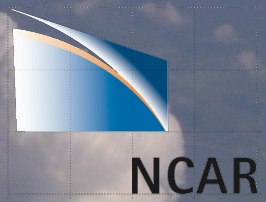
GV for ATTREX

Laura Pan and Bill Randel



Topics of Discussions

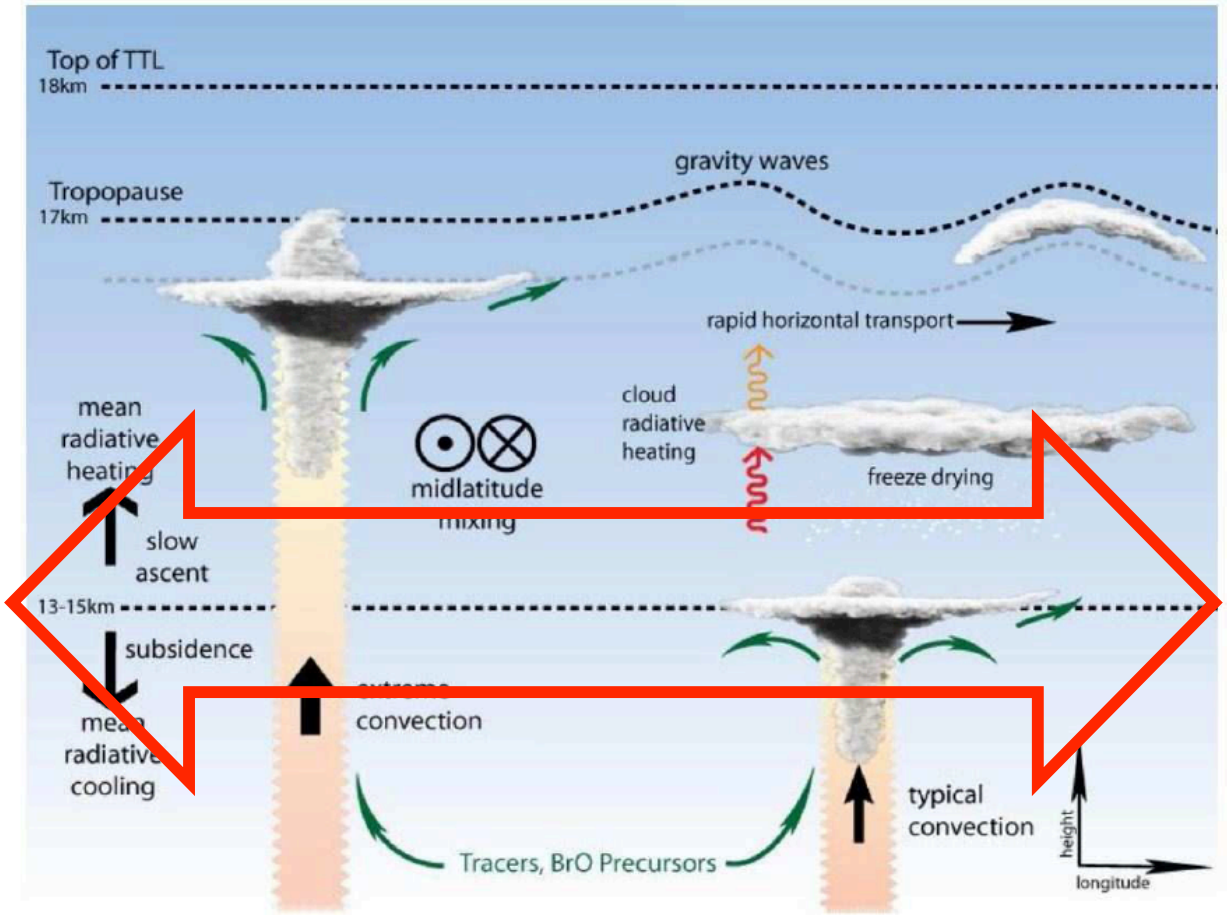
- GV Basic facts
- Role of GV in ATTREX Science
- GV instrument/payload capability
- Request process
- Strategies and plans

