Air Accident Investigation Unit Ireland

SYNOPTIC REPORT

SERIOUS INCIDENT
Avions de Transport Régional
ATR 72-212A, EI-REL
Near Cork Airport (EICK)
2 January 2014

An Roinn Iompair Turasóireachta agus Spóirt
Department of Transport, Tourism and Sport

Foreword

This safety investigation is exclusively of a technical nature and the Final Report reflects the determination of the AAIU regarding the circumstances of this occurrence and its probable causes.

In accordance with the provisions of Annex 13[1] to the Convention on International Civil Aviation, Regulation (EU) No 996/2010[2] and Statutory Instrument No. 460 of 2009[3], safety investigations are in no case concerned with apportioning blame or liability. They are independent of, separate from and without prejudice to any judicial or administrative proceedings to apportion blame or liability. The sole objective of this safety investigation and Final Report is the prevention of accidents and incidents.

Accordingly, it is inappropriate that AAIU Reports should be used to assign fault or blame or determine liability, since neither the safety investigation nor the reporting process has been undertaken for that purpose.

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[1] **Annex 13**: International Civil Aviation Organization (ICAO), Annex 13, Aircraft Accident and Incident Investigation.

[2] **Regulation (EU) 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.

[3] **Statutory Instrument (SI) No. 460 of 2009**: Air Navigation (Notification and Investigation of Accidents, Serious Incidents and Incidents) Regulations 2009.

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In accordance with Annex 13 to the Convention on International Civil Aviation, Regulation (EU) No 996/2010 and the provisions of S.I. No. 460 of 2009, the Chief Inspector of Air Accidents on 3 January 2014 appointed Mr Thomas Moloney as the Investigator-in-Charge to carry out an Investigation into this Serious Incident and prepare a Report.

Aircraft Type and Registration:	**ATR 72-212A, EI-REL**	
No. and Type of Engines:	**2 x Pratt & Whitney Canada PW127F**	
Aircraft Serial Number:	**748**	
Year of Manufacture:	**2007**	
Date and Time (UTC[4]):	**2 January 2014 @ 22.52 hrs approximately**	
Location:	**In the vicinity of Cork Airport (EICK), Ireland**	
Type of Operation:	**Public Transport - Scheduled**	
Persons on Board:	**Crew - 4**	**Passengers - 46**
Injuries:	**Crew - Nil**	**Passengers - Nil**
Nature of Damage:	**None**	
Commander's Licence:	**ATPL[5] issued by the Irish Aviation Authority (IAA)**	
Commander's Details:	**Female, aged 40 years**	
Commander's Flying Experience:	**5,036 hours, of which 4,750 were on type**	
Notification Source:	**EICK Airport Duty Manager**	
Information Source:	**AAIU Investigation and AAIU Pilot Report Form submitted by the Commander**	

[4] **UTC:** Co-ordinated Universal Time. All times in the Report are UTC, which is also equivalent to local time.
[5] **ATPL:** Airline Transport Pilot Licence

SYNOPSIS

The aircraft, which was on a scheduled passenger flight, carried out a go-around from its first approach to Runway (RWY) 25 at Cork Airport (EICK) in stormy weather, due to a significant increase in indicated airspeed on short final. The aircraft then positioned under radar control for a second approach to the same runway. Its track brought it south of EICK, close to the coast and at times over the sea. During this time, a thick layer of sea salt formed on the front windscreens, obscuring the Flight Crew's forward visibility. As it was not possible to acquire the necessary visual references for landing, a second go-around was flown. The Flight Crew flew the aircraft to areas of shower activity and a small portion of the Commander's windscreen was cleared. A third approach was flown to a successful landing.

1. FACTUAL INFORMATION

1.1 History of the Flight

EI-REL departed from Manchester, UK (EGCC) at 21.06 hrs on a scheduled passenger service to EICK. The Commander was the Pilot Flying. The Flight Crew were aware from their weather briefing that strong southwesterly winds were forecast for the time of their arrival into EICK. The aircraft made an initial approach to RWY 25 at EICK but executed a go-around at

22.29 hrs, at which time the wind was reported by the Tower as being from 230°, 29 knots (kts) gusting to 44 kts. Subsequent to the go-around, EI-REL reported to Cork Approach Air Traffic Control (ATC) and to another of the Operator's aircraft on approach to EICK that, just before the go-around, they had experienced an *"increase of plus twenty knots"* in their indicated airspeed.

