicated an impending accident.

1.10 Aerodrome and ground facilities

Not pertinent to the accident.

1.11 Flight recorders

Not mentioned in the report.

1.12 Wreckage

The wreckage was located at 35°46' N, 06°05' W. It was at a depth of approximately 225 metres and was not recovered.

Items which were recovered were not sufficient to determine, even approximately, the angle of the aircraft at the moment of impact, but the volume and amount of the coupled seats and backs of seats recovered made it possible to assume that the fuselage broke apart upon impact.

1.13 Fire

There was no fire.

1.14 Survival aspects

Three survivors were rescued 1½ hours after the accident by a Spanish trawler and taken to Tangier by a fast motor boat.

The impact at the time of the accident was a heavy one as revealed by the examination of the 21 seats which had been torn loose and then recovered. A safety belt attachment was found twisted and torn from its base while the belt itself was still firmly closed, indicating that the passenger was apparently strapped in.

There were indications on the tubes forming the base of seats (both front and rear) that the latter had broken loose through shearing of the rivets anchoring them to the supports. On one of the two coupled seats, the rear tube was severed in such a way as to indicate forward acceleration.

The joints of some of the tubular seat supports showed that rivet fastenings were distorted into cup-shaped protuberances vertical to the rivet holes, without the latter becoming oval-shaped. This seemed to confirm that, due to the sharp forward acceleration, the rivets (heads and shafts) anchored to the supports were driven through the tube.

1.15 Tests and research

None mentioned in the report.

1.16 Gap-straps

The section of the leading edge of the wing between the fuselage and the engine nacelle is detachable, and therefore joints, called "gap-straps", are placed at both ends of this section to give a continuous metal edge which is indispensable for a good aerodynamic flow over the wing area.

The maintenance of these gap-straps is a delicate operation, since if they are not perfectly adjusted a turbulent flow results which leads to a reduction of the wing's lift. Unfortunately this was not covered by an Airworthiness Directive and, therefore, General Dynamics, upon the airlines' request, had to send its engineers to the various airlines using the Convair 440. One of them had inspected IBERIA's fleet a few days before the accident. It is to be noted that the subject aircraft was not inspected by this engineer.

Flight tests were carried out on 30 March 1965 under the direction of the Chief Convair pilot of Iberia, assisted by a General Dynamics engineer. The following data were obtained from one of the aircraft:

Flight tests before adjustment of gap-straps	Flight tests with gap-straps adjusted and smoothed
Altitude : 9 000 ft Power : 0 Flaps : retracted Landing gear : retracted Take-off weight : 46 000 lb Position of centre of gravity: 17 per cent	Same parameters
Stalling at 115 kt indicated air speed	Stalling at 99 kt indicated air speed
Identical parameters but cruising	Same parameters
Stalling at 110 kt indicated air speed	Stalling at 95 kt indicated air speed
30° pitch Cruising power Clean configuration	Same parameters
Stalling at 115 kt indicated air speed	Stalling at 104 kt indicated air speed

2. - Analysis and Conclusions

2.1 Analysis

The three survivors of the accident were interviewed at length as soon as their condition permitted.

The following points were noted. The flight was completely normal until the accident occurred and nothing in the behaviour of the aircraft or of the crew gave any hint of an imminent catastrophe and, in particular, no instructions for an impending landing were given to the passengers.

So far as the flight path was concerned, the three passengers agreed that after Gibraltar the density of the clouds increased progressively until the aircraft entered a "kind of fog". Two of the survivors stated that the aircraft remained in the clouds three or four minutes up to the crash.

The witnesses stated that there was no fire aboard the aircraft and no explosion during flight. This was confirmed by the examination of the different items of wreckage of the aircraft which, although they were soaked in oil and gasoline, bore no trace of fire.

Compared with most of the other bodies, the bodies of the crew suffered only moderate physical damage. This led to the assumption that the most violent force of the impact was not borne by the aircraft's nose.

The following possibilities were considered as a cause of the accident:

Structural failure

Neither the air-ground communications, which lasted nearly up to the time of the accident, nor the three survivors' statements gave support to this possibility.

Explosion in flight

The statements of the witnesses and the examination of the wreckage eliminated this possibility at the outset.

Fire in the cabin

An electrical or electronic fire in the initial stage would have developed only slowly and the crew would have reported it by radio. Furthermore, the flight engineer had a cabin fire extinguisher that was adequate for such a fire. Therefore, such a possibility was considered very unlikely.

Engine failure

It could not by itself have caused the accident since the Convair 440's performance on one engine is more than adequate.

Incorrect setting of the altimeters

This possibility appeared very improbable since the crew acknowledged receipt of the airport's QFE (1 022 mb). Even if the altimeters had been left at the en-route QNH of 1 013 mb, it would have had a favourable effect since the aircraft would have flown at a higher altitude than indicated by the instruments.

