CIVIL AVIATION AUTHORITY

WINTER INFORMATION GROUP

UK WINTER RUNWAY ASSESSMENT TRIAL 2011/2012

TRIAL REPORT

REFERENCE: CAA/Safety Regulation Group/Aerodrome and Air Traffic Standards

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CONTENTS LIST **PAGE**

1	Executive Summary	3
2	Objective	4
3	Test Programme	4
4	Assessment Methodology	5
5	Benefits	5
6	Test Results (Data)	5
7	Conclusions	6
8	Recommendations	6
9	FAA TALPA-ARC	6

APPENDICES

A	Assessment Table	A-1
B	Guidance Notes	B-1
C	Tabulated Results	C-1

1 EXECUTIVE SUMMARY

1.1 The Winter Information Group (WIG) was convened in July 2010, initially to review all current available information published by the CAA concerning operations in winter conditions and publish new information as deemed necessary. This task was quickly completed and feedback from aircraft operators on the group indicated that the work, taking place in North America under the FAA's TALPA ARC[1], could be adapted for use in the UK and so a trial was commissioned for winter 2010-11.

1.2 Owing to the short timescales available before the winter a limited trial, involving 4 aerodromes, was initiated. Owing to a mild winter this trial provided very limited information; accordingly, the trial was re-commissioned for winter 2011-12, involving 17[2] aerodromes geographically spread around the UK. As in 2010-11, winter 2011-12 was mild, such that there were few significant snow events. However, 52 events from 10 participants were recorded and these results have been reviewed.

1.3 Although the resulting data set was small there was some evidence of correlation between the braking action estimate and the perceived braking action assessed on the runway. The group concluded that the proof of concept had been achieved. However, the lack of results prevents a change to rulemaking so the Group plans to conduct a further trial during the winter of 2012/13.

[1] Take-off And Landing Performance Assessment – Aeronautical Rulemaking Committee

[2] Belfast International, Bristol, Cardiff-Wales, City of Derry, Edinburgh, Exeter, Glasgow, Glasgow Prestwick, Inverness, Liverpool, Leeds-Bradford, London Gatwick, London Stansted, Luton, Manchester, Newcastle, Norwich, Stornoway.

2 OBJECTIVE

2.1 The Winter Wash Up meetings held following the severe weather experienced in the UK in 2010 prompted the formation of a Winter Information Group (WIG). This group met, reviewed all current available information published by the CAA concerning operations, amended it where necessary, and published new guidance in the form of NOTAL, ATSIN, FODCOM and updated AIP and AIC pages.

2.2 Feedback from aircraft operators on the group indicated that the work, taking place in North America under the FAA's TALPA ARC, could be adapted for use in the UK and so a trial was commissioned for winter 2010-11. This trial provided only limited information. However, the potential benefits remain and the trial was re-commissioned. With additional time available to prepare the trial was expanded to include 17 aerodromes, geographically spread across the United Kingdom and the format of the trial revised - in view of the fact that part of the TALPA ARC matrix will require changes to aircraft manufacturers flight operations manuals, an abbreviated runway surface assessment tool was trialled (see Appendix A).

2.4 The trial had three key objectives:

a) To see how the quality of data, gathered by UK aerodrome operations staff and passed to airline operators' crews via ATC, can be improved by the adoption of an enhanced assessment format, which uses standard phraseology to describe estimated braking action. This is obtained by assessing the runway state against a reference table using type of contaminant and its depth;

b) To see if aircrew understand the phraseology and whether the reports add value to the runway state report promulgated either by Snowtam, Metar, Runway State Group or ATIS;

c) To obtain feedback from participating Air Traffic Service Units (ATSUs) concerning the management of data transmission generated by the trial and the usefulness of the data to ATSUs themselves.

2.5 Concurrent with the trial, the CAA published SN 2011/016 *Operations on Contaminated Runways*, which provides aeroplane and aerodrome operators with guidance concerning operations on contaminated runways.

3 TEST PROGRAMME

3.1 The trial ran from 1 November 2011 to 31 March 2012.

3.2 Any aircraft operator using a participating aerodrome's runways during the trial was encouraged to participate. At each location ATC passed Estimated Braking Action information to any aircraft using RTF when aerodrome operations personnel make a report available.

3.3 Aircraft landing, taking off or performing a rejected take-off were asked to submit a completed pilot questionnaire via their flight operations department or online at www.caa.co.uk/SRG2007, by email to aerodromes@caa.co.uk, or by fax to 01293 573971.

