Chesapeake Lighthouse and Aircraft Measurements for Satellites
“CLAMS”

July 10 – Aug 2, 2001

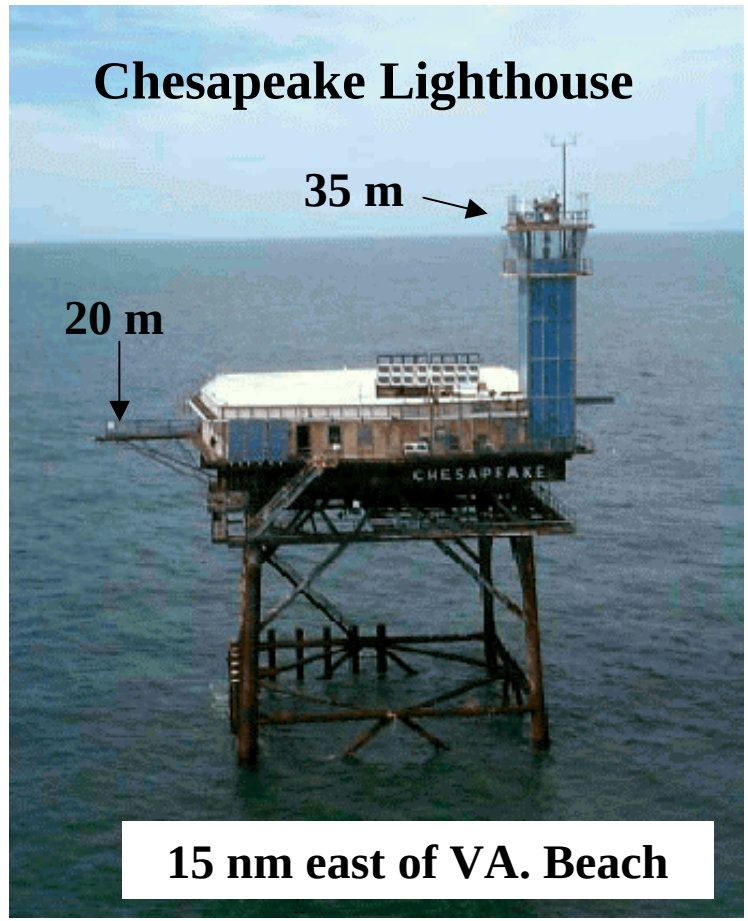
W. L. Smith Jr.
Lead Mission Scientist

G. C. Purgold
Flight Operations Manager

CERES Ocean Validation Experiment (COVE)

A stable sea platform providing continuous, long term measurements of

- Upwelling and downwelling spectral and broadband solar and thermal radiation
- Aerosol properties
- Wind and waves



CLAMS – A Satellite Validation Experiment

EOS TERRA

Key Instruments:

1. Clouds and the Earth's Radiant Energy System (CERES) - LaRC
   - *TOA, surface and atmospheric heat budget*
2. Multi-angle Imaging Spectro-Radiometer (MISR) – JPL
   - *Cloud, aerosol, surface properties*
3. Moderate Resolution Imaging Spectroradiometer (MODIS) - GSFC
   - *Cloud, aerosol, surface properties*

NOAA Polar Orbiter(s)