After the go-around, EI-REL followed ATC instructions to maintain the runway heading and to climb to 3,000 feet. At 22.34:24 hrs, the Flight Crew informed ATC that they intended to make a second approach to RWY 25. ATC acknowledged this and instructed EI-REL to turn left onto a heading of 180°. Thereafter, ATC provided vectors to EI-REL which brought the aircraft onto an easterly track to the south of EICK, close to the coast and at times over the sea, **Figure No. 1**.

At 22.43:14 hrs, ATC provided EI-REL with its final vector, turning left onto a heading of 280° to intercept the radial and cleared EI-REL for a VOR[6] approach to RWY 25. A wind check passed by ATC at this time was 220°, mean speed 28 kts, maximum 41 kts. At 22.44:16 hrs, EI-REL confirmed that they were established on the inbound course to land. ATC informed them that the Operator's other aircraft was a mile from touchdown and instructed EI-REL to contact the Tower.

[6] **VOR:** Very high frequency Omnidirectional Radio Range, an aviation navigation aid.

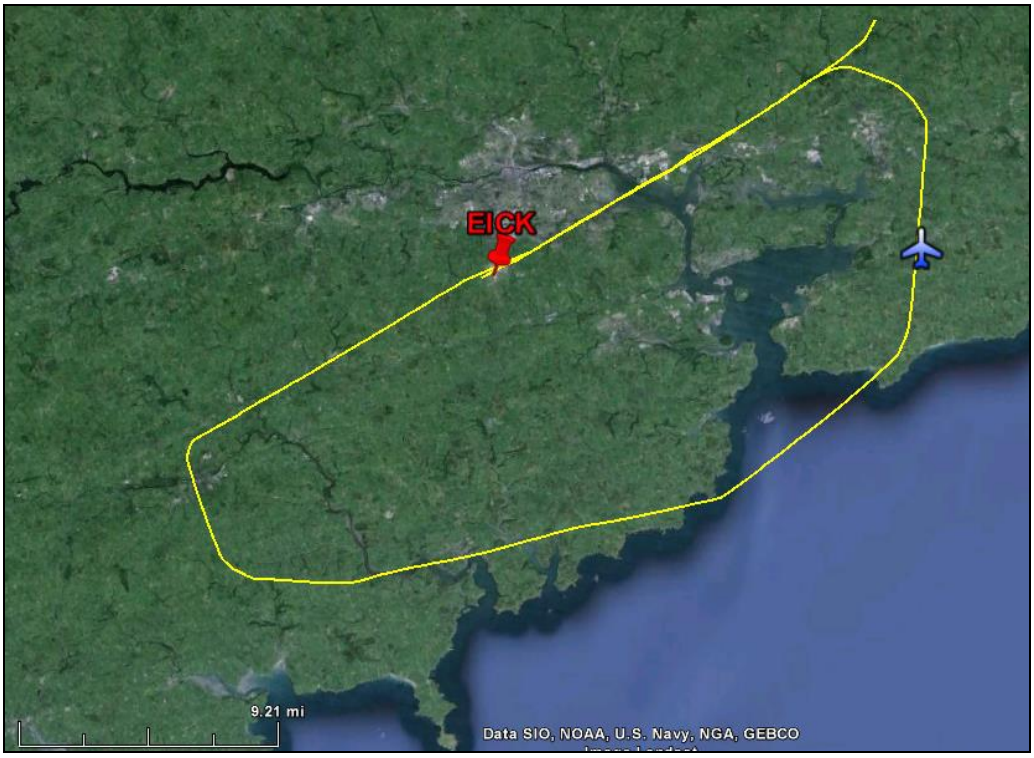

Figure No. 1: Track of EI-REL between First and Second Approaches.

The Operator's other aircraft landed on RWY 25 at 22.45 hrs and after it had vacated the runway, EI-REL was cleared to land on the same runway. The final wind check passed by ATC was 230°, 28 kts maximum 41 kts. At 22.52:13 hrs, EI-REL informed the Tower that they were going around. ATC instructed them to continue on runway heading, to climb to 3,000 ft and to advise their intentions. EI-REL was then transferred back to the Cork Approach frequency.