4 ASSESSMENT METHODOLOGY

4.1 A task detail sheet was produced to help aerodrome operations staff carry out a runway inspection and obtain all the necessary data to pass on to ATC.

4.2 An assessment table was provided for use in contaminated runway conditions to help enable aerodrome operations staff assess conditions and derive an estimate of runway friction (See Appendix A). The words are the same as those used in reports of estimated braking action on compacted snow and ice as detailed in the UK AIP.

4.3 The trial continued with the normal phraseology for occasions when a runway was not contaminated, namely Dry, Damp, Wet or Wet with de-icer fluid.

4.4 Pilot reports (PIREPS) were encouraged during periods of runway contamination and a hierarchy of validity developed. Any PIREP that reported the runway as worse than the current Estimated Runway Friction prompted a downgrading to that state and triggered a reassessment of the runway condition. Any PIREP suggesting better than reported conditions did not upgrade the Estimated Braking Action; instead it triggered a reassessment of the runway state.

4.5 SNOWTAMs were issued and updated, for significant changes, in accordance with AIC Yellow 86/2009. This included Runway State Groups appended to the METAR, in accordance with CAP 782.

5 BENEFITS

5.1 The main benefit from the trial was validation of a methodology whereby greater clarity and accuracy, in terms of passing data from operations staff to ATC who then promulgate runway states to aircraft operators, may lead to improved safety and a reduction in weather diversions due to winter contamination of runways.

6 TEST RESULTS (DATA)

6.1 Data obtained for every element of the Test Schedule, including Flight Data Monitoring data where supplied, was gathered and presented at the end of the evaluation.

6.2 This report has evaluated the data obtained and offers an analysis of that data, with particular reference to the stated objectives of the evaluation. The results have also been reviewed by members of the WIG.

6.3 52 events were recorded which involved the braking action assessment (using the matrix) being passed to aircraft. However, only 12 instances were recorded where feedback was received from the airline or pilots involved. Of these 12 instances, 10 indicated that the runway condition matched the assessment provided (see Appendix C).

6.4 In addition to the data points gathered from participating aerodromes and their operator partners, the opportunity to examine data collected and stored on easyJet Airbus aircraft was offered by the manufacturer.

6.5 As Flight Data Recording (FDR) is automatic, it only required identification of a flight that landed during the trial weather conditions at a participating aerodrome to extract relevant performance figures from the aircrafts' FDR. This has been done and Airbus has reported on 27 of them. Within that number 10 landings were 'friction limited'[3] during part of the landing roll.

[3] In this context 'friction limited' means when the friction on the runway is not sufficient to support the applied braking force, the antiskid system will reduce the applied braking force to one that can be supported by the runway friction. In this case, the deceleration and braking force are "friction limited".

7 CONCLUSIONS

7.1 Although the resulting data set was small there was evidence of correlation between the braking action estimate and the perceived braking action. The WIG has concluded that the proof of concept had been achieved.

8 RECOMMENDATIONS

8.1 The lack of results prevents a change to rulemaking so the Group recommends that a further trial should be conducted next winter, with process improvements identified:

8.1.1 In view of the limited number of pilot questionnaires returned via the interactive web page, a change in methodology is planned. The WIG recommends that ATCOs at participating aerodromes during periods of 'Trial Conditions' seek a verbal response from crews, who have been passed an estimate, about their perception of the braking action.

8.1.2 Improved briefing of crews, so that they have an improved understanding of the trial and their role in it. The major UK operators have committed to this process.

8.1.2 Items which would make the analysis of data easier and more complete:

1. Collection of FDM by Airbus may be considered for all UK airports to which A319s operate;
2. Aerodrome operations reports issued before any winter events and after runway clearing or the end of contamination would add granulation to the findings. These reports will help to show how the event unfolded;
3. PIREPs from crews would introduce a valuable additional source of information; and
4. Briefing crews for the systematic use of A-BRK MED would improve the level of successful analysis and would also be in line with Airbus SOP for operations on contaminated runways. A-BRK is an auto brake system (A-BRK) intended to automatically apply even, adequate braking force to the wheels of the aircraft at stages of the landing or take-off.

