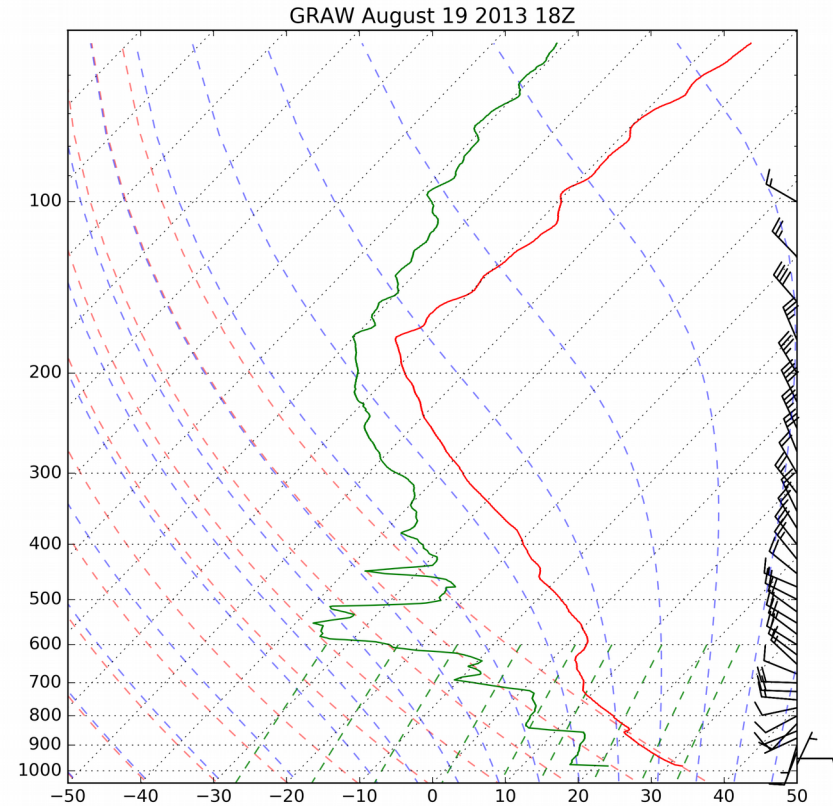
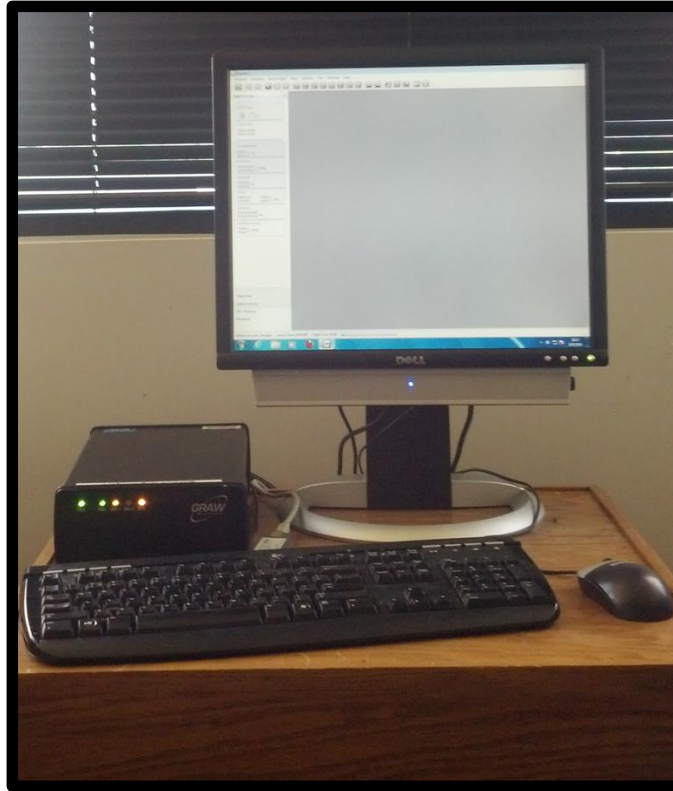


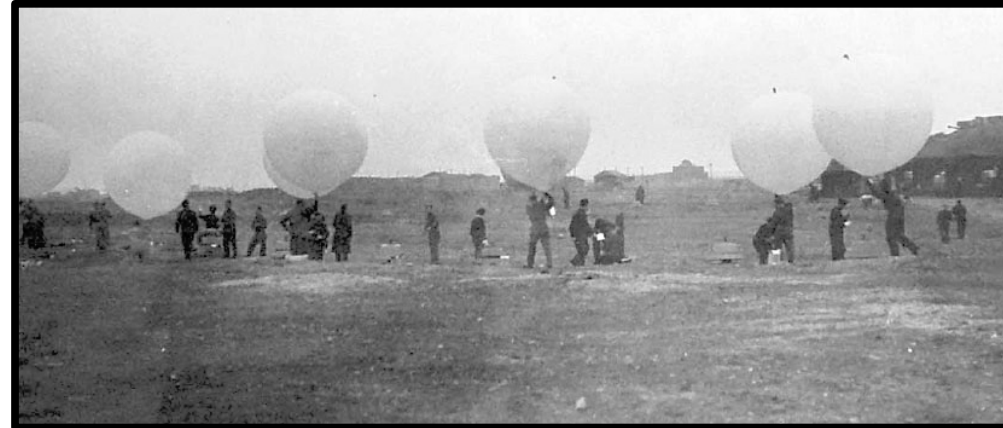
Instrumentation & Airborne Science



Dr. David J. Delene, University of North Dakota

Ballooning History

- First human-carrying balloon was done by the Montgolfier brothers (Joseph-Michel and Jacques-Etienne) in France in 1783.
- British attack Germany by means of free-flying balloons carrying trailing steel wire and incendiary devices.