GV Basics

- Maximum Range: 6,055 nm (11,265 km)
- Maximum Cruise Altitude: ~~51,000 ft (15,545 m)~~ 14.5 km or 47kft
- Maximum Scientific Payload: 5,600 lbs (2,540 kg)
- Typical Zero Fuel Weight: 53,679 lbs (24,349 kg)
- Maximum Mission Fuel: 37,221 lbs (16,883 kg)
- Maximum Ramp Weight: 90,900 lbs (41,232 kg)
- Maximum Takeoff Weight: 90,500 lbs (41,051 kg)

Role of GV in ATTREX Science

Airborne Tropical TRopopause EXperiment (ATTREX)



Science issues:

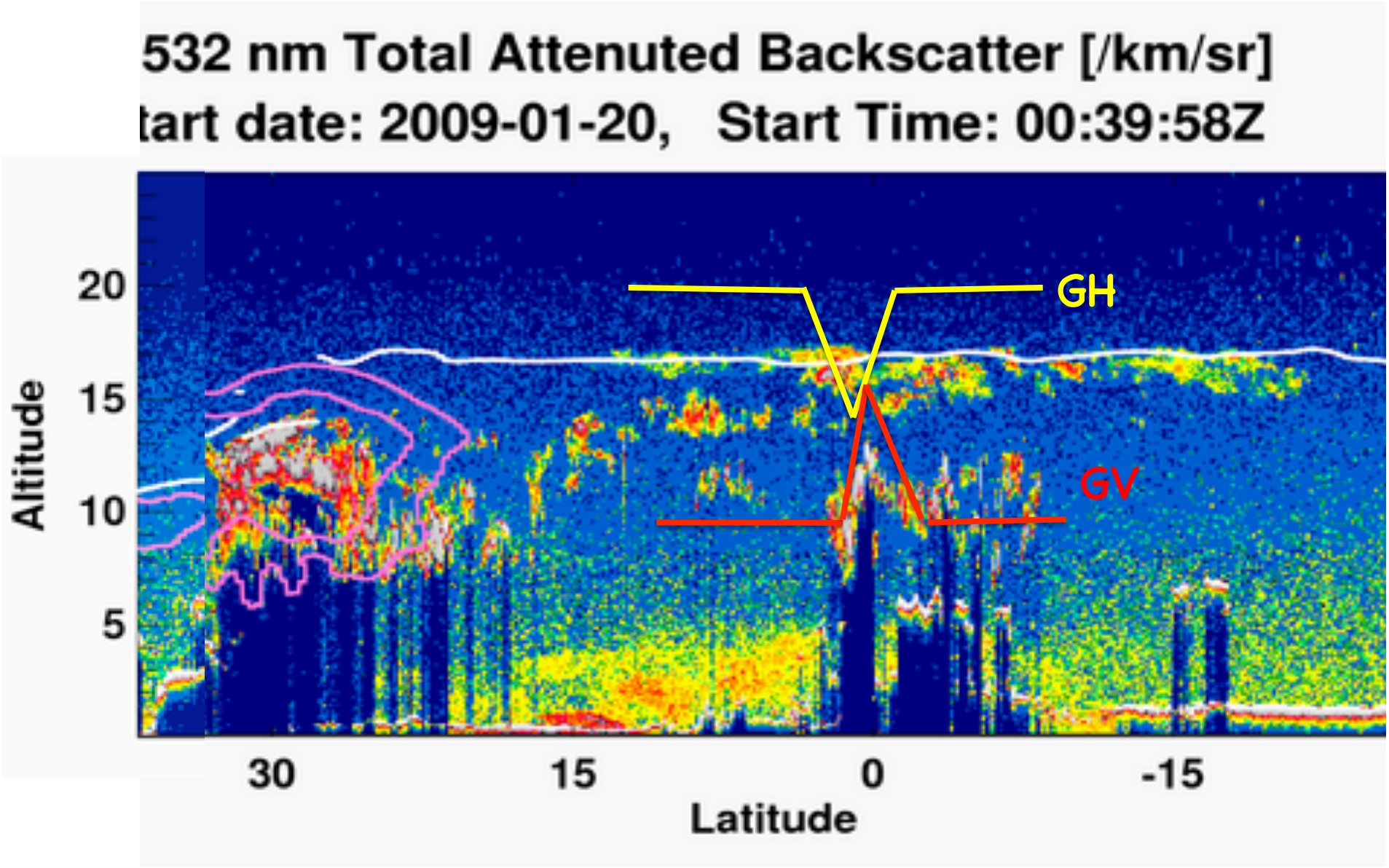
–thin cirrus, dehydration, radiative heating