9 FAA TALPA-ARC

9.1 During the trial period, the CAA had expected the results of the TALPA-ARC trial to progress towards rulemaking. However, contact with the FAA had indicated some issues with bringing the recommendations of the TALPA ARC project into regulation. This was due to more pressing Congressional business, and it appears that permission has been obtained for roll out of the project on an advisory basis whilst awaiting ratification. The future trial remains consistent with the TALPA-ARC programme.

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APPENDIX A - ESTIMATED BRAKING ACTION - ASSESSMENT TABLE
(See over for guidance notes)

A runway is contaminated when more than 25% of the runway surface area (whether isolated or not) within the reported length and width being used is covered by:

- water more than 3mm deep;
- slush, frost or loose snow equivalent in depth to more than 3mm of water; or
- any compacted snow or ice.

Note: For the purposes of this trial, depths between 0 mm and 3 mm should be assessed and reported.

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<table>
<tr><th>Depth</th><th>Water</th><th>Slush</th><th>Snow (Wet)</th><th>Snow (Dry)</th><th>Compacted Snow (any depth)</th><th>Ice/Rime</th><th>Frost</th></tr>
<tr><td>⬆ >19mm</td><td>Flooded</td><td>STOP</td><td>STOP</td><td>STOP</td><td rowspan="4">Warmer than -15C
Medium

-15C and Colder
Good to Medium</td><td rowspan="4">Poor</td><td rowspan="3">N/A</td></tr>
<tr><td>19mm
|
>13mm</td><td>Flooded</td><td>STOP</td><td>STOP</td><td>STOP</td></tr>
<tr><td>13mm
|
>3mm</td><td>Medium
To Poor</td><td>Medium
to Poor</td><td>Medium</td><td>Medium</td></tr>
<tr><td rowspan="2">3mm
|
0mm</td><td>Good</td><td>Good</td><td>Good</td><td>Good</td><td rowspan="2">Good</td></tr>
<tr><td colspan="4">See over for cautionary note ref 3 Kelvin Rule</td></tr>
<tr><td>Dry</td><td colspan="7">The runway is not affected by Water, Slush, Snow, Ice or Frost</td></tr>
</table>

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APPENDIX B GUIDANCE NOTES

Caution:
The Norwegian Accident Investigation Board has recently published a report on 'Winter Operations, Friction Measurements and Conditions for Friction Predictions'. The report is based on findings from 30 incidents that have occurred on contaminated runways over the last 10 years in Norway. The report highlights a number of safety indicators from its findings, one of these is the '3-Kelvin-Spread Rule'. The rule states that at air temperatures of +3°C and below, with a dew point spread of 3ºC or less, the runway surface condition may be more slippery than anticipated on snow and ice. The narrow dew point spread indicates that the air mass is relatively close to saturation which is often associated with actual precipitation, intermittent precipitation, nearby precipitation or fog. How these atmospheric conditions affect braking action is not considered by the rule, however, many of the incidents highlighted in the Norwegian report which relate to insufficient friction were linked to precipitation or deposition of water, liquid or frozen. The validity of the rule may depend on its correlation with precipitation but it may also, at least in part, depend on the exchange of water at the air-ice interface. The rule was observed in 21 out of the 30 incidents related to braking action on ice and snow investigated by Norway. Due to the other variables involved such as surface temperature, solar heating and ground cooling or heating, a small spread does not always mean that the braking action will be poor. The rule may be used as an indicator of slippery conditions but not as an absolute. When these conditions exist it may be appropriate to factor the landing distance above and beyond those factors.

NOTE - For the purposes of this trial, the surface condition may be passed as Good when wet with de-icing fluid**,** as there should be no difference in braking action to that when the runway is wet with water.

DEFINITIONS

Dry Runway: For airplane performance purposes and use of this Table, a runway can be considered dry when no more than 25% of the runway surface area within the reported length and the width being used is covered by visible moisture or dampness.

Wet Runway: For airplane performance purposes and use of this Table, a runway is considered wet when more than 25% of the runway surface area within the reported length and the width being used is covered by any visible dampness or any water up to 3 mm deep.

Contaminated Runway: For airplane performance purposes and use of this Table, a runway is considered to be contaminated when more than 25 % of the runway surface area (whether in isolated areas or not) within the required length and width being used is covered by the following:

(i) surface water more than 3 mm (0,125 in) deep, or by slush, or loose snow, equivalent to more than 3 mm (0,125 in) of water;
(ii) snow which has been compressed into a solid mass which resists further compression and will hold together or break into lumps if picked up (compacted snow); or
(iii) ice, including wet ice.