\$10,000,000 Airborne Platform

WB-57

TDL Inlet



TDL

CCP

CIP

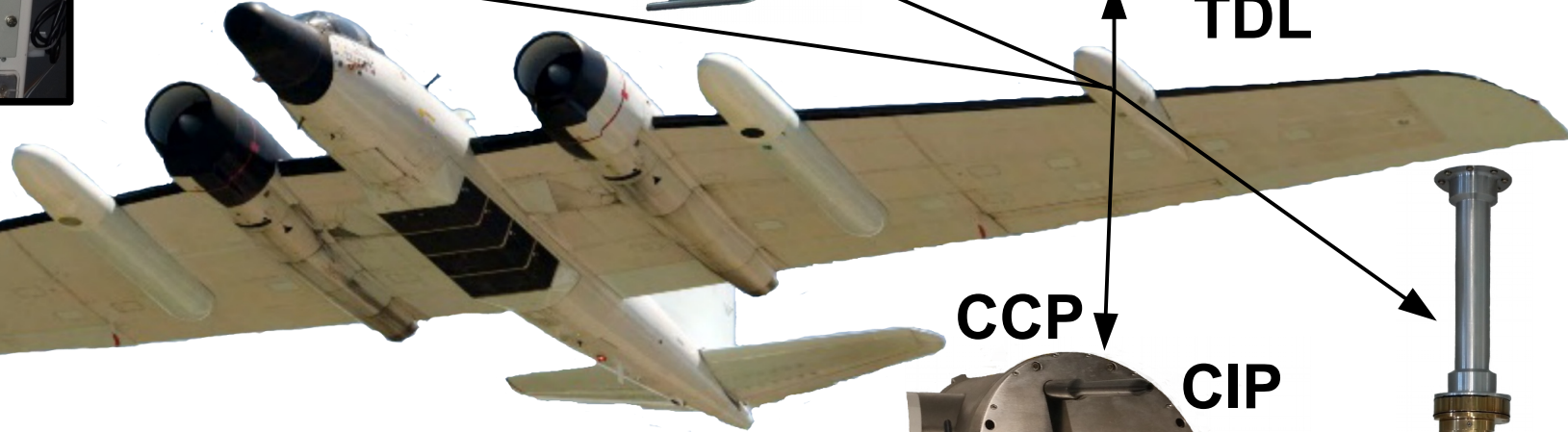
CDP

**Nevzorov
Probe**

M300 DAS

**CPI DAS &
Control Box**

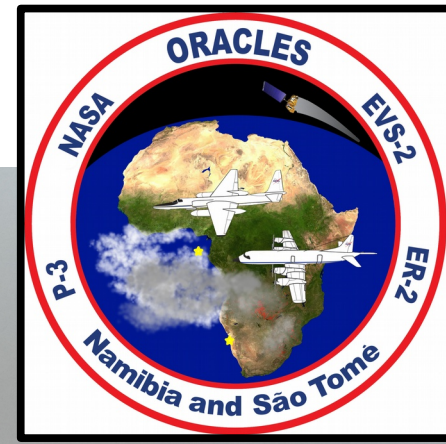
CPI



\$10,000,000 Airborne Platform

NASA

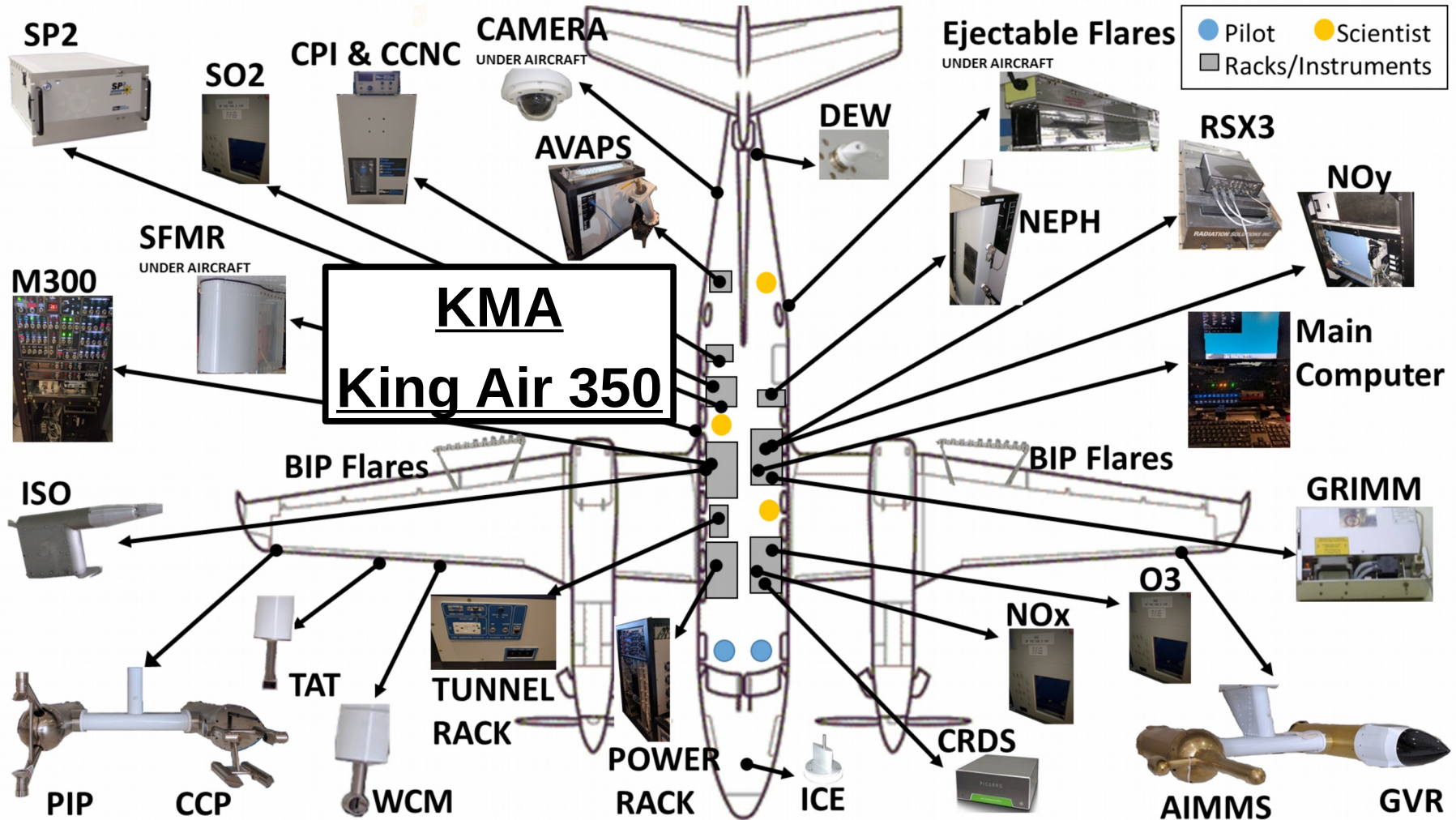
P3



\$10,000,000 Airborne Platform (P3)

