

Accident: Windjet A319 at Palermo on Sep 24th 2010, touched down short of runway

Aviation Herald translation from official report.

By Simon Hradecky, created Friday, Oct 5th 2012 13:01Z, last updated Friday, Oct 5th 2012 13:01Z

The Italian ANSV have released a second preliminary report releasing five safety recommendations, 4 of them dealing with rescue and recovery operations and one with the approach lights possibly being submerged, as result of the investigation so far.

The ANSV reported the aircraft was approaching Palermo following a flight, during which the captain (52, ATPL, 13,860 hours total, 2,918 hours on type) repeatedly engaged in conversation with another pilot off duty on the observer seat. Approach told the crew that weather conditions at Palermo were visibility 4000 meters/13100 feet, few cumulo nimbus cloud at 1800 feet, scattered cloud at 2200 feet, broken cloud at 3000 feet, recently there had been a thunderstorm with rain, there was windshear on approach to runway 20, runway 07 was in use with winds from 070 degrees at 12 knots. An aircraft ahead of EI-EDM just having landed on runway 07 reported they encountered windshear losing 10 knots on short final. A discussion between captain, first officer (31, CPL, 1,182 hours total, 937 hours on type) and observer arose about the weather conditions and the observations on the weather radar, which were concluded by the captain stating the weather conditions were not challenging.

The aircraft was subsequently cleared to descend to 5000 feet and cleared for the VOR Z approach. While still heading towards SALAP, the entry point into the VOR-Z procedure, the captain requested a heading of 190 degrees to fly around weather indicated on the weather radar and was approved to deviate from the course towards SALAP. The captain subsequently requested vectors to intercept the final approach course at about 7nm, ATC advised the requested would be granted after the necessity to remain on the heading of 190 degrees was removed.

The first officer, pilot flying, commented he needed a heading of 170 or 165 to get onto finals, the commander after reviewing the weather radar decided however it was necessary to continue 190 degrees due to weather echos. After the aircraft had passed the cloud the captain requested and was approved to turn onto a heading of 165 degrees and cleared to descend to 4000 feet. The captain recommended to slow the aircraft and activate the approach phase on the flight management system. 15nm out the aircraft was cleared to descend to 2000 feet, the captain now urged to slow the aircraft using spoilers as the aircraft was still doing 250 KIAS, the first officer advised he was maintaining 250 KIAS to accelerate the descent. The aircraft was cleared further down to 1500 feet and onto a heading of 120 degrees to intercept the VOR radial, tower reported winds at 030 degrees at 5 knots gusting up to 16 knots.

The aircraft intercepted the radial. About 4.3nm out the captain remarked he could not see the runway, the first officer stated MDA of 700 feet 1.5nm out. Tower cleared the aircraft to land reporting winds at 020 degrees 4 knots gusting 16 knots and

instructed the crew to report upon touchdown.

The cockpit voice recorder recorded the "hundred above" automatic call at 810 feet MSL, 100 feet above MDA, both pilots did not see the runway. Upon the automatic call "Minimums" the first officer indicated he had no visual contact with the runway, the captain responded "Continue! Continue!"

At 480 feet radio altitude the first officer remarked he could see the runway to the left, the captain took control of the aircraft (the report mentions the call "I have control" but does not state any reaction of the first officer), disengaged autopilot and autothrust and continued manually.

Flight data recorded by the black boxes showed no significant deviations from the descent profile until that point. However, thereafter the vertical speed increased to 1360 feet per minute. While descending through 240 feet radio altitude the first officer exclaimed seeing four reds, there was no response from the captain. The rate of descent however gradually decreased.

The main gear contacted an embankment rising from about 6 meters above mean sea level to 8 meters above mean sea level about 367 meters before the runway threshold at about 512 feet/minute rate of descent, 8 degrees of nose up angle and about 128 knots over ground, bounced with both engines and flight data recorder stopped upon first impact and touched down a second time, impacted the localizer antenna runway 25 and came to a stop about 850 meters past the runway threshold at the intersection with runway 02/20. The captain ordered the evacuation of the aircraft, the passengers and crew evacuated into intense rain and walked "disorderly" towards the lights of the airport buildings in about 900 meters distance.