Dry Snow: Snow that can be blown if loose, or that will not stick together to form a snowball using gloved hands.

Wet Snow: Snow that contains enough water content to be able to make a well-compacted, solid snowball, but water will not squeeze out.

Slush: Snow that is so water saturated that water will drain from it when a handful is picked up. Slush will splatter if stepped on forcefully.

Compacted Snow: Snow that has been compressed into a solid mass such that the airplane tyres, at operating pressures and loadings, will run on the surface without significant further compaction or rutting of the surface. Compacted snow may include a mixture of snow and embedded ice; if it is more ice than compacted snow, then it should be reported as either ice or wet ice, as applicable. A layer of compacted snow over ice should be reported as compacted snow.

Water: Water in a liquid state.

Frost: Frost consists of ice crystals formed from airborne moisture that condenses on a surface whose temperature is below freezing. Frost differs from ice in that the frost crystals grow independently and therefore have a more granular texture. Heavy frost that has noticeable depth may have friction qualities similar to ice and downgrading the runway condition code accordingly should be considered. If driving a vehicle over the frost does not result in tyre tracks down to bare pavement, the frost should be considered to have sufficient depth to consider a downgrade of the runway condition code.

Rime: Deposit of ice generally formed by the freezing of super cooled fog or cloud droplets on objects whose surface temperature is below or slightly above 0 deg C.

Ice: Frozen water.

Wet Ice: Ice with a layer of water on top of it or ice that is melting.

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APPENDIX C – TABULATED RESULTS

Belfast International

Airline report	ATC report	Pilot report	Time	Ops report	State
5 Dec 2011					
Nil	Nil	Nil	23.10	Slush x 3 / 100% x 3 / 2 - 1 - 0mm / Good x 3	Open
6 Dec 2011					
Nil	Nil	Nil	00.30	Slush – Wet x 2 / 50 – 100% x 2 / No Sig x 3 / Good	Open
16 Dec 2011					
Nil	Nil	Nil	11.27	Wet snow – Slush x 3 / 70 – 100% x 3 / 2mm x 3 / Good x 3	Open
Nil	Nil	Nil	11.50	Slush x 3 / 100% x 3 / 1 mm x 3 / Good x 3	Open
Nil	Nil	Nil	12.15	Slush – Wet x 2 / 100% x 3 / 1 mm x 3 / Good x 3	Open
Nil	Nil	Nil	13.25	Wet x 3 / 100% x 3 / 1 mm x 3 / Good x 3	Open

Birmingham

Airline report	ATC report	Pilot report	Time	Ops report	State
4 Feb 2012					
RYR666	Nil	Good x 3	16.25	Wet x 3 / 25% x 3 / 1mm x 3 / Good x 3	Open
FlyBe	Nil	Good x 3	17.08	Wet x 3 / 25% x 3 / 1mm x 3 / Good x 3	Open
Nil	Nil	Nil	17.27	Wet x 3 / 100% x 3 / 10mm x 3	Closed

Bristol No suitable conditions

Cardiff Wales No suitable conditions

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City of Derry

Airline report	ATC report	Pilot report	Time	Ops report	State
14 December 2011					
Nil	Yes	Nil	06.50	Frost x 3 / 100% x 3 / <1mm x 3 / Nil	Open
Nil	Yes	Nil	07.50	Frost x 3 / 100% x 3 / <1mm x 3 / Nil	Open
Nil	Yes	Nil	08.19	Wet x 3 / 100% x 3 / Nil / Good x 3 /	Open
Nil	Yes	Nil	17.57	Wet x 3 / 100% x 3 / Nil / Good x 3 /	Open

Edinburgh No suitable conditions

Exeter No suitable conditions

Glasgow No suitable conditions

Glasgow Prestwick No suitable conditions

Inverness

Airline report	ATC report	Pilot report	Time	Ops report	State
5 Feb 2012					
LOG6951	Nil	Medium x 3	10.45	Slush x 3 / 100% x 3 / 5mm x 3 / Medium x 3	Open

Liverpool

Airline report	ATC report	ATIS period	Ops report	State
4 Feb 2012				
easyJet				
7002	Nil			
7204	Nil			
7198	Nil	10.20 – 14.15	Wet x 3	Open
7180	Nil			
7296	Nil			
0604	Nil			
7092	Nil			
0606	Nil	14.15 – 19.05	Wet x 3	Open
0636	Nil			
7284	Nil			