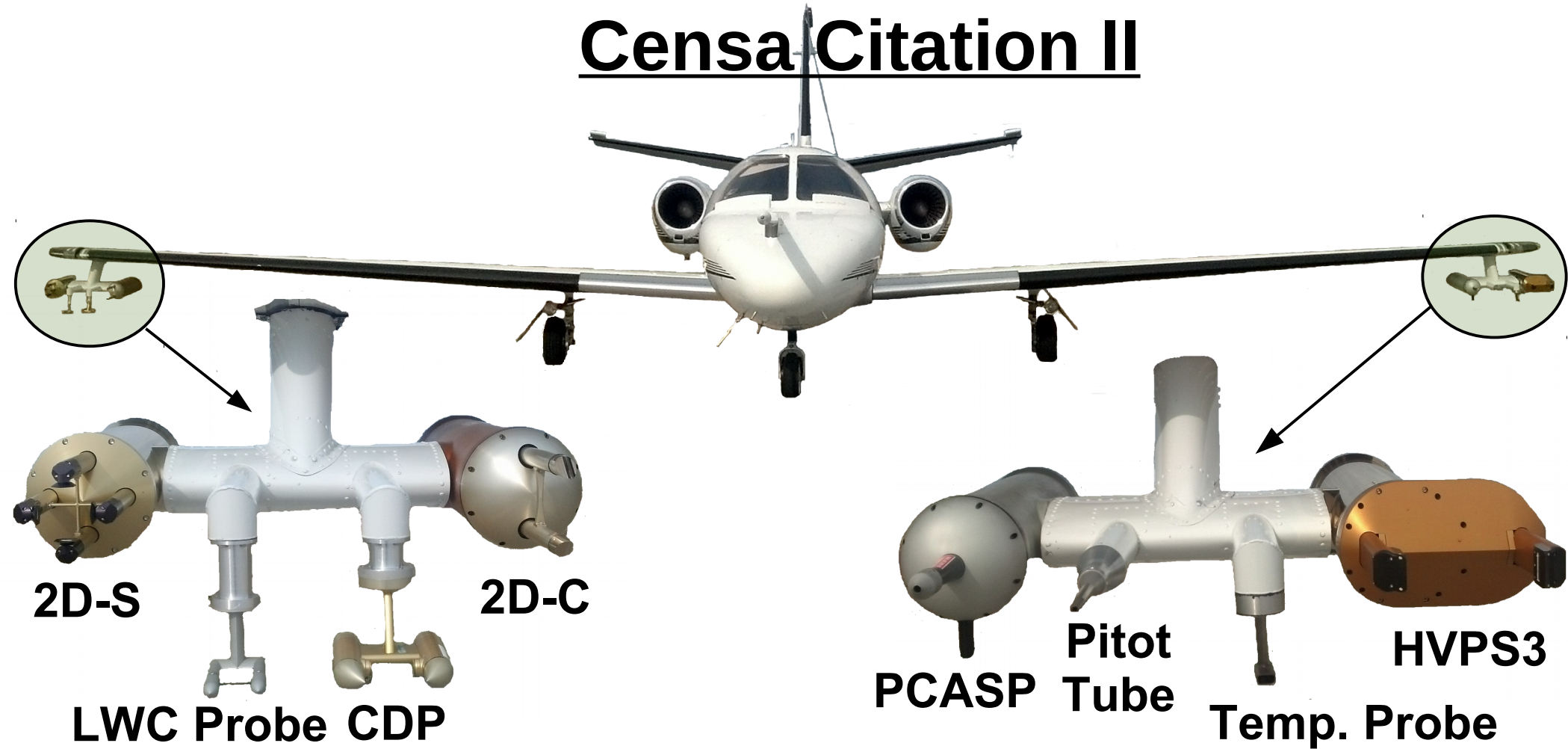


\$1,000,000 Airborne Platform



\$1,000,000 Airborne Platform

Censa Citation II



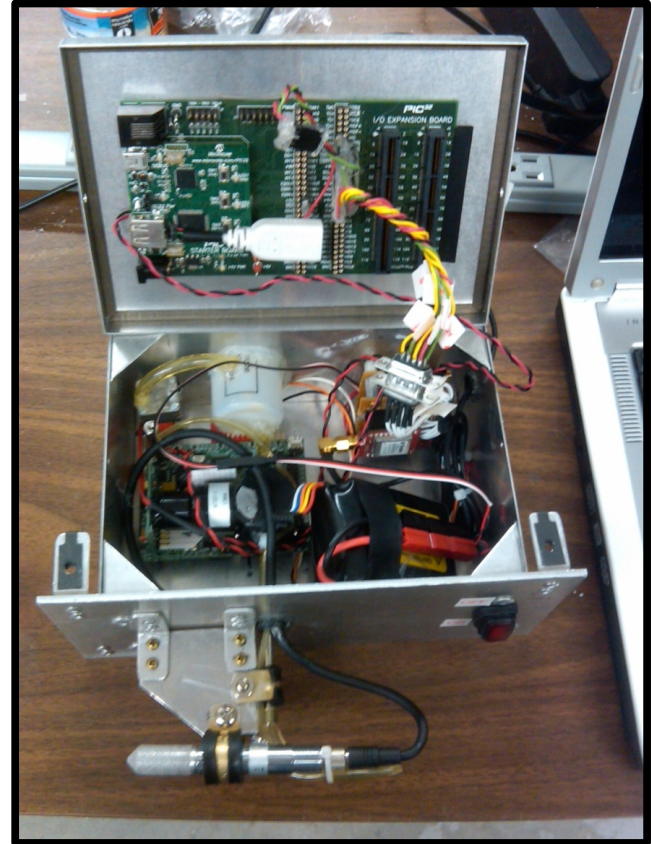
\$100,000 Airborne Platform

University of Wyoming



\$10,000 Airborne Platform

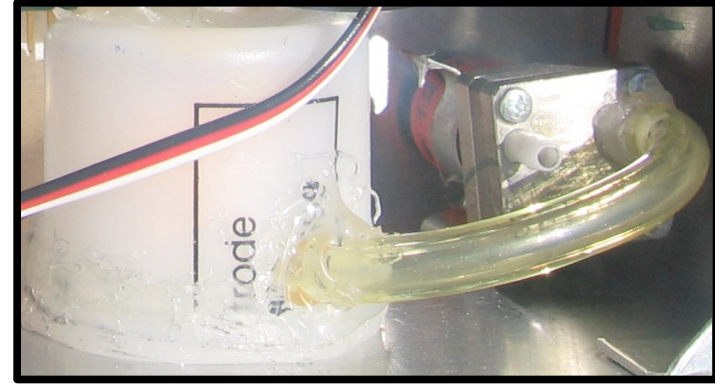
Senior Telemaster



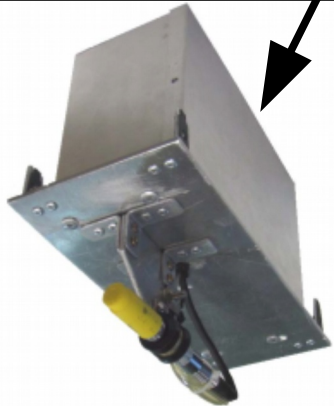
