Introduction
The Department of Defense (DOD) has supported the National Science Foundation (NSF) for over 60 years in Antarctica. Missions flown in support of Operation Deep Freeze (ODF) require specially qualified aircrew and aircraft operating under guidance specific to this operation. The LC-130 is modified with skis which allow it to deliver cargo and personnel to the remote skiways throughout the continent. The aircraft also performs inter-theater airlift between Christchurch, New Zealand and McMurdo Station, Antarctica when the C-17 is not available. Neither aircraft can fly this mission without regulations and procedures specific to ODF. The aircrews flying this mission are required to calculate a Point of Safe Return (PSR) prior to each flight. This calculation determines how far the aircraft can fly enroute to McMurdo then return to Christchurch while maintaining required fuel reserves. Aircrews receive an updated weather forecast as they approach the PSR which determines whether or not they can continue to McMurdo or “boomerang” back to Christchurch.

Research Focus
Determine how often McMurdo experienced specific weather levels and analyze if there are operational benefits associated with changing the weather minimums required to continue past the current PSR of 500 feet and 3 miles. Also determine if there is a time of day that offered better weather conditions for ODF planners to exploit.

Collaboration
HQ AMC/A9L, JTF-SFA, 108 AW, SPAWAR

Maj Bret Echard
Advisor: Lt Col Joseph R. Huscroft, PhD
Advanced Studies of Air Mobility (ENS)
Air Force Institute of Technology

<table>
<thead>
<tr>
<th>Season</th>
<th>McMurdo Flights</th>
<th>Delays</th>
<th>Cancels</th>
<th>Aborts</th>
<th>% Delays/Cancels/Aborts</th>
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<tbody>
<tr>
<td>2008-2009</td>
<td>427</td>
<td>25</td>
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<tr>
<td>2009-2010</td>
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<td>52</td>
<td>7</td>
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<td>9</td>
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<tr>
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<td>2014-2015</td>
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<td>2008-2015</td>
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<td>354</td>
<td>61</td>
<td>17.0%</td>
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**McMurdo Area**
- Predicted Cancel, Abort, Delay %
  - 2008/3: 20.6%
  - 1200/3: 19.3%
  - 1000/3: 19.2%
  - 1000/2.5: 18.4%
  - 1000/2: 18.2%
  - 800/2: 17.4%

**McMurdo Area**
- Predicted Cancel, Abort, Delay %
  - 800/1.5: 16.7%
  - 500/3: 17.7%
  - 500/2.5: 17.2%
  - 500/2: 17.0%
  - 500/1.5: 16.4%
  - 400/2: 16.6%

Methodology
The data, provided by SPAWAR, consists of weather observations for the McMurdo area from November 2009 up to December 2015. The total percentage of weather observations at specific levels in the McMurdo area was then found by totaling the observations for each location and calculating a percentage. This represents the percentage of time that location experienced weather at those specific levels. This data was also grouped into time categories at each location to determine if there was a time of day that historically offered better weather for operations. Operational flight data from Polar Mission Summary was then compiled for all LC-130 flights from November 2008- March 2015 in the McMurdo area. The data was then filtered to display only missions that experienced a weather delay, cancellation or abort caused by McMurdo weather. The percentage of missions affected by weather was determined for each year as well as an overall percentage.

Results
The analysis showed that overall 17% of LC-130 McMurdo missions were affected by weather with a point of safe return minimum of 500 feet and 2 miles. The analysis relied on the C-17 model that assumed for every 1% change in average weather there would also be a 1% change in weather delays. Based on the analysis, the 2015-2016 PSR minimum of 500 feet and 3 miles appears to be ideal for the LC-130 mission. The time period of 1201-1800 Zulu represented the worst time of day for aircraft operations at McMurdo. This period was 3-4% higher in weather observations than the others which were all within 3% of each other. The results also verified the C-17 study previously performed by PACAF/A9.