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16 Feb 2012				
easyJet				
Nil	1 report – as per Ops	11.50 – 12.20	Slush x 3 / 100% x 3 / 4mm x 3 / Medium Poor x 3	Open
Nil	1 report – as per Ops	12.20 – 12.50	Slush x 3 / 50% x 3 / 3mm x 3 / Good x3	Open
Nil	1 report – as per Ops	12.50 – 13.20	SW x 3 / 100% / 6mm x 3 / M/P x 3	Closed
Nil	1 report – as per Ops	13.20 – 13.50	SW x 3 / 100% / 15mm x 3 / Stop x 3	Closed

Leeds Bradford

Airline report	ATC report	Pilot report	Time	Ops report	State
5 Dec 2011					
Nil	Nil	Nil	10.22	Slush x 3 / 5% x 2 – 40% / <1 mm x 2 - < 2 mm / Good x 3	Open
Nil	Nil	Nil	11.10	Wet x 2 – Slush / 0% x 2 – 20% / 0mm x 2 - < 2 mm / Good x 3	Open
Nil	Nil	Nil	12.49	Wet x 2 – Slush / 0% x 2 – 5% / 0mm x 2 - < 1 mm / Good x 3	Open
7 Dec 2011					
Nil	Nil	Nil	15.40	Slush x 3 / 80% x 3 / < 1 mm x 3 / Good x 3	Open
Nil	Nil	Nil	16.09	Slush – wet x 2 / 20% - 0% x 2 / < 1mm – 0mm x 2 / Good	Open

London Gatwick No suitable conditions

London Luton

Airline report	ATC report	Pilot report	Time	Ops report	State
4 Feb 2012					
Nil	Nil	Nil	19.03	Wet Snow x 3 / 100% x 3 / <1mm x 3 / Good x 3 /	Open
Nil	Nil	Nil	19.40	Wet Snow x 3 / 100% x 3 / 1mm x2 - <1mm / Good x 3 /	Open
Nil	Nil	Nil	20.17	Wet Snow x 3 / 5% x 3 / <1mm x 3 / Good x 3 /	Open
Nil	Nil	Nil	20.50	Wet Snow x 3 / 100% x 3 / 2mm x 3 / Good x 3 /	Open
5 Feb 2012					

Nil	Nil	Nil	03.58	Wet x 1 – Slush x 1 – nil / 100% x 2 – nil / 3mm x 1 – 2mm x 1 – nil / Good	Open

London Stansted

Airline report	ATC report	Pilot report	Time	Ops report	State
EZY3378	Nil	Nil	18.51	Nil	
DS1497	Nil	Nil	19.13	Nil	
EZY3058	Nil	Nil	19.24	Nil	
EZY3206	Nil	Nil	20.05	Nil	
EZY3252	Nil	Nil	20.31	Nil	
FR296	Nil	Nil	20.50	Snow x 3 / 100% x 3 / 1mm x 3 / Good x 3	Open
FR6535	Nil	Nil	20.59	Snow x 3 / 100% x 3 / 1mm x 3 / Good x 3	Open
EZY3010	Nil	Nil	20.42		
EZY3140	Nil	Nil	21.02	Snow x 3 / 100% x 3 / 3mm x 3 / Medium x 3	Open
EZY3142	Nil	Nil	21.02	Snow x 3 / 100% x 3 / 3mm x 3 / Medium x 3	Open
Titan AWC3B	Nil	Med/Good x 3	21.08	Snow x 3 / 100% x 3 / 3mm x 3 / Medium x 3	Open
FR9775	Nil	Med/Good x 3	21.18	Snow x 3 / 100% x 3 / 3mm x 3 / Medium x 3	Open
FR3919	Nil	Med/Good x 3	21.22	Snow x 3 / 100% x 3 / 5mm x 3 / Medium x 3	Open
FR233	Nil	Nil	21.28	Snow x 3 / 100% x 3 / 5mm x 3 / Medium x 3	Open
IFA2071	Nil	Nil	21.40	Snow x 3 / 100% x 3 / 8mm x 3 / Medium x 3	Open
FR3467	Nil	Nil	21.44	Snow x 3 / 100% x 3 / 8mm x 3 / Medium x 3	Open
FR969	Nil	Med/Good x 3	21.46	Snow x 3 / 100% x 3 / 8mm x 3 / Medium x 3	Open
FDX039	Nil	Med/Good x 3	21.52	Snow x 3 / 100% x 3 / 8mm x 3 / Medium x 3	Open
WZZ6002	Nil	Med/Good x 3	21.56	Snow x 3 / 100% x 3 / 8mm x 3 / Medium x 3	Open
			21.58	Snow x 3 / 100% x 3 / 10mm x 3 / Stop	Closed
			23.44	WS x 3 / 100% x 3 / 8mm x 3 / Medium x 3	Open
FR4197	Nil	No problem	23.58	WS x 3 / 100% x 3 / 8mm x 3 / Medium x 3	Open
5 Feb 2012					
FDX5220	Nil	Med/Poor x 3	00.10	WS x 3 / 100% x 3 / 8mm x 3 / Medium x 3	Open
FR3007	Nil	Nil	00.15	WS x 3 / 100% x 3 / 8mm x 3 / Medium x 3	Open
			00.17	Snow Clearing	Closed
FR3253	Nil	Nil	06.43	WS x ? / 75% x ? / 1mm x ? & 25% x ? /3 mm/ G x 3	Open