Telemaster Package Major Components



**Optical Particle Counter
(Metone 9012)**



**Counter Pump
(Clark 15317)**



**GPS Unit
(Trimble)**



**Pressure Sensor
(Amega PX40-15G5V)**



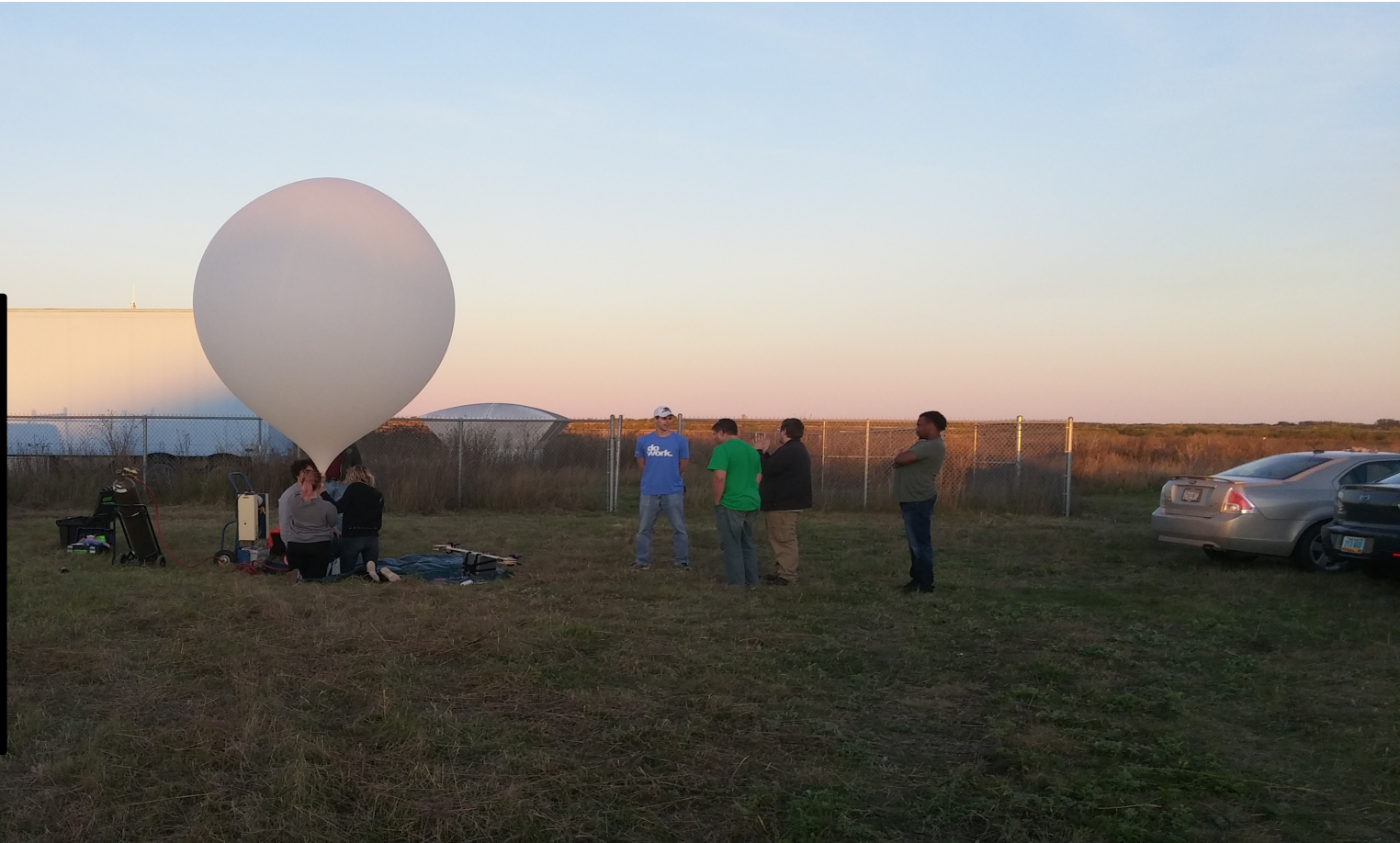
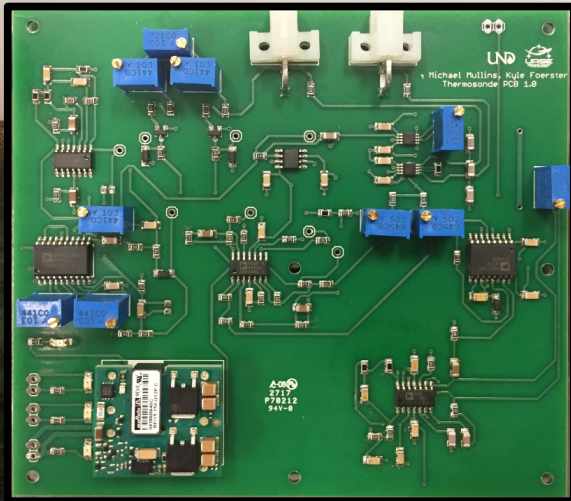
**Temperature/RH Sensor
(Vaisala HMP50)**



\$1,000 Airborne Platform

Thermosonde to Temperature Difference