At 22.55 hrs, EI-REL advised ATC that the reason for the second go-around was a *"problem with the windscreens."* The Commander told ATC that she could see nothing through the windscreens and that something had totally blurred her vision through the windscreens for the second approach. She felt that the aircraft may have flown through some substance since the first approach and she enquired from ATC whether they were aware of any major fires in the area *"because it seems to be like smoke on the front of the windscreen that's sealed and dried in. The wipers aren't taking it off."* ATC replied that they were unaware of any such issues.

ATC instructed EI-REL to climb to 4,000 ft and vectored them initially towards the north west because another aircraft (an Airbus A321) was inbound from the east for an approach to RWY 17. The Flight Crew made contact by mobile phone with the Operator's engineering staff at EICK to discuss the issue.

At 23.09 hrs, the Flight Crew requested the wind and runway condition at their alternate Shannon (EINN) and the wind at EICK. At 23.15 hrs, the Commander informed Cork Approach that *"the problem I have is that I can't see out the windscreen."* She reported that it looked like there was a weather cell (visible on the weather radar) ten miles straight ahead and she requested that she could maintain the current heading (330°) and that *"possibly the rain in that cell might help clear it…"*.

The Commander continued that they would go to the edge of the cell and hope that the rain would wash the contamination off because at that time they could see nothing. ATC informed EI-REL of a similar situation in Shannon a couple of weeks earlier in high winds which turned out to be a film of sea salt on the windscreen. The Commander responded that the same thing had happened to a company aircraft that evening but that obviously it wasn't as bad for them. She had learned this in the earlier telephone communication with the engineering staff.

Between 23.16 hrs and 23.26 hrs, ATC facilitated EI-REL with all requested heading changes in the area of the shower activity while the aircraft maintained 4,000 ft. During this time, a small area at the base of the Commander's windscreen cleared of contamination. ATC also informed EI-REL that the crew of the A321 which had just landed believed that a film on the outside of their windscreen was sea salt. At 23.27 hrs, ATC reported that EI-REL could be seen from the Tower and that they would put all of the runway lights on to full brightness to see if the aircraft could identify the airport. EI-REL reported that they could see the runways and requested a descent for an approach onto RWY 25. ATC provided vectors for a procedural VOR approach to RWY 25. At 23.30 hrs, the Commander declared a PAN[7] *"in light of the condition of the windscreen".* The Flight Crew subsequently requested that the fire services be put on standby and ATC responded that they were all in position. Following their approach briefing, the Flight Crew commenced an approach at 23.42 hrs. As they approached the runway, the aircraft entered a rain shower which further cleared the windscreen. The aircraft landed safely on RWY 25 at 23.54 hrs and taxied to its parking stand.

1.2 Commander's Statement

The Commander provided a comprehensive description of the occurrence to the Investigation. She confirmed that at the time of the first go-around, which was due solely to an increase in indicated airspeed on final approach, the windscreen was completely clear. It was during the period of the vectors around EICK while other aircraft were making their approaches that the Flight Crew noticed a considerable build-up of white contamination forming on the windscreen. Initially, the Flight Crew had no idea what was causing the build-up but later they learned that it was a sea salt residue caused by the stormy weather.

The Commander described how, on reaching MDA[8] on the second approach to RWY 25, the residue had obscured the front windscreens to the point where the Flight Crew had no visual reference whatsoever. Consequently, they executed another go-around. She said that the salt contamination had created a thick opaque layer and that it was impossible to make out the runway as the residue had the effect of diffusing the lights into a complete blur. She continued, *"It looked like a frosted glass windscreen."* She stated that the windscreen wipers had no effect in clearing the residue since it was so dry. She believed the fact that the front windscreens were heated to prevent ice accretion further exacerbated the problem in that, as the salt built up, it dried and became more opaque.

[7] **PAN:** A state of urgency.

[8] **MDA**: Minimum Descent Altitude, a specified altitude in a non-precision approach, below which descent must not be made without the required visual reference.