Emergency services in the meantime were searching for the aircraft, after discovery of debris and report by "Red 1" emergency services were told the aircraft had gone off the runway into the sea. Emergency services therefore rushed towards the perimeter access gates to leave the aerodrome perimeter. The ANSV however also reported, that although tower was aware of the approximate position of the aircraft he did not intervene and correct the information relayed to emergency services. An aerodrome operations vehicle, instructed to proceed via taxiways tango, runway 02/20 and echo observed passengers walking towards the terminal and despite the extreme rain spotted the aircraft at the intersection of runways 07/25 and 02/20 and advised tower. Emergency services thus arrived at the aircraft 10 minutes after the aircraft had come to a stop and after passengers and crew had already abandoned the aircraft.

One member of the crew and 34 passengers suffered minor injuries.

The ANSV reported that detailed examination of the weather data at Palermo aerodrome showed an extremely active thunderstorm associated with extreme electrical activity and heavy rainfall had just crossed the aerodrome moving in a northerly direction. The weather station recorded extreme rainfall (more than 50mm/2 inches per hour) at the time of the arrival of EI-EDM.

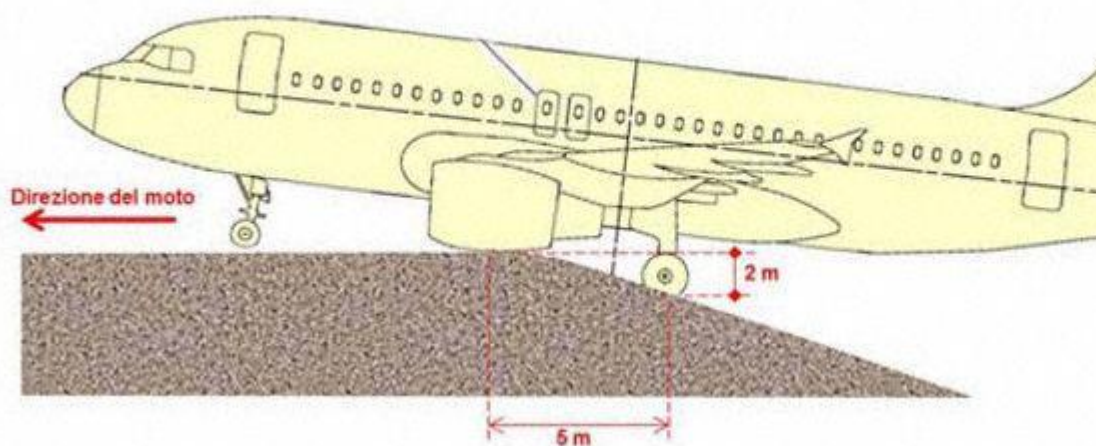
The investigation revealed the possibility that the approach lights might have been

submerged under water due to the extreme rainfall.

Aerial overview (Photo: ANSV):



Sketch of the embankment of first contact (Graphics: ANSV):



By Simon Hradecky, created Monday, Dec 1st 2014 16:36Z, last updated Monday, Dec 1st 2014 16:36Z

Italy's ANSV have released their final report in Italian concluding the probable cause of the accident was:

The occurrence has been rated a short landing accident and the cause is mainly due to human factors.

The fact, that the aircraft contacted ground 367 meters before the runway threshold, has been the result of the decision of the crew to continue the instrument approach without sufficient visual reference to complete the non-precision landing manoeuvre.

The investigation revealed no element to consider that the accident occurred due to technical factors related to the aircraft.

Contributing factors were:

- The poor attitude of those present in the cockpit with respect to the use of main principles of cockpit resource management, in particular the cognitive and interpersonal skills of each and predominantly the commander.

- The deliberate disregard for standard operating procedures, which at the minimum descent altitude require to follow the missed approach procedure if no adequate visual reference of the runway in use can be established by both pilots.

- The failure of those present in the cockpit to apply the rules, in particular the "sterile cockpit" concept, the failure to conduct an approach briefing and the lack of call outs during the approach.

- The routine of the crew with respect to the approach to Palermo, which resulted in complacency and personalization instead of adhering to standards set by regulator and law. The complacency is one of the most insidious aspects of the human factors as it creeps in in the individual in the form of condition of self satisfaction resulting in lowered situational awareness but leading the individual to believe he found the best formula to operate on.

- The existence of adverse weather, characterized by the presence of extreme rainfall, which significantly reduced the overall visibility.

- The phenomenon of "black hole" approach due to adverse weather together with the approach carried out in night conditions over the sea towards a coast line characterized by few urban settlements and dimly lit. This created the illusion of the first officer feeling they were high on the approach with respect to what he saw and identified as runway threshold causing him to abandon the ideal approach profile and apply an excessive correction resulting in the short landing.

- The decrease of the light beam performance of the semi flush threshold lights in extreme rain; the only bright reference for the crew were the cross bars of the simple approach lighting system, which were probably mistaken for the threshold of the runway.