Main Circuit Board

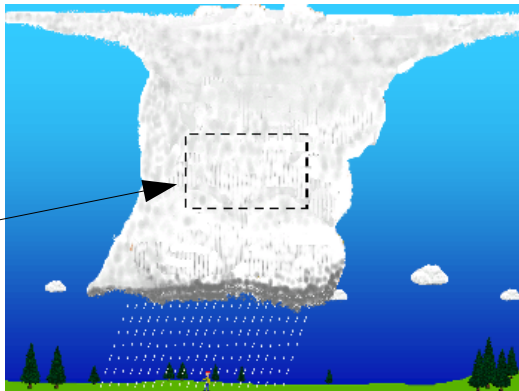


Scientific Objective

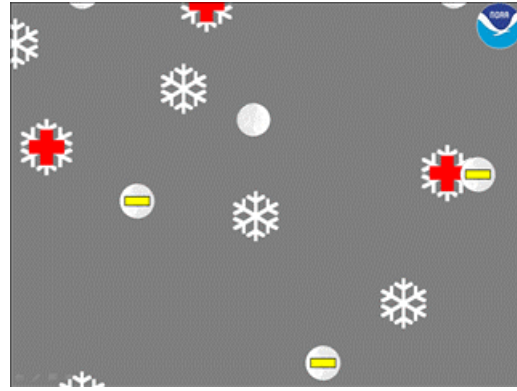
Charge Distribution on Hydrometers

- Determine the charge-size relation for hydrometers.
 - Charge-size relationship is essential to evaluate cloud electrification mechanisms.
 - Are charged cloud particles insignificant or dominant?