The Commander spoke to a company engineer by mobile phone and he informed her that the residue was due to salt accretion, as an Operator's ATR 72 and an A321 which had recently landed had both sustained small salt build ups on their windscreens.

The Commander described how the weather radar was showing evidence of showers and cells on the periphery of the Cork control zone. She requested clearance from ATC to route towards them in an effort to clear the windscreen. She stated that by flying towards the edge of the cells, they managed to clear a fraction of the contamination on the base of the windscreen near the coaming. However, the First Officer soon noticed that the salt residue was reforming on his side. The Commander stated that as there was not much moisture in the weather cells and as the salt residue was thick and dried out, they were unable to completely clear the windscreen but that she did have visual reference on her side through a small gap at the base of the windscreen. Since at that point EI-REL had 1 hour 20 minutes fuel endurance remaining, she elected to make a third approach to RWY 25 at EICK while still having sufficient fuel to subsequently divert and make an approach to EINN without reaching the final reserve fuel figure. The Commander was also conscious that the conditions at EINN were approaching maximum crosswinds across a wet runway and she was reluctant to attempt a landing in such conditions with an obscured windscreen.

When EI-REL commenced its third approach to RWY 25, the Commander had a small gap at the base of her windscreen which she estimated to be *"3 inches wide and 1 inch high"*, through which she could see the runway. The First Officer had no visual reference. The Flight Crew briefed that they would carry out a go-around if, on reaching MDA, the Commander was not satisfied that the approach would result in a safe landing. As EI-REL approached the runway, a shower passed over the aerodrome. As they approached the runway threshold and touched down, the rain began to clear the windscreen. The third approach resulted in a normal landing.

In response to specific questions, the Commander told the Investigation that the aircraft was not in cloud nor had it just exited a layer of cloud but was flying through apparently clear air when the salt accretion began to become visible. There was no evidence of icing on the windscreen just before the salt deposits appeared. She stated that the salt accretion process was at first very insidious. She re-iterated that she believed that the heated windscreen exacerbated the problem by drying the salt and enabling a thick layer to form. She described how, even when the aircraft climbed to a higher altitude in the effort to fly into cloud cells to clear the windscreen, salt accretion continued. The Flight Crew attempted to clear the windscreen by using the wipers when they initially saw the contamination start to build up. At that point they were unaware of what it might be and thought that it could be moisture or condensation. They also used the wipers during the time that they flew towards the rain showers, but with only very limited success.

1.3 Information from second ATR 72 Commander

Another of the Operator's ATR 72 aircraft, EI-REI, was also affected by sea salt contamination in a similar timeframe to EI-REL. However, the effects were less severe and the aircraft landed on RWY 25 at 22.45 hrs from its first approach. This aircraft had been approaching EICK from a northerly direction and it did not fly over the sea at low level. The Commander of this aircraft also provided information to the Investigation.

He reported that neither he nor the First Officer noticed any salt accretion on the windscreen until about two minutes before establishing on the VOR approach in VMC[9] conditions. Before that, they had been vectored onto a right base for RWY 25. They had been in visual contact with the lights of Cork city and EICK from 15 to 20 miles away and they did not encounter any icing conditions. He recalled that the aircraft had probably been heading south at a speed of 180 kts when they first noticed the salt accretion.

He said that the accretion seemed to be a fast and invisible process. Although the aircraft was VMC, due to the level of turbulence and the type of approach (VOR) being carried out, the Flight Crew's focus was on their instruments rather than on the outside. He felt that the salt accretion occurred during a few minutes, turning the windscreen condition from clear to a blur. The Flight Crew tried to clear the windscreen using both wipers, but to *"absolutely no effect"*. The Operator provided photographs of the contamination on EI-REI taken after it had parked, one of which is reproduced as **Photo No. 1**.

The Commander of EI-REL told the Investigation that the salt accretion on her aircraft was thicker than that shown on the photograph of EI-REI.

Photo No. 1: Contamination on Windscreen of EI-REI which landed at EICK shortly before EI-REL.