Advanced Very High Resolution Radiometer (AVHRR) - GACP

- Aerosol Properties

CLAMS PRIMARY OBJECTIVES

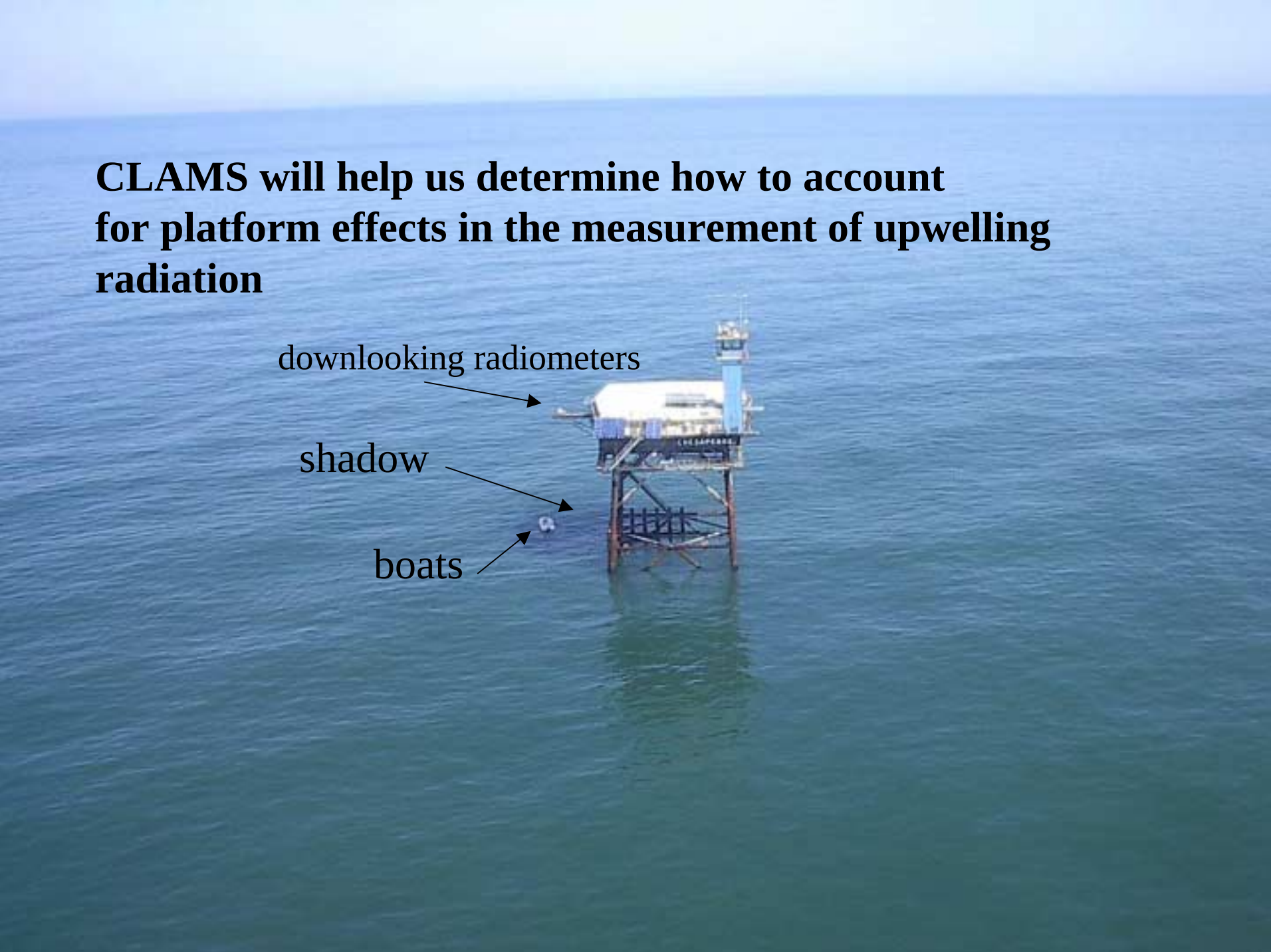
Validate satellite retrievals of

- Aerosols
- Radiative flux profiles
- Temperature, water vapor profiles
- Sea surface temperature

Improve knowledge of ocean optics

Improve interpretation of COVE data

CLAMS will help us determine how to account for platform effects in the measurement of upwelling radiation




tidal wake

Strategy

Conduct an intense AIRCRAFT measurement campaign from Wallops Flight Facility targeting COVE and nearby ocean targets in primarily clear conditions over a 3 week period in July.