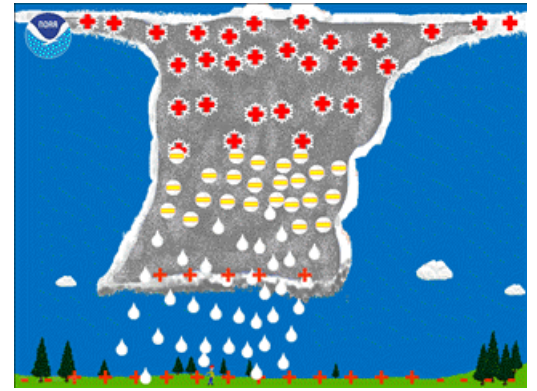
Charging
Area



Thunderstorm

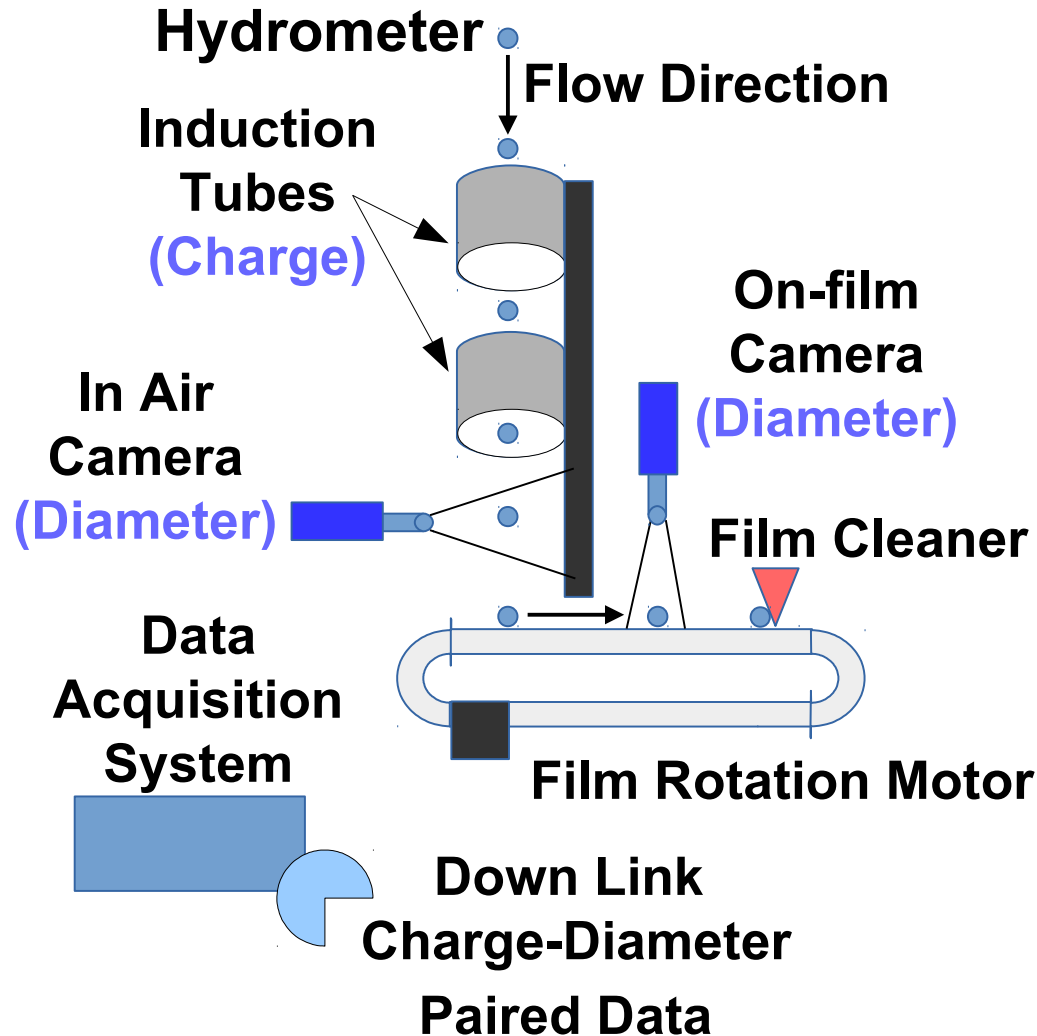


Ice Crystals Charging