[9] **VMC:** Visual Meteorological Conditions

1.4 Information from A321 Flight Crew

A third aircraft also reported windscreen contamination on the same evening. This was an Airbus A321 which landed on RWY 17 at 23.13 hrs. The Flight Crew of the A321 was aware of EI-REL's situation and, after parking, commented to ATC that they had a powdery dusty substance on their windscreens and that *"you could write your name on it"*.

They said that the substance did not affect their visibility during their approach but that it became noticeable in the terminal lighting when they parked the aircraft. Later, they informed the Tower that they thought the substance was sea salt. This aircraft had not flown over the sea at altitudes below approximately 8,000 ft during its approach.

1.5 Aircraft Information

The ATR 72 Flight Crew Operating Manual (FCOM) states that rain removal from the front windscreens is provided by two wipers, each of which is driven by a two-speed electric motor. The maximum speed for operation of the wipers is 160 kts. There is no windscreen washer facility installed.

The front windscreens are each protected against ice formation by an electrically heated transparent film, incorporated between two plies of glass. The temperature is controlled by an electronic controller which keeps the outer windscreen temperature above 2°C. The inner surface remains above 21°C to prevent mist formation. Each front windscreen has an individual push button to enable the heating to be selected on or off.

1.6 Meteorological Information

Met Éireann provided the Investigation with meteorological information related to the occurrence.

The meteorological situation at the time was that a deep depression of 947 hPa[10] tracked close to Ireland's west coast. An occluded front had cleared the area and was followed by a very strong, unstable, showery flow with embedded trough lines. Surface winds at EICK were 220°, 25-30 kts with gusts of 45-50 kts. The winds at 2,000 ft were 230°, 60 kts. Visibility was 15 to 20 km. The surface temperature was 8°C and the dew point was 3°C. The mean sea level pressure was 977 hPa.

Met Éireann reported that the METAR[11] for EICK at 23.00 hrs suggested NIL weather. However, potential for showers did exist at the time in the vicinity. The Report continued, *"It should be noted that RADAR imagery taken at 23.00 hrs shows the EICK area to be echo free - implying that any showers that may have existed in the region of Cork Airport were very light."*

This radar imagery is reproduced in **Figure No. 2**.

[10] **hPa**: Hectopascal, a unit of pressure.
[11] **METAR:** Actual weather report.

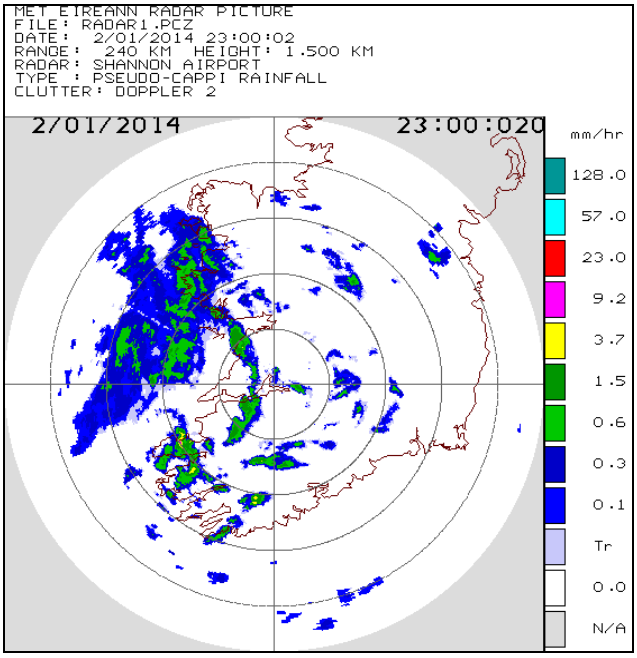

Figure No. 2: Radar Imagery at 23.00 hrs.

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A number of Local Warnings and SIGMETs[12] had been issued for the relevant timeframe. The Local Warning for EICK for the time period between 21.00 hrs on 2 January and 11.00 hrs on 3 January forecast southerly winds of maximum values between 40 and 45 kts becoming south southwesterly 25-30 kts, maximum 45-50 kts between 23.00 hrs and 01.00 hrs. There was also a windshear warning issued for EICK. The SIGMETs forecast severe turbulence in the Shannon Flight Information Region (FIR) between surface level and 6,000 ft.

Met Éireann stated that their research concluded that sea salt windscreen accretion on aircraft was a very rare phenomenon.