–transport pathways

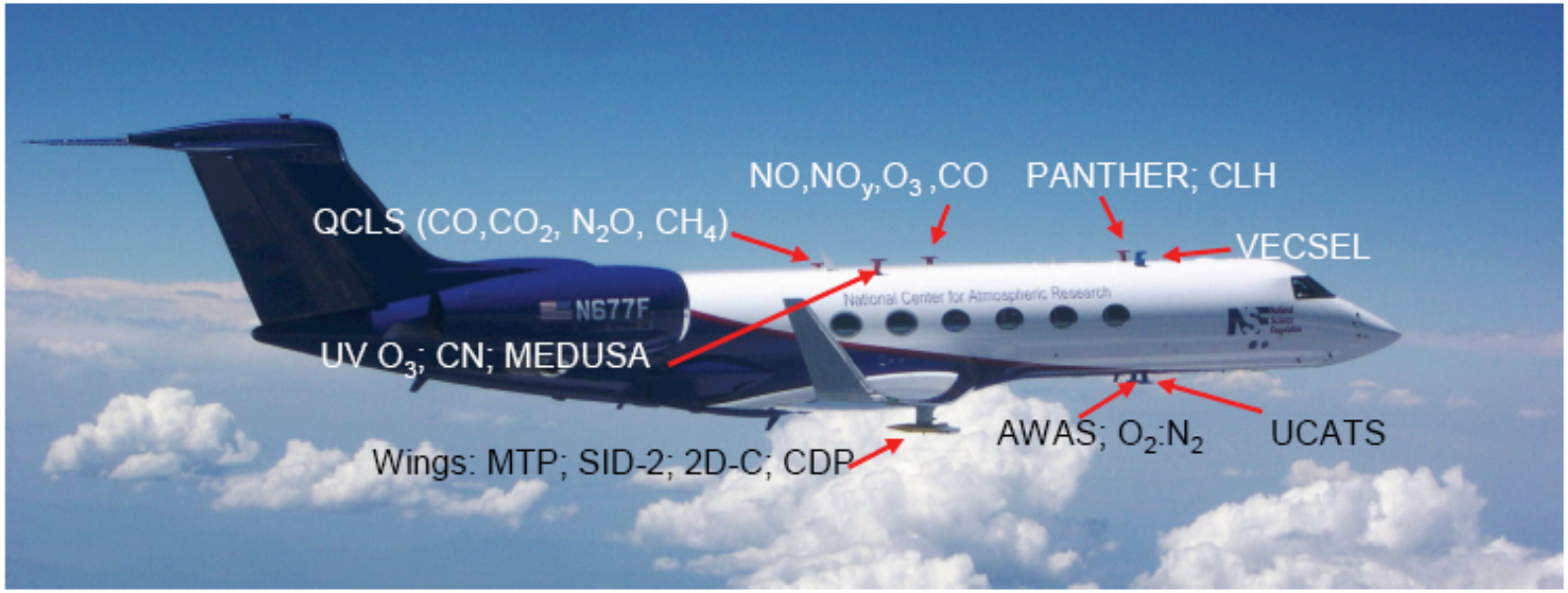
–thermal structure: waves, circulation

–chemistry: bromine budg

Level of main convective out flow

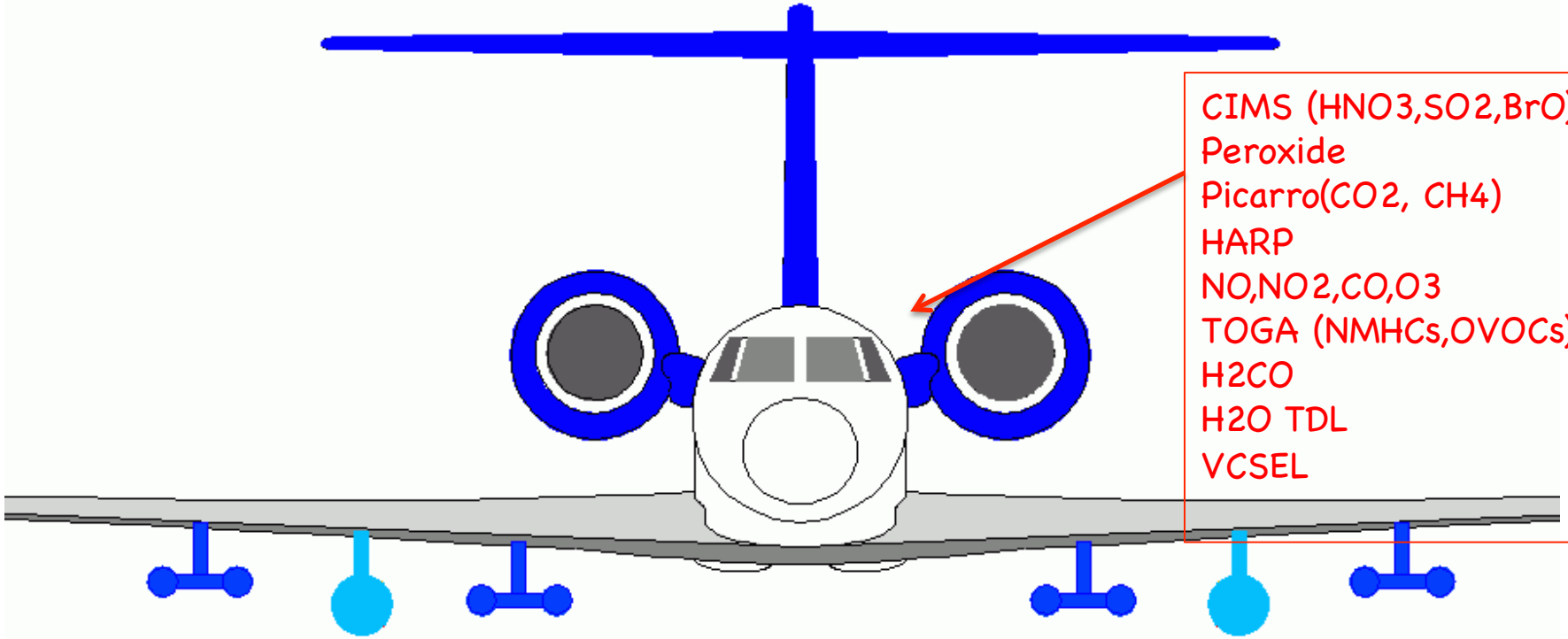

532 nm Total Attenuted Backscatter [/km/sr]
tart date: 2009-01-20, Start Time: 00:39:58Z
Altitude
20
15
10
5
GH
GV
30
15
0
-15
Latitude

GV Payload for START08



DC3/SEAC4RS

NSF/NCAR GV - N677F
HIAPER



CIMS (HNO3,SO2,BrO)
Peroxide
Picarro(CO2, CH4)
HARP
NO,NO2,CO,O3
TOGA (NMHCs,OVOCs)
H2CO
H2O TDL
VCSEL

SID2
CDP
Video
RICE

3V-CPI

2DC
UHSAS

CLH?