Following the accident the application of the airport emergency plan highlighted many serious problems that did not permit to provide aid and assistance of the victims of the accident in a timely manner. The airport organisation was not capable, at various levels, to deliver prompt and effective rescue, in addition the investigation of the accident identified numerous latent critical issues.

The ANSV analysed that there were two company pilot colleagues, one of them being a commander, amongst the passengers travelling off duty. The commander invited the commander colleague into the cockpit, the colleague took the observer's seat. The cockpit voice recorder revealed that the commander frequently "undertook dense communication" with the colleague while the aircraft was in motion.

While enroute the cockpit voice recorder revealed that the first officer, pilot flying, also assumed the role of pilot monitoring because the both commanders, the one in duty and the other off duty, were

engaged in conversation with each other.

The cockpit voice recorder further revealed that the descent and approach briefings did not take place. It even appears that the commander, who had done 94 approach to Palermo in the last 6 months, did not have the related approach plates in front of him feeling the maps were not needed because of familiarity with the aerodrome. The briefings, inter alia, would require the crew review status of aircraft, minimum safe altitudes, review and input the related landing data into the flight guidance management system, take note of the approach minima, minimum weather requirements, landing technique, the missed approach procedure, the alternate aerodrome and the fuel needed to reach the alternate. At this stage the physical properties of the runway and the visual references available (e.g. ALS runway lighting) would be noted. The ANSV wrote: "In essence, the briefing for the descent is a very important moment for the timely and thorough preparation of the crew and the aircraft rapprochement and landing; in particular, it is necessary to establish the proper mental approach of the crew to the execution of the final phases of flight, regardless of familiarity with the airport of destination and frequency of the approaches made to the same. The omission of the briefing put the crew members in a position unable to correct each other in the case of incorrect or incomplete information."

The ANSV analysed that, when the aircraft was cleared to descend to 1500 feet and for the VOR approach Z runway 07, an intense exchange of strong views arose between commander in charge and first officer about technical issues of controlling an aircraft in turbulence with the commander instructing the first officer to reduce speed for passenger comfort, the commander adopting non-standard phraseology and maintaining an attitude, employing strong criticism of the approach chosen by the first officer and employing biting sarcasm, "that could have had a highly negative impact on interpersonal and cognitive skills of the copilot." The ANSV wrote: "Such behaviour, totally unprofessional and totally undesirable, may have inhibited the co-pilot, both in terms of communication in the cockpit and in terms of the ability to analyze the situation ..."

The ANSV analysed that upon the automated call "100 feet above" the pilot monitoring was required to monitor both outside and inside of the cockpit in order to both verify visual references for a visual completion of the landing being available and proper continuation of the instrument flight, upon reaching minimums the pilot monitoring according to standard operating procedures was required to call out "Continue" if sufficient visual reference was available or "Minimums" in case insufficient visual reference was available. Upon the call "Continue" the pilot flying would look up and establish visual reference then call out "confirmed continue", or in case of "Minimums" or insufficient visual reference following the "Continue" call require "Go-Around, Go-Around flaps".

The ANSV analysed that following the "100 feet above" a situation of sterile cockpit arose, the commander was about performing to standard operating procedures, however, by inquiring "Do you see" (resulting in reply "I do not" as the first officer had not yet even begun to scan for visual references being purely on instruments waiting for the "continue" or "minimums" call by the pilot monitoring) indicated he was not fully aware of the roles of the pilots. After the automated call "Minimums" the commander called out "Continue, Continue" clearly providing the intention to continue the approach, however in violation of procedures and rules.

The first officer, upon hearing the call "Minimums", automated or not, was required to initiate the go-around and call for "Go-Around Flaps". In post accident interviews the first officer reasoned however in view of his lack of assertiveness that he trusted the commander had acquired visual reference and he, too, would acquire visual reference. About 20 seconds later, at 480 feet AGL, he did acquire visual reference. The ANSV reasoned, that the previous conduct of the commander, the precarious crew cooperation, the limited experience of the first officer had caused the first officer to enter a psychological state of being shy and unable to contradict the commander's intentions, thus being unable to apply the automatic responses to initiate the go-around. Instead, the flight data recorder showed the first officer continued instrument scan and approach until 480 feet AGL, when he acquired visual reference "On the left, I see!".