Manchester

Airline report	ATC report	Pilot report	Time	Ops report	State
4 Feb 2012					
Nil	Nil	Nil	13.40	Slush x 3 / 100% x 3 /3mm x 3 / Moderate x 3	Open
Nil	Nil	Nil	15.15	Slush x 3 / 100% x 3 / 2mm x 3 / Good x 3	Open

Newcastle

Airline report	ATC report	Pilot report	Time	Ops report	State
4 Feb 2012					
	Nil	Nil	14.23	Wet x 3 / 100% x 3 / 2mm x 3 /	
	Nil	Nil	15.41	Slush x 3 / 100% x 3 / 2mm x 3 /	
	Nil	Nil	16.29	Slush x 3 / 100% x 3 / 4mm x 3 /	
	Nil	Nil	16.30	Slush x 3 / 25% x 3 / 2mm x 3 /	
	Nil	Nil	17.15	Slush x 3 / 100% x 3 / 3mm x 3 /	
	Nil	Nil	18.49	Slush x 3 / 75% x 3 / 2-3mm x 3 /	
	Nil	Nil	19.05	Slush x 3 / 100% x 3 / 2-3mm x 3 /	
	Nil	Nil	20.08	Compact SN x 3 / 15% 20% 60% / 3mm x 3 /	
	Nil	Nil	20.31	Compact SN x 3 / 15% 20% 60% / 2mm x 3 /	
	Nil	Nil	21.33	Compact SN x 3 / 10% 20% 50% / 2mm x 3 /	
	Nil	Nil	22.56	Compact SN x 3 / 10% 20% 50% / 2mm x 3 /	
5 Feb 2012					
	Nil	Nil	00.06	Compact SN x 3 / 10% 20% 50% / 2mm x 3 /	
	Nil	Nil	01.18	Compact SN x 3 / 10% 20% 50% / 2mm x 3 /	
	Nil	Nil	02.41	Compact SN x 3 / 10% 20% 50% / 2mm x 3 /	
	Nil	Nil	05.20	Compact SN x 3 / 10% 20% 50% / 2mm x 3 /	
	Nil	Nil	05.50	Compact SN x 3 / 10% 20% 50% / 2mm x 3 /	
	Nil	Nil	06.45	Compact SN x 3 / 10% 20% 50% / 2mm x 3 /	
	Nil	Nil	07.57	SN – Slush x 3 / 20% x 3 / 3mm x 2 – 6mm x 1 /	
	Nil	Nil	09.18	Slush x 3 / 15% 20% 60% / 2mm x 2 – 3mm x 1 /	
	Nil	Nil	11.13	Slush x 3 / 20% x 3 / 2mm x 2 – 3mm x 1 /	
	Nil	Nil	12.42	Wet x 3	

Norwich No suitable conditions

Stornoway

Airline report	ATC report	Pilot report	Time	Ops report	State
5 Feb 2012					
LOG779	Nil	Good x 3	15.39	WS x 3 / 50% x 3 / 1 mm x 3 / Good x 3	Open
9 Feb 2012					
LOG6947	Nil	Wet x 3	18.10	WS x 3 / 100% x 3 / 1mm x 3 / Good x 3	Open

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