HOx

HCR or lead

GV Instruments I: Standard

a) GV Standard Instrumentation

		Data		Sensor
Description		**Rate(s)**	**Location**	**Quantity**
Aircraft Attitude (IRU)		1 / 25 sps	electronics bay	2
Aircraft Position & Ground Speed (IRU)		1 sps	electronics bay	2
Aircraft Position & Ground Speed (GPS)		1 sps	ads rack	2
3 - Dimensional Wind Fields		1 / 25 sps	radome	1 set
Ambient Temperature		1 sps	fuselage	2 - 4
Static Pressure		1 / 25 sps	fuselage	2
Dynamic Pressure		1 / 25 sps	radome	2
Cabin Temperature		1 sps	electronics bay	1
Cabin Pressure		1 sps	electronics bay	1
Dew Point Temperature		1 sps	radome	2
GPS Altitude (MSL)		1 sps	ads rack	2
Gas Dump Manifold Pressures		1 sps	wall tubes	2
Fwd Digital Video		1 sps	wing pylon	1
SATCOM		N/A	ads rack	
XCHAT		N/A	N/A	
Real Time Data Transfer to Ground		variable	N/A	

b) GV Instrumentation by Request

GV Instruments II: by request

Can be added to the research payload without added expense or extra deployment staffing.
Standard data processing with output included in primary data set.

	Data		Rack	Priority
Description	**Rate(s)**	**Location**	**Space**	**0 - 1 - 2**
Fast Ambient temperature	1 / 25 sps	radome	0	
CDP Cloud Droplet Probe #1	1 / 10 sps	wing pod canister	0	
CDP Cloud Droplet Probe #2	1 / 10 sps	wing pod canister	0	
OAP 2D Precipitation Probe (25 um)	Auto	wing pod canister	0	
OAP 2D Precipitation Probe (10 um)	Auto	wing pod canister	0	
OAP 2D Precipitation Probe (200 um)	Auto	wing pod canister	0	
UHSAS Aerosol Probe	Auto	wing pod canister	2-U	
CN Concentration - water	1 / 25 sps	cabin rack	1/4	
Differential GPS w/ ground station	1 / 10 sps	cabin rack	0	
Digital Video - alternate views	1 sps	partial aperture	0	
HIMIL Chemistry Inlet (std)	N / A	std aperture	0	
HIMIL Chemistry Inlet (heated)	N / A	std aperture	2-U	
VCSEL TDL Hygrometer	1 sps	std aperture	0	
King Probe Liquid Water Content	1 / 25 sps	wing hard point	0	
Icing Rate	1 sps	wing hard point	0	
One unit of rack space is equivalent to one standard GV rack				
There are three basic wing store configuration options:				
configuration 1: 6 pylons (12 cannisters)				
configuration 2: 2 pylons (4 cannisters)				
configuration 3: 6 pylons (8 cannisters + 2 large pods)				
Priority code: (0 = un-necessary; 1 = required; 2 = desired but optional)				

c) GV Instrumentation by Special Request

GV Instruments III: by special request

Adding these systems will require an added expense for expendables
Adding these systems will require additional support crew for a field deployment
Special data processing required by Science staff or outside participant