Immediately afterwards the captain announced "I have control", disconnected the autopilot and continued manually, applying several large left and down inputs resulting in a maximum left bank angle of 16 degrees and a pitch attitude of 2 degrees nose down. Descending through 400 feet AGL the aircraft reached 1360 fpm rate of descent, which then remained constant until about 240 feet

AGL, by then the first officer announced "I see four reds" referring to the PAPIs. The aircraft crossed the VOR at a height of 92 feet radar altitude, required 200 feet radar altitude, subsequently the rate of descent decreased until the aircraft contacted an embankment 367 meters before the runway threshold.

The ANSV analysed that from the moment the commander took control of the aircraft the flight continued consistent with what the commander believed to be seeing based on the visual cues acquired. At the time of impact the rate of descent had reduced to 512 fpm, the attitude was 8 degrees nose up, obviously the intention to flare the aircraft and put it down at a predetermined point of the runway considered suitable for landing.

The ANSV stated: "The change of roles from PNF to PF on final approach, in adverse weather conditions, is absolutely not recommended by the operator's standard operating procedures."

The ANSV continued analysis that the extreme rain caused refraction due to water accumulation on the windshield despite screen wipers produces effects of apparent brightness of approach lights which make the runway appear closer than it actually is. In addition, the approach over the sea towards the coastline rising from about 2 to 8 meters MSL, could have produced the illusion of being higher than they actually were ("black hole illusion").

The ANSV analysed that neither of the three pilots present in the cockpit recognized a danger, despite the first officer's "I see four reds", probably indicating that all of them perceived the approach of being safe based on the external visual cues available. This suggests that the pilots should have properly assessed the possible visual references available, e.g. the cross bar of the SALS approach lighting, and the influence of weather phenomena (extreme rain) and the photometric effects associated, which may have changed the commander's decision process to not continue the approach.

The ANSV analysed that in vacuum the light beam follows a straight line. In reality on earth however, due to the refractive characteristics of various elements (molecules of air, rain drops, ...) absorption and deviation of the light beam occurs. In the course of this accident the light beams off the runway threshold lights runway 07 had to cross natural means formed by the accumulation of water creating absorption almost cancelling the light, however, without affecting the cross bars of the SALS, 300 meters closer to the aircraft. These findings were confirmed by tests conducted at the Air Force Laboratories. It was further found that the shape of the embankment as well as the runway around the threshold lights probably contributed to the accumulation of water in the vicinity of the runway threshold resulting in "flooded" threshold lights.

The ANSV had the EGPWS units sent to the manufacturer for further analysis of why, despite the rate of descent suggesting a "SINK RATE" call should have occurred, did not occur. The manufacturer found that the rate of descent bordered the Mode 1 criteria, the filters for nuisance calls prevented the actual call out. The ANSV analysed that the absence of this call prevented the crew to recheck their approach and perhaps develop a different mental picture.

30 seconds after first impact with the embankment 367 meters short of the runway threshold the Emergency Locator Transmitter activated (according to its built in stand by phase of 30 seconds), the ELT signal was received at Palermo Tower. At that point the aircraft had already come to a stop and evacuation was initiated. After all passengers were evacuated, the commander in charge also left the aircraft, the off duty commander phoned the tower and gave an approximate position of their aircraft. The passengers in the meantime, seeing lights in the distance, proceeded in the direction of those lights, a number of them arriving at the fire house and being assisted by staff there, another number arriving at the terminal and were assisted at the arrival hall.

A flight attendant, seated and belted in his cabin crew seat, received head injuries upon first impact with the embankment, when the body, despite the belt, swung around and permitted the head to contact a wheel chair stored opposite to the seat.

Upon receiving the ELT signal, at the latest after receiving the phone call by the commander off duty, the tower should have activated the signal "state of accident" informing emergency crews that an actual accident had happened at the aerodrome, however activated "state of emergency" signalling a pending emergency. This delayed the implementation of the accident emergency plans and

influenced the "good sense" of the staff involved. Thus tower provided a first estimate of the aircraft position only 5 minutes and 37 seconds after the activation of the "state of emergency", at which point it became clear to emergency crews that an actual accident had happened.