1.7 Additional Information

The Operator experienced another case of sea salt accretion on an ATR 72 during stormy weather in January 2015. In this case, the aircraft was unable to land at Dublin from two approaches due to out-of-limits crosswinds. The Commander reported that on his second approach, there was a light layer of salt on both front windscreens following a downwind flown at 3,000 ft. The aircraft then diverted to Belfast International Airport (EGAA). The Commander reported that with one mile to go on finals, he was unable to see the runway because of the salt deposits. By raising his seat and moving his head he was able to make out the runway through a small area near the top of the windscreen. This event occurred during daylight, in severe turbulence and winds gusting above 50 kts.

The Investigation made enquiries through the Bureau d'Enquêtes et d'Analyses pour la Sécurité de l'Aviation Civile (BEA), the civil aviation safety investigation authority of France, as to whether any instances of sea salt accretion on aircraft windscreens were known to them.

[12] **SIGMET:** Significant meteorological information.

The BEA confirmed that no such occurrences were noted in their files and that furthermore, no similar events were contained in the databases of the aircraft manufacturers, Airbus and ATR.

Further research conducted by the Investigation revealed an occurrence in 2007 in which a NOAA[13] Lockheed WP-3D turboprop aircraft involved in the study of near-surface wind speeds over the North Atlantic Ocean some 500 nautical miles (nm) east of St John's, Newfoundland lost power on three of its four engines. The aircraft was operating primarily at altitudes of around 2,500 – 3,000 ft in very high wind speeds (85 to 95 kts) in the on-station area. All members of the crew noted that there was much less liquid precipitation during this flight in comparison to previous flights, i.e. they were not flying through as much rain as they normally did. As the aircraft was unable to maintain altitude on the power of only one engine, it began a descent at a rate of about 700 feet per minute. The crew carried out the restart procedure for the No. 1 engine, at which time the aircraft passed through an area of liquid precipitation for less than 60 seconds. The engine restart was successful and subsequently the crew were able to restart No. 3 and No. 4 engines and the aircraft recovered safely to St. John's. An investigation report published by NOAA (Mishap Investigation Report 01-07) found that salt accretion on the compressor stator and rotor vanes of the engines during the incident flight was considered a causal factor in this occurrence. It is noteworthy that the Report mentions the fact that, on landing, the crew had *"very limited visibility through the windshield."*

The NOAA investigation board identified several major contributing factors which can potentially generate a dangerous operating environment due to the presence of a high concentration of sea salt aerosol[14] in the atmosphere. The report states that the following factors contribute to such an environment:

> *"1. A large difference between the sea surface temperature and the air temperature, particularly with warm water and cold air. Along with this, large horizontal temperature gradients within the ocean appear to contribute significantly.*
>
> *2. High surface wind speeds. We are currently defining this to mean in excess of approximately 30 m/s* [58.3 kts]*, a value which would certainly be subject to refinement. Included along with wind speed are large distance of fetch and long duration of continued high wind speeds. No specific values are offered at this time to define large fetch or long duration, but based on this incident, 500 nm and 48 hours would seem to qualify.*
>
> *3. Lack of precipitation, particularly in ambient air temperatures near 0°C.*
>
> *4. Relative humidity at or above 80%.*
>
> *5. Height of the Marine boundary layer. The high salt environment will not extend above a well-defined boundary layer."*

[13] **NOAA:** United States National Oceanic and Atmospheric Administration.
[14] **Aerosol:** A gaseous suspension of fine solid or liquid particles.

The report states that if several of these conditions prevail in a given environment, an increased likelihood of high sea salt aerosol concentration exists. The combination of several of these parameters can create a synergy allowing the production of excessive salt aerosols at the surface and their subsequent transport to altitudes which would not normally be reached at a dangerous or even discernable level. The report notes that precipitation will very effectively remove salt particles from the atmosphere, even in the presence of large vertical mixing velocities. The report also states that dangerous concentrations of sea salt aerosol are not anticipated above 5,000 ft, due to dilution and settling.