			Rack	Num	Priority
Description	**Inlet**	**Location**	**Space**	**Oper**	**0 – 1 - 2**
Counterflow Virtual Impactor (CVI)	special	cabin w/ aperture	2	1	
Airborne Whole Air Sampler	simple	cabin w/ aperture	1	0 / 1	
Fast Ozone (CARI)	simple	cabin w/ aperture	1	1	
Carbon Monoxide (CARI)	simple	cabin w/ aperture	1	0	
QCLS	HIMIL	cabin w/ aperture	1	0 / 1	
NO-NOY (CARI)	special	cabin w/ aperture	1	1	
Small Ice Detector - II (SID-2)	N/A	wing pod canister	1/4	0	
Microwave Temperature Profiler	N/A	wing pod canister	1/4	0	
TDL Hygrometer (CARI)	N/A	std aperture	0	0	
RDMA	simple	cabin w/ aperture	1	1	
Wet/Dry Nephelometers	simple	cabin w/ aperture	1/4	0	
VCSEL TDL Hygrometer	N/A	std aperture	0	0	
HARP Radiometer Package	N/A	tail & special aper	1	1	
Airborne Oxygen Analyzer (AO2)	HIMIL	cabin w/ aperture	1	1	
Medusa Flask Sampler	HIMIL	cabin w/ aperture	1	1	
Mission Coordinator Station	N/A	cabin	1	0 / 1	
HSRL Lidar	N/A	cabin / Optic Win	4	1	
GISMOS	N/A	cabin w/ windows	1	0 / 1	
One unit of rack space is equivalent to one standard GV rack					
There are three basic wing store configuration options:					
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configuration 3: 6 pylons (8 cannisters + 2 large pods)					
Priority code: (0 = un-necessary; 1 = required; 2 = desired but optional)					

GV request - philosophy

Science – jump over a high bar

Desire a Broad community

Fit in the low budget in all pools involved

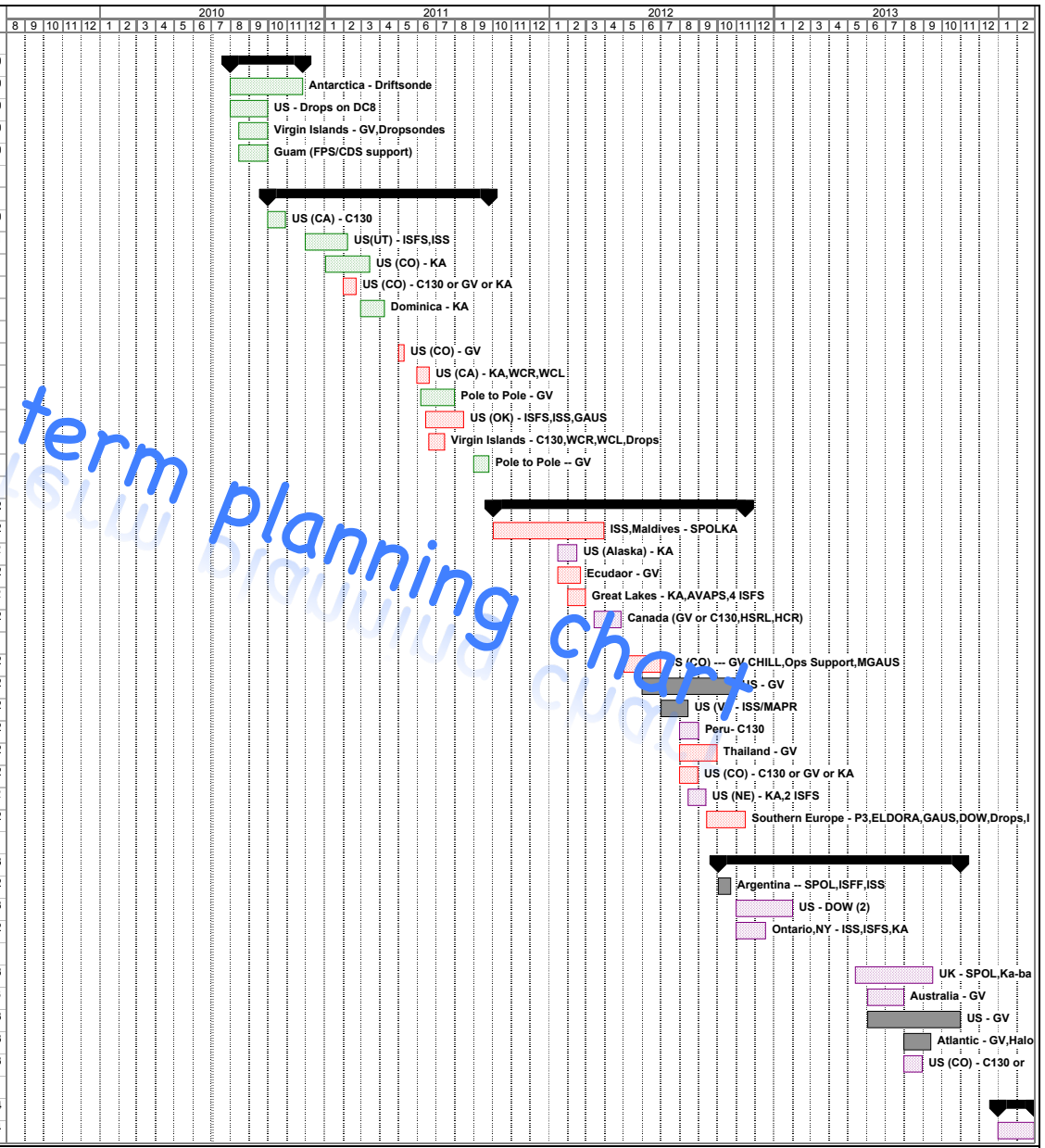
1. NSF/OFAP deployment pool
2. NSF program
3. NCAR budget for campaign