Failure of static, dynamic or mechanical devices of the altimeters

Such possibility was eliminated because the aircraft carried two altimeters and a radiosonde and the crew had the possibility of connecting the air intake in several ways, thus avoiding the risk of a complete failure or icing.

Erroneous altimeter readings

Altimeters with needles such as used in the Convair 440 are very easy to read. Such possibility was considered very unlikely, since the instruments and the radio-sonde should have been constantly watched by the crew during the critical phase of breaking out of the cloud.

Following a flight test on 20 March, the aircraft was reported to stall at an indicated airspeed of 105 kt whenever the stalling speed for that weight and configuration should have been 89 kt according to the manual. However, the Chief Pilot of the Iberia's Convair 440 permitted the aircraft to continue flying and reassigned it to passenger transportation. The aircraft made 45 flights between the flight test and the date of the accident.

The Board believed that the crew might not have followed exactly the instructions of Tangier Control and might have tried to break through the cloud layer in order to complete the flight at low altitude in VMC. The aircraft then stalled, probably while making a turn and the pilot was unable to regain control before the aircraft struck the sea. Twelve U.S. pilots of Convair 440 were interrogated regarding the altitude necessary to recover from a stall; they quoted an average loss of altitude of 500 ft to recover from an intended stall. It is obvious that it would take much more altitude to recover from an unexpected stall, especially in fog.

Physical failure of the crew

Such a possibility was considered improbable due to the presence of a pilot and a co-pilot.

2.2 Conclusions

Findings

The crew were properly certificated.

The aircraft had a valid certificate of airworthiness.

The aircraft encountered meteorological conditions which were below the general minima north-west of Tangier. However, the pilot was aware of the conditions.

It was considered probable that the crew did not exactly follow the instructions of Tangier Control and attempted to complete the flight in VMC underneath the cloud layer. The aircraft then stalled at low altitude and the pilot was unable to regain control before striking the sea.

Cause or

Probable cause(s)

For undetermined reasons, the aircraft stalled at an altitude from which recovery could not be effected.

3. - Recommendations

None were contained in the report.

COMMENTS BY THE STATE OF REGISTRY

1. Technical personnel from our Administration and Iberia Airlines attended the investigation carried out by the Moroccan Administration from the very beginning, having been present at the accident site and during the recovery of the few parts of wreckage floating in the sea.
2. Since neither the aircraft nor important structural parts were recovered, it was absolutely impossible to determine the probable cause of the accident.
3. Since, as stated above, the aircraft wreckage was not recovered, we consider that the investigation should result in "no conclusions".

On the other hand, concerning probable causes for the stalling of the aircraft, we do not believe this can be attributed to the "gap-straps", since their effect is noticeable only when they are dented and when the aircraft is in a clean configuration (landing gear, flaps retracted etc.) and can, of course, only be detected at low speeds. Some considerable time before the date of the accident in question, this effect was noticed by an Iberia pilot on another Convair 440 of the airline; this was always during take-off and in the aforementioned configuration. Since the cause of this was not known, exhaustive flight testing took place resulting in some figures which were later contributed to the Moroccan inquiry.

Since it was impossible to ascertain the cause, Convair was consulted. They sent an expert who reported that the same problem had previously arisen in aircraft of this type flown by SAS.

It had then been observed that the gap-straps of that aircraft had, in fact, been dented. An inspection was carried out by the Convair expert of all Convair 440 aircraft in Madrid, while another expert of Iberia Airlines inspected the remainder, among them the aircraft which was subsequently involved in the accident and which was stationed at Malagá.

The following conclusions were drawn from this:

1. Only pilots with extensive experience on this type of aircraft, on very rare occasions (perhaps five occasions after flying the aircraft for several years) and always during take-off, detected a slight, very rapid indication of stall, which disappeared at once and did not recur.
2. Following a systematic series of test flights which were carried out to find the cause, it was concluded that if the aircraft was not in a clean configuration - in other words, with the landing gear extended, or flaps somewhat extended, or with one engine out - this effect would disappear and therefore could never occur in the landing configuration.
3. There is no doubt that this has no importance from the point of view of flight safety, since Convair have not published any service bulletin mentioning this effect in the case of its 340 or 440 models, nor did they inform Iberia Airlines, when the problem was encountered by SAS. They only informed us that there was a very old bulletin applicable to the 240. There also was no airworthiness directive concerning this matter.

In the light of the thorough study made before the accident took place, it is our view that the effect is of no importance and can only be detected by very experienced pilots in the few seconds during which the aircraft changes from take-off to clean configuration.

Although the aircraft involved in the accident was not inspected by the Convair expert, it was inspected by Iberia personnel as well as by personnel of the Civil Aviation Administration during the exhaustive tests carried out on the other aircraft which had experienced a similar occurrence, at which time a thorough inspection of all the aircraft of the fleet was carried out.

In the light of the foregoing, it is requested that account be taken of the proposal in paragraph 3 that the report on the aircraft in question be completed without any conclusions, since the aircraft was not recovered.