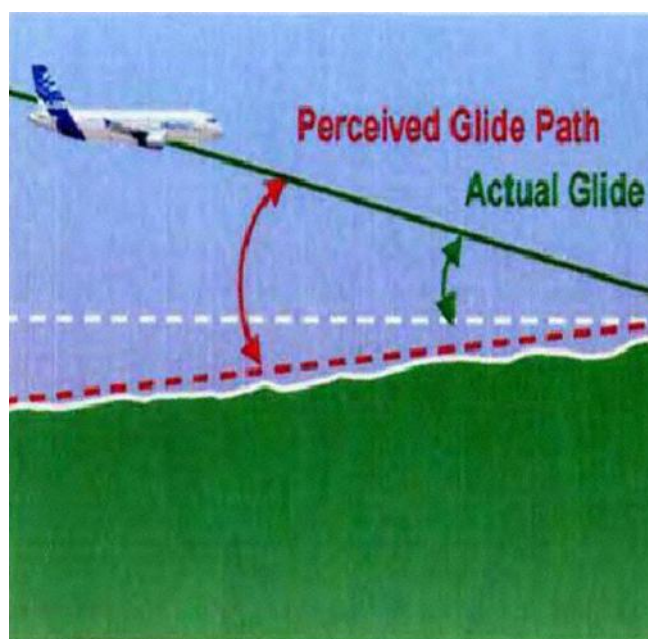
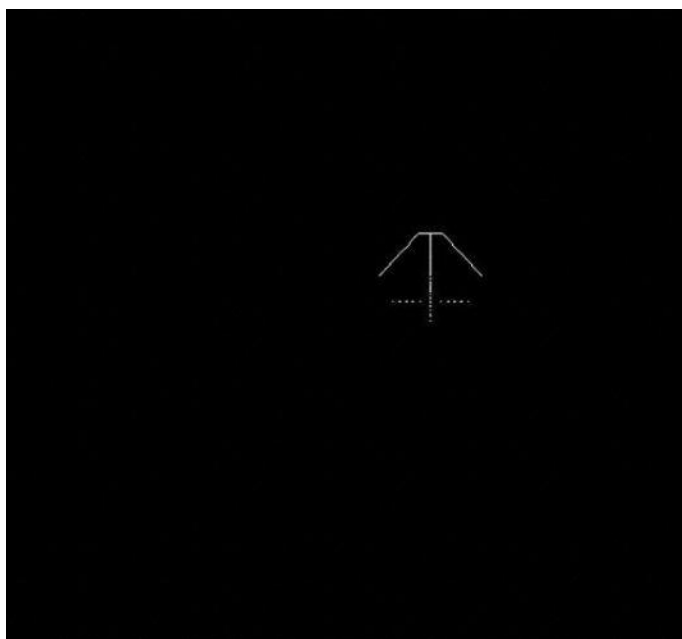
However, the poor quality of the communication on the frequency assigned to communication between tower and emergency vehicles at approximately 440 MHz, which rendered communication mostly incomprehensible contributed to further delays so that the first emergency vehicles arrived at the aircraft only 22 minutes and 5 seconds after the ELT activated.

The poor quality of communication, the excitement of staff on frequency as well as the unfamiliarity of fire crews with phraseology used by tower further contributed to the lack of overview over the rescue phase by emergency crews which led e.g. to the belief that the aircraft had gone off the runway into the sea, resources therefore being dedicated to drive along the perimeter road of the aerodrome to look for the aircraft. The ANSV analysed that with the first alert tower should have made clear that the aircraft had landed on runway 07, which could have significantly focussed the resources and accelerated the arrival at the aircraft.

The ANSV continued analysis of the rescue efforts: "Even the phase of post-rescue has been particularly deficient."

The ANSV stated that none of the staff on the ground ever understood there had an accident occurred, even after 118 passengers arrived at the fire house and the terminal it did not occur to staff that an accident had happened and the airport emergency plan was still not implemented according to the accident category. Hence, for example, the passengers were all taken to the arrival hall of the airport, where they mixed with passengers from other flights, instead of the designated VIP room for post accident assistance (depriving emergency services to account for all occupants, some of whom had already left the airport and gone home). In addition, due to accident emergency plan not being put into action, the west gate of the aerodrome remained closed. Local Emergency services, ambulances and local fire engines from the city of Palermo, could not enter the aerodrome and remained outside the aerodrome at the west gate. A few minutes later those vehicles were redirected to the North gate. This could have had seriously negative consequences had the accident been more catastrophic.

The Civil Aviation Authority of Italy suspended the air operators certificate of Windjet on Aug 26th 2012 resulting in the suspension of all activities by the operator. The ANSV reported that this suspension of the AOC was the result of the CAA listening to the cockpit voice recorder recording remarks of irregular payment of salaries to employees. The ANSV analysed that it was not possible to determine whether the irregular payments affected the mood and consequently the conduct of flight, however, it was appropriate and necessary to be mentioned in the final report.



Reconstruction of visual cues available (Graphics: ANSV):

Explanation of perceived glide path (Graphics: ANSV):