GV request - process

- Letter of Intent
- Proposal (NSF)
  - campaign - 2yr (for general indication of support based on science)
  - If a large project (over 1M or multi-agency) SPO/EDO
  - Also estimate cost of science (NSF program pool for university participants + NCAR fund for NCAR people)
- Facility request (OFAP)
  - To evaluate scientific quality and the design of the exp.
  - To evaluate feasibility
  - To calculate cost (deployment pool)

EOL Long term Planning chart

ID	Task Name	Start	Finish
1			
2	**FY2010**	**Sun 8/1/10**	**Fri 11/26/10**
3	CONCORDIASI (Cohn)	Sun 8/1/10	Fri 11/26/10
4	GRIP (Halverson)	Sun 8/1/10	Thu 9/30/10
5	PREDICT (Davis)	Sun 8/15/10	Thu 9/30/10
6	ITOP (Harr)	Sun 8/15/10	Thu 9/30/10
7			
8	**FY2011**	**Fri 10/1/10**	**Sun 9/25/11**
9	WAMO (Jaffe)	Fri 10/1/10	Fri 10/29/10
10	PCAPS (Whiteman)	Wed 12/1/10	Mon 2/7/11
11	CAMPS (Avallone)	Mon 1/3/11	Tue 3/15/11
12	IDEAS IV (Stith)	Tue 2/1/11	Mon 2/21/11
13	DOMEX (Smith)	Tue 3/1/11	Fri 4/8/11
14			
15	DC3 Instrumentation Test (GV)	Mon 5/2/11	Tue 5/10/11
16	PREAMBLE (Parish)	Tue 6/1/11	Mon 6/20/11
17	HIPPO Phase-4 (Wofsy)	Tue 6/7/11	Sun 7/31/11
18	NABLU (Klein)	Wed 6/15/11	Mon 7/15/11
19	ICE-T (DeMott, Heymsfield)	Mon 6/20/11	Fri 7/15/11
20	HIPPO Phase-5 (Wofsy)	Thu 9/1/11	Sun 9/25/11
21			
22	**FY2012**	**Mon 10/3/11**	**Thu 11/15/12**
23	DYNAMO (Zhang et al)	Mon 10/3/11	Fri 3/30/12
24	PolarNOx (Simpson)	Mon 1/16/12	Wed 2/15/12
25	TORERO 2012 (Volkamer)	Mon 1/16/12	Tue 2/21/12
26	GLICAF II (Laird)	Wed 2/1/12	Wed 2/29/12
27	AICETEC (Boybeyi/Gultepe)	Thu 3/15/12	Fri 4/27/12
28			
29	DC3 (Cantrell & Barth)	Wed 5/2/12	Sat 6/30/12
30	FOREST 3-D (NASA)	Fri 6/1/12	Tue 10/30/12
31	Shenandoah	Mon 7/2/12	Tue 8/14/12
32	DYCOMS III (Faloona)	Wed 8/1/12	Fri 8/31/12
33	PACE 3 (NASA)	Wed 8/1/12	Sun 9/30/12
34	IDEAS IV (Stith)	Wed 8/1/12	Thu 8/30/12
35	LUCE (Parish)	Wed 8/15/12	Wed 9/12/12
36	HYMEX (Friedrich)	Fri 9/14/12	Thu 11/15/12
37			
38	**FY2013**	**Wed 10/3/12**	**Thu 10/31/13**
39	La Plata Basin (Berbery)	Wed 10/3/12	Tue 10/23/12
40	LIAP LES (Steiger)	Thu 11/1/12	Thu 1/31/13
41	OWLES (Clark)	Thu 11/1/12	Tue 12/18/12
42			
43	UK Radar Project (Weckwerth)	Tue 5/14/13	Mon 9/16/13
44	ATTREX (Randel)	Mon 6/3/13	Wed 7/31/13
45	FOREST 3-D (NASA)	Mon 6/3/13	Thu 10/31/13
46	T-NADWEX (Harr)	Thu 8/1/13	Fri 9/13/13
47	IDEAS IV (Stith)	Thu 8/1/13	Fri 8/30/13
48			
49	**FY2014**	**Wed 1/1/14**	**Fri 2/28/14**
50	ATTREX	Wed 1/1/14	Fri 2/28/14