Following this event, the NOAA requested the assistance of the United States Naval Research Laboratory (NRL) Marine Meteorology Division to help understand the meteorological conditions that led to the event. The NRL subsequently published Report NRL/MR/7540-07-9080. The NRL report noted that *"There is very little collected data on sea salt aerosol particles in high wind conditions, and much of the data at moderate wind speeds is suspect…"* The report stated that *"the primary causal factors for the environmental conditions experienced are determined to be a lack of wet scavenging by precipitation, and high surface marine winds."*

In its summary, the NRL report stated that *"high winds (>50 kts; especially >60 kts) with little precipitation can result in high concentrations of airborne sea salt particles. Even under more benign conditions, giant mode particles* [diameter > 15 µm] *can reach 800 m* [2,625 ft]. *Under the worst of conditions, sea salt particles of this size can probably reach ~1.5 km* [approximately 5,000 ft]. The report also concluded that *"the high-wind, dry, cold sector behind a front or southwest of an occluded system appears to be the most dangerous region in the storm for sea salt fouling."*

2. ANALYSIS

2.1 The Occurrence

The Flight Crew were faced with a very rare but significant issue when the forward visibility through their windscreens was obscured due to sea salt accretion on the windscreens, while attempting a night landing at EICK during a winter storm. Their first approach to RWY 25 had resulted in a go-around which was entirely due to a significant increase in indicated airspeed on finals. At that time, there was no issue with forward visibility. The aircraft was then positioned back onto finals by radar vectors issued by ATC, while two other aircraft made approaches to EICK. The track followed was initially to the southwest on the runway heading, followed by left turns under radar control, which brought EI-REL back to the east of the airport along a ground track which was south of EICK, close to the coast and at times over the sea at an altitude of 3,000 ft.

It is likely that the aircraft windscreens began picking up the sea salt contamination while flying along this track, although its presence at that stage is unlikely to have been of particular significance to the Flight Crew, in the absence of strong external light sources.

However, when making their second approach to RWY 25, when the runway lighting would have been the primary external landing aid, their forward vision was obscured to such an extent that they had no alternative but to execute another go-around.

This was approximately 23 minutes after the initial go-around. The Commander later described how the contamination had created a thick opaque layer on the windscreen and how she found it impossible to see the runway as the salt residue had the effect of diffusing the lights into a complete blur.

Following the second go-around, the Flight Crew showed good airmanship and crew resource management (CRM) in seeking to fly to areas of shower activity which were visible on their weather radar. They were facilitated in this by ATC and they found areas of moisture which, although not active enough to completely clear the windscreen, did clear a small area of the windscreen on the Commander's side. The Commander was then able to commence a third approach to RWY 25, using the visual cues which she could see through this small gap in the salt residue. At the time, the First Officer still had no visual reference. As they approached EICK, a shower passed over the airport, which assisted in clearing the windscreen and they were able to carry out a normal landing.

Another ATR 72 landed shortly before EI-REL's second go-around. It also suffered salt contamination on its front windscreens, although to a lesser extent than EI-REL. The other aircraft had not flown at low level over the sea. It is noteworthy that the Flight Crew of EI-REL and the commander of the other ATR 72 both stated that the windscreen wipers were ineffective in clearing the salt residue. The Commander of EI-REL also stated that she believed that the windscreen heat had exacerbated the issue by drying out the salt and enabling a thick layer to form.

2.2 Other Salt Accretion Events

The fact that neither the aircraft manufacturers ATR nor Airbus had any record of a similar occurrence on file illustrates that the available data on this type of event is very rare.

However, useful information concerning sea salt accretion on aircraft is available from reports published by the NOAA and the NRL, arising from the serious incident involving a WP-3D research aircraft over the North Atlantic in 2007. In that case, as in the subject occurrence involving EI-REL, flight through precipitation played a significant part in a resolution of the issues presented to the crew. The NRL report found that high marine winds greater than 50 to 60 kts in combination with little precipitation can result in high concentrations of airborne sea salt particles. During the portion of the flight between the two go-arounds, EI-REL was operating at 3,000 ft. In the given atmospheric circumstances, it is considered likely that, at that altitude, it was flying in an area of high sea salt particle concentration. According to the NOAA and NRL reports, dangerous concentrations of sea salt are unlikely to be found at altitudes greater than 5,000 ft.