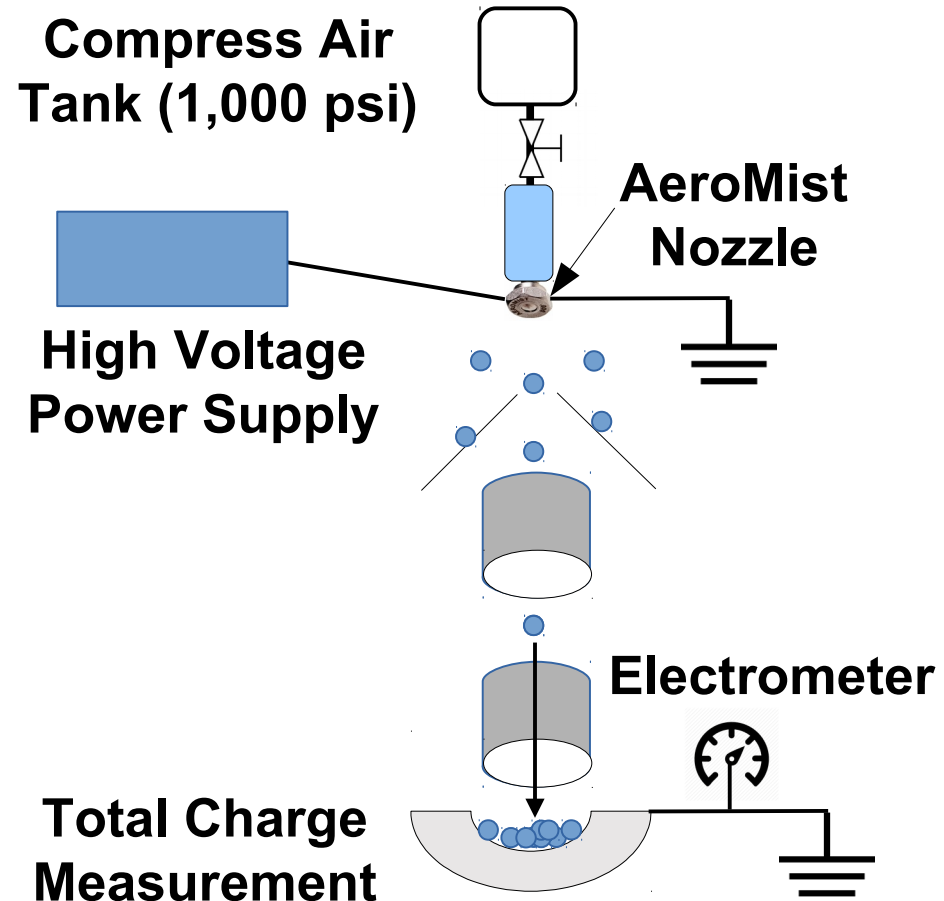


Charge Separation

Balloon Package

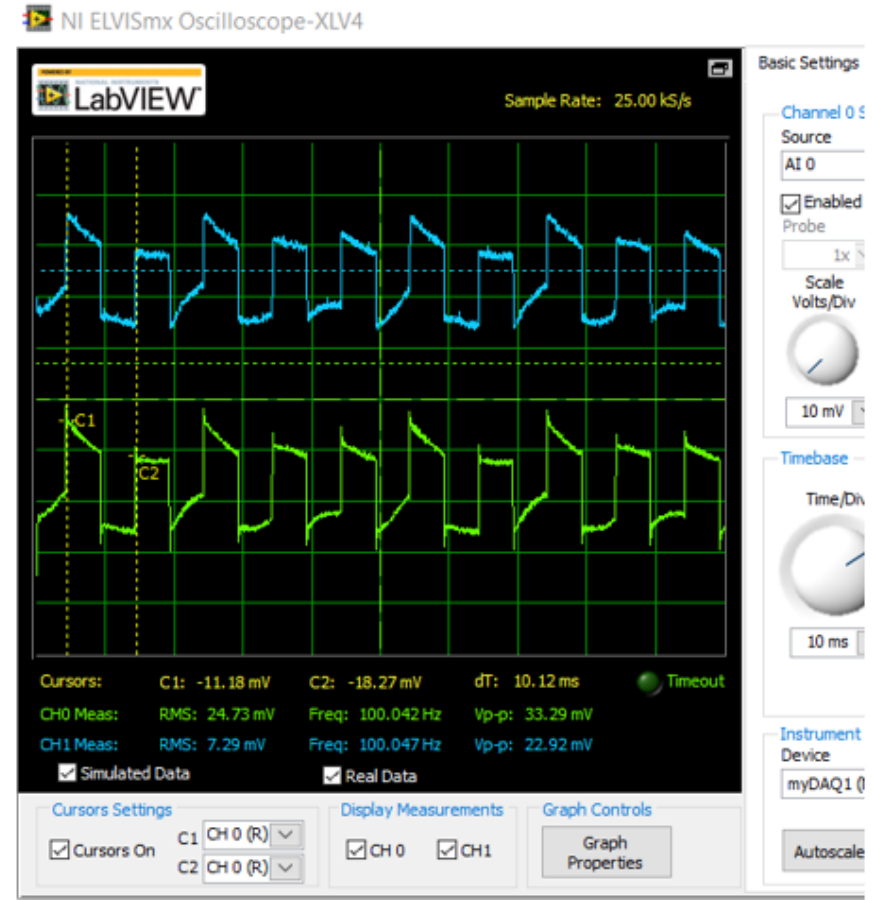
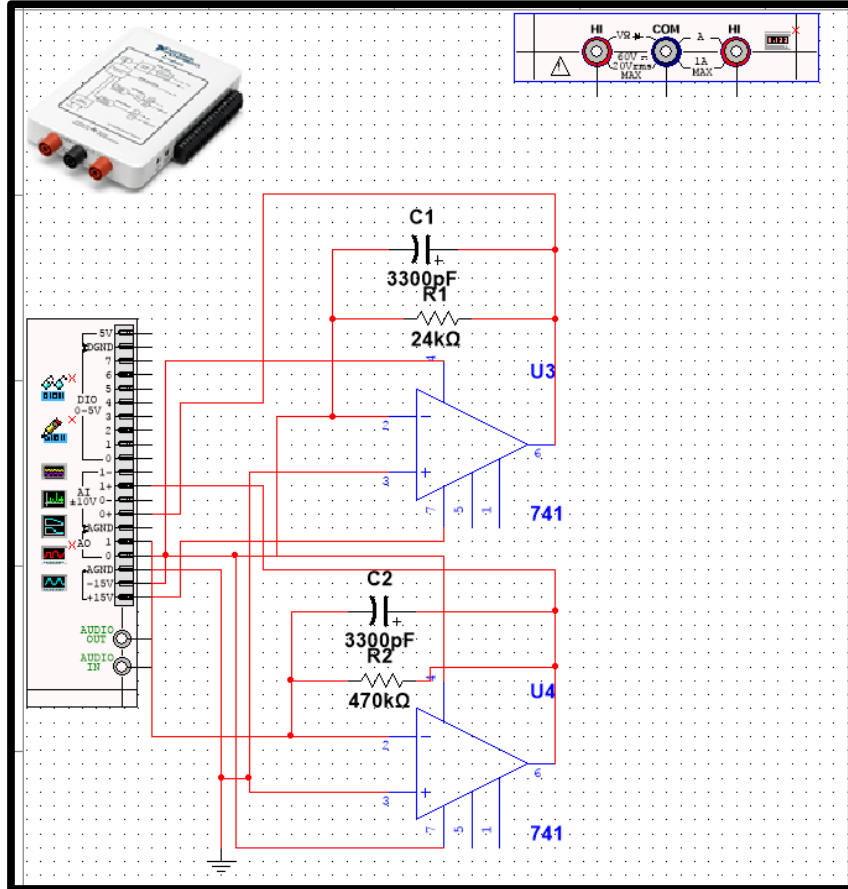