Project: LongTermSchedule
Date: Fri 7/2/10

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

38		***FY2013***	**Wed 10/3/12**	**Thu 10/31/13**
39		**La Plata Basin (Berbery)**	Wed 10/3/12	Tue 10/23/12
40		**LIAP LES (Steiger)**	Thu 11/1/12	Thu 1/31/13
41		**OWLES (Clark)**	Thu 11/1/12	Tue 12/18/12
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43		**UK Radar Project (Weckwerth)**	Tue 5/14/13	Mon 9/16/13
44		**ATTREX (Randel)**	Mon 6/3/13	Wed 7/31/13
45		**FOREST 3-D (NASA)**	Mon 6/3/13	Thu 10/31/13
46		**T-NADWEX (Harr)**	Thu 8/1/13	Fri 9/13/13
47		**IDEAS IV (Stith)**	Thu 8/1/13	Fri 8/30/13
48				
49		***FY2014***	**Wed 1/1/14**	**Fri 2/28/14**
50		**ATTREX**	Wed 1/1/14	Fri 2/28/14

Strategies and Plans

possibility -> probability -> reality

- Identify key science relevance
  - What is the broader impact to the science and community?
- Evaluate the factors involved:
  - Potential strength: Partnership with GH
  - Potential issues: too soon after DC3/SEAC4RS, funding pot is probably not recovered
- Initiate the conversation with NSF
- Carefully form a team/community
  - Strong science and sensible budgetary impact
- Start looking into payload
  - Iterate to balance chemistry and microphysics
  - Relatively compact payload, considerations of instruments' overall cost effectiveness

4.2 Crew Duty Limitations

Crew duty limitations apply not only to RAF staff (flight crew, maintenance and technician personnel, etc.) but also to any other persons flying on board NSF/NCAR aircraft. Research personnel participating on flights should abide by the duty limitations specified. These limitations have been established to prevent crew fatigue from becoming a safety concern during flight operations. Thus, specific project flight schedules may necessitate additional staffing in order to meet the crew duty limitation requirements specified. The crew duty limits for the GV are as follows:

Any 24 hour period	10 flight hours
Any consecutive 7 days	35 flight hours
Any 30 day period	110 flight hours
Consecutive working days	6 days
Crew duty period	14 hours
Minimum crew rest period between consecutive flights	12 hours
Switching from day to night or night to day flight operations	36 hours notice to all flight crew members

Table 4.1. GV crew duty limitations.

Investigators are advised that the above limits may – at the pilot's discretion – be extended for aircraft ferry purposes.