Deploy from Wallops

- ER-2 (32 hours)
- UW CV-580 (40 hours)
- Cessna 210 (40 hours)
- Proteus (40 hours)

Deploy from LaRC

- OV-10 (25 hours)

Deploy from NN/Wmsbg Intl'

- Lear Jet (10 hours)

Underfly TERRA (~Noon EDT), NOAA-AVHRR (~1430 EDT) and the ER-2 (an airborne version of TERRA at 65kft) at other times

(a) EOS-TERRA SATELLITE OVERPASS DATES & LOCAL TIMES FOR THE CHESAPEAKE LIGHTHOUSE

Last Predict 5-27-01

SITE = COVE	JULY 2001																						AUG 2001	
Lat= 36.9 Lon=284.29	**10**	11	**12**	13	14	15	16	**17**	18	**19**	20	**21**	22	23	24	25	**26**	27	**28**	29	30	31	1	**2**
Overpass Time **EDT**	**1207**		**1155**	1238	1143	1226	1131	**1214**	1119	**1201**	1244	**1149**	1232	1137	1220	1124	**1207**		**1155**	1238	1143	1226	1131	**1213**
Distance to SITE (km)	**95**		**173**	761	441	503	707	**245**	979	**44**	902	**292**	643	561	382	831	**120**		**152**	786	416	528	683	**267**
Direction from COVE	**W**		**E**	W	E	W	E	**W**	E	**W**	W	**E**	W	E	W	E	**W**		**E**	W	E	W	E	**W**
Viewing Zenith Angle (deg)	**8**		**15**	52	35	39	50	**21**	60	**2**	57	**25**	47	42	31	55	**11**		**13**	53	34	40	49	**23**
Best Days	**X**									**X**							**X**							
Good Days			**X**					**X**				**X**							**X**					**X**

(b) NOAA-16 (AVHRR) SATELLITE OVERPASS DATES & LOCAL TIMES FOR THE CHESAPEAKE LIGHTHOUSE

Last Predict 6-06-01

SITE = COVE	JULY 2001																						AUG 2001
Lat= 36.9 Lon=284.29	10	11	12	13	14	15	**16**	**17**	**18**	19	20	21	22	23	24	25	**26**	**27**	**28**	29	30	31	1	**2**
Overpass Time **EDT**	1429	1419	1409	1358	1348	1518	**1508**	**1457**	**1447**	1436	1426	1416	1405	1355	1345	1515	**1504**	**1454**	**1444**	1433	1423	1413	1402	**1352**
Distance to SITE (km)	36	262	489	711	934	1044	**811**	**578**	**346**	118	121	340	568	788	1011	962	**729**	**499**	**267**	37	199	418	644	**865**
Direction from COVE	E	E	E	E	E	W	**W**	**W**	**W**	W	E	E	E	E	E	W	**W**	**W**	**W**	W	E	E	E	**E**
Viewing Zenith Angle (deg)	3	19	33	45	53	57	**49**	**38**	**25**	9	8	24	38	48	56	54	**45**	**34**	**19**	3	14	29	41	**51**
Best GACP Days							**X**	**X**	**X**								**X**	**X**	**X**					

Participating Organizations and Agencies

Analytical Services and Materials, Inc. (AS&M)
Columbia University
Flight International, Inc.
Joint Center for Earth Systems Technology (JCET)
McMillen Enterprises, Inc.
NASA Jet Propulsion Laboratory (JPL)
NASA AMES Research Center (ARC)
NASA Goddard Institute for Space Studies (GISS)
NASA Goddard Space Flight Center (GSFC)
NASA Langley Research Center (LaRC)
Old Dominion University (ODU)
Science Applications International Corporation (SAIC)
Scaled Composites, LLC.
Science Systems and Applications, Inc. (SSAI)
University of Maryland-Baltimore Campus (UMBC)
University of Washington (U. of Wash.)
University of Wisconsin (UW)
Wallops Flight Facility (WFF)