The Met Éireann aftercast for the subject event states that an occluded front had cleared the area. This data bears similarities to the information in the NRL report stating that the high-wind, dry, cold sector behind a front or southwest of an occluded system appears to be the most dangerous region in the storm for sea salt fouling. Also, it can be seen from the radar imagery provided by Met Éireann that, while there was substantial rainfall off the west coast of Ireland, the area around EICK was virtually echo free, implying that any showers that may have existed in the region of Cork Airport were very light. It is known that precipitation very effectively scavenges salt particles from the atmosphere.

Conversely, if other meteorological conditions for the transport of sea salt aerosol into the atmosphere are present, then a lack of precipitation means that the primary method for the removal of these particles from the atmosphere is unavailable.

2.3 Safety Actions

Following discussions with the AAIU regarding this event, the Operator issued a Flight Crew Instruction (FCI) on Sea Salt Aerosol Accretion. This FCI contains general information on the generation of sea salt contamination, similar to the information contained in this Report. It reminds crews that, in the event of experiencing contamination leading to degradation of visibility through the windscreen of an aircraft, it may be necessary to fly through precipitation prior to conducting a landing.

The Investigation reminds operators that, in the event of an aircraft operating in areas of high concentrations of sea salt aerosol, particular attention should be paid to the washing of engines and airframe as a corrosion prevention measure.

The Investigation considers that, given the rarity of this type of event, no specific Safety Recommendations are warranted other than a general raising of awareness through the publication of this Report.

3. CONCLUSIONS

(a) Findings

1. The aircraft carried out a go-around from its first approach to RWY 25 at EICK, due to a substantial increase in indicated airspeed on short finals.

2. There were no issues with forward visibility during this first approach.

3. Following the go-around, the aircraft initially maintained a southwesterly heading, followed by an easterly track to the south of EICK under radar control and ultimately back onto final approach to RWY 25.

4. The track to the south of EICK brought the aircraft close to the coast and at times over the sea at an altitude of 3,000 ft.

5. The aircraft carried out a go-around from its second approach to RWY 25 because the Flight Crew's forward visibility was obscured by a thick residue of sea salt which had adhered to the windscreens.

6. The Flight Crew exercised good airmanship and CRM in approaching shower activity which was visible on their weather radar, with a view to clearing the salt residue.

7. While flying through precipitation, a small portion of the Commander's windscreen cleared to the extent that an approach was possible.

8. During the third approach to RWY 25, a rain shower crossed over EICK further clearing the windscreen and the aircraft was able to make a successful landing.

9. Weather conditions at the time were very stormy with southwesterly winds gusting up to 50 kts at EICK. There were warnings of severe turbulence and windshear in force.

10. Although there was a very strong, unstable, showery flow with embedded trough lines at the time of the event, weather radar imagery showed that the area around EICK was echo free, i.e. any showers that may have existed in the area of Cork Airport were very light.

11. Previous meteorological reports on sea salt accretion events have found that the primary causal conditions for accretion on aircraft are a lack of wet scavenging by precipitation, combined with high surface marine winds.

12. Dangerous concentrations of sea salt are unlikely to be found at altitudes greater than 5,000 ft.

13. In the period between the first and second go-arounds, EI-REL was flying close to the coast and over the sea in conditions conducive to sea salt accretion, i.e. high surface winds, a lack of precipitation and at an altitude of 3,000 ft.

(b) Probable Cause

Loss of forward visibility due to sea salt accretion on the front windscreens.

(c) Contributory Cause

A confluence of meteorological circumstances including high marine surface winds combined with a lack of precipitation.

4. SAFETY RECOMMENDATIONS

This Report does not sustain any Safety Recommendations.

- END –

In accordance with Annex 13 to the Convention on International Civil Aviation, Regulation (EU) No 996/2010, and Statutory Instrument No. 460 of 2009, Air Navigation (Notification and Investigation of Accidents, Serious Incidents and Incidents) Regulation, 2009, the sole purpose of this investigation is to prevent aviation accidents and serious incidents. It is not the purpose of any such investigation and the associated investigation report to apportion blame or liability.

A safety recommendation shall in no case create a presumption of blame or liability for an occurrence.

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