Droplet Charge Testing System



Hydrometer Change Probe Circuit Design

Ballah Sallie Forkpah, EE480 Senior Project



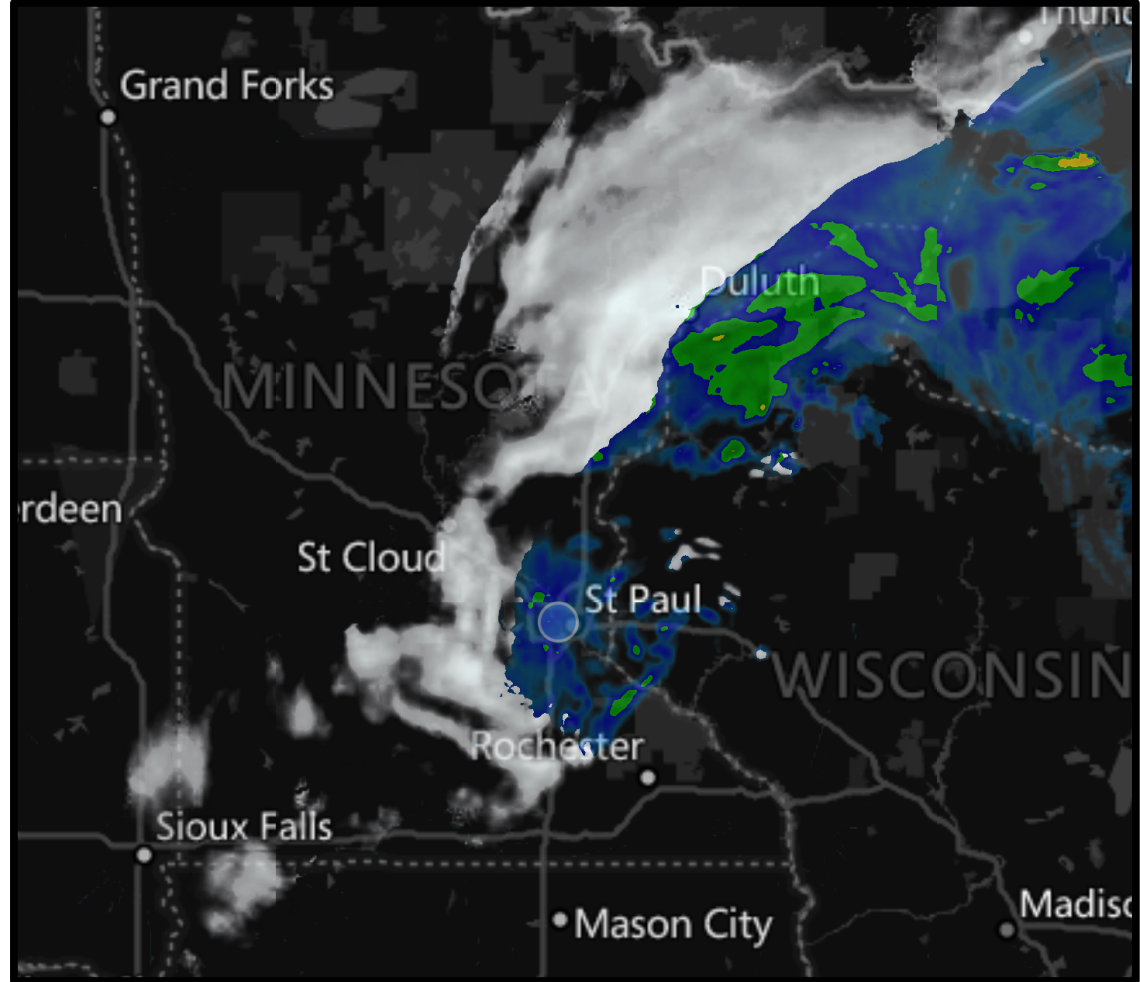
\$100 Airborne Platform



Future: Support?

- Write and Sell Books
- Educational Projects
 - Published Reports/Papers
- Scientific Research (Thunderstorms Ballooning)
 - Mentor Student (Universities)
 - Collaboration
 - Single Package, Several Launch Teams

Logistics



Launch into a Thunderstorm

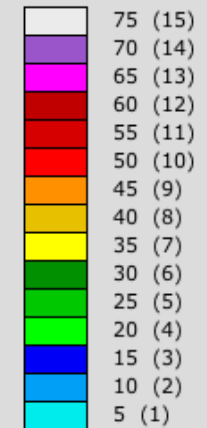
2012/08/07 - 18:03:05

2012/08/07 - 19:29:32

NEXRAD LEVEL-III
COMPOSITE REF. 124NM
KMVX - GRAND FORKS, ND
07/08/2012 19:29:32 GMT
LAT: 47/31/40 N
LON: 97/19/30 W
ELEV: 1080 FT
MODE/VCP: A / 21

MAX: 60 dBZ
BOT: 0 KFT
TOP: 0 KFT

Legend: dBZ (Category)



References

- Catterall, C., 2013: The hot air balloon book: build and launch kongming lanterns, solar tetrons, and more. Chicago Review Press, Chicago, Illinois, <http://public.eblib.com/choice/publicfullrecord.aspx?p=1249241>.
- Delene, D. J., Kurt Hibert, Jamie Ekness, Dennis Afseth, Ryan Richter, World Class Platform for Weather Modification and Atmospheric Research, Poster given at the 2017 Joint Western Snow Conference / Weather Modification Association Conference, 17 April 2017, Boise, Idaho
- Tilley, J. S., D. J. Delene, J. Nordlie, P. Tselios, D. Boura, K. Strang, R. Johnson, C. Taylor, B. Gunvalson, G. Sever and M. A. Askelson, 2011: On the use of low-cost unmanned aircraft platforms as part of a system to determine short-term electromagnetic propagation characteristics in the surface and boundary layers. Poster presented by Jeffery Tilley at the Second Aviation, Range and Aerospace Meteorology Special Symposium on Weather-Air Traffic Management Integration. American Meteorological Society Conference, Seattle, Washington, 23-27 January 2011.