CLAMS OPERATIONS MANAGEMENT PERSONNEL

5/30/2001

Position	Contact	Communication Links		
		Phone	Radio	Mail Stop
LEAD MISSION SCIENTIST Manager	Bill Smith Jr. CLAMS Mission Manager W.L.Smith@larc.nasa.gov	757-864-8577	TBD	MS - 420
FLIGHT OPERATIONS Manager	Carl Purgold CLAMS Flight Operations Manager g.c.purgold@larc.nasa.gov	757-827-4685	TBD	MS - 927
SUPPORT Manager	Roy Chesson CLAMS Support Manager r.w.chesson@larc.nasa.gov	757-827-4686	TBD	MS - 927
WALLOPS RANGE SUPPORT Manager	Theodore Bugtong Wallops-CLAMS Range Support Manager bugtong@pop800.gsfc.nasa.gov	757-824-1604	TBD	MS - 840.0
WALLOPS TEST DIRECTOR	Jay F. Brown Wallops Test Director jfbrown@pop800.gsfc.nasa.gov	757-824-1094	TBD	MS - 840.0
COVE SITE Scientist CHESAPEAKE LIGHTHOUSE	Ken Rutledge COVE Site Manager c.k.rutledge@larc.nasa.gov	Office 757-827-4643 COVE SITE Cellular 1-757-871-7844	COVE SITE PAGER 888-934-0573	MS - 936

TEAM/PLATFORM MISSION MANAGEMENT FOR CLAMS

TEAM/PLATFORM	NAME	E-MAIL	PHONE
CERES/GACP Mission Scientist	Tom Charlock (NASA LaRC)	t.p.charlock@larc.nasa.gov	757-864-5687
MISR Mission Scientist	Ralph Kahn (NASA JPL)	Ralph.Kahn@jpl.nasa.gov	818-354-9024
MODIS Co-Mission Scientist	J. Vanderlei Martins (JCET/UMBC)	martins@climate.gsfc.nasa.gov	301-614-5818
MODIS Co-Mission Scientist	Lorraine Remer (NASA GSFC)	remer@climate.gsfc.nasa.gov	301-614-6194
CV-580 Mission Scientist	Peter Hobbs (U. of Washington)	phobbs@atmos.washington.edu	206-543-6027
ER-2 Mission Manager	Jeannette Van den bosch (NASA Dryden)	jeannette.vandenbosch@dfrc.nasa.gov	661-276-2273
OV-10 Mission Scientist	Bill Smith Jr. (NASA LaRC)	w.l.smith@larc.nasa.gov	757-864-8577
PROTEUS Mission Scientist	Bill Smith Sr. (NASA LaRC)	bill.l.smith@larc.nasa.gov	757-864-5984
CESSNA Mission Scientist	Michael Mishchenko (NASA GISS)	crmim@stokes.giss.nasa.gov	212-678-5590
LEAR Mission Scientist	Michael Pitts (NASA LaRC)	m.c.pitts@larc.nasa.gov	757-864-2693

ER-2 Payload

Operating altitude
• 65 kft

- MAS *(MODIS Airborne Simulator)*
  50 band multispectral scanner; 50 m res
- AirMISR - *Multi-angle Imaging Spectroradiometer*
  4 color (446, 558, 672, 867 nm) pushbroom imager; 20m res
- CPL - *Cloud Physics Lidar*
- AVIRIS – *Advanced Visible and Infrared Imaging Spectrometer*
  224 band (400-2500nm) scanner; 20 m res
- S-HIS – *Scanning High Resolution Interferometer Sounder*
  3.3-18 μm (2km res)

Proteus/NAST Participation in CLAMS

Operating Altitude:
100 to 55000 ft

Payload: NAST-I (LaRC)
NAST-M (MIT)
FIRSC (LaRC)

University of Washington Convair 580

Operating Altitude
100ft – 25kft

Duration: ~7hours

In-situ aerosol profiler (AOT, g, ω_0)

- aerosol size spectrum (DMPS, PCASP-100X)
- scattering coefs (various nepholometers)
- absorption coefs (PSAP)
- humidification factor (Scanning humidograph)
- filter measurements (carbonaceous and ionic species)

NASA GSFC, AMES personnel/equipment on board

University of Washington Convair 580

Radiation

- BRDF (NASA GSFC Cloud Abs. Radiometer)
- Broadband LW & SW
- Skin Temperature
- Sunphotometry (NASA AMES AATS-14)

NASA Langley OV-10

Operating Altitude
100ft – 10kft

Duration: ~2hours

2-3 flights/day

C-FAR : CERES Fixed-wing Airborne Radiometer

Up and Downlooking Radiometers

- ASD Fieldspec (350-2200 nm; 10nm res) spectral flux
- Eppley broadband LW & SW fluxes

Operating under LaRC FSR reissued 4-11-01 (exp. 3-13-02)

CLAMS requirements:
- 5 nmi extension to offshore limit
- Extended operations at 100-500 ft
- Participation in multi-aircraft mission

Cessna 210 with Research Scanning Polarimeter

P.I.'s B. Cairns (Columbia U.), M. Mishchenko (NASA GISS)

http://www.giss.nasa.gov./data/rsp_air/

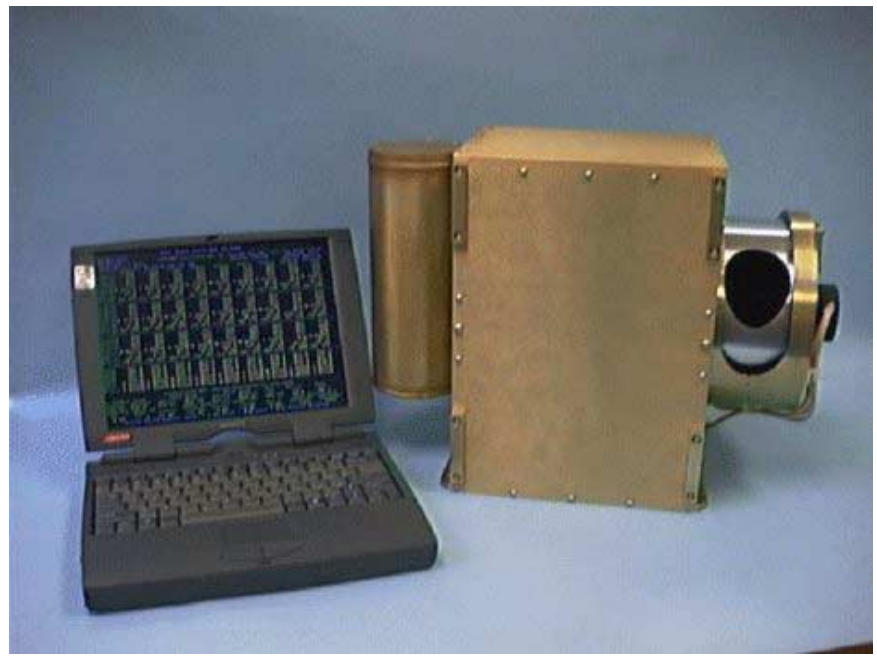
9 bands : 410 (30), 470 (20), 550 (20), 670 (20), 865 (20) and 960 (20), 1590 (60), 1880 (90), and 2250 (120) nm.

•Wide angular coverage (+/-60° from nadir) allows the identification of an aerosol model
• Polarization features in scattered radiation are less affected by multiple scattering than intensity features
• Polarization is a relative measurement which allows for simple and extremely accurate calibration (~0.2%)

Flight altitudes for CLAMS

•12kft for aerosols
•300-500ft to characterize surface reflectances

No NASA equipment or personnel on board



Flight International, Inc. LEAR 25C
Newport News, VA.

Langley Airborne A-Band Spectrometer (LAABS) For Aerosols

dimensions: 34.5 x 9.7 x 16.9

weight: 100 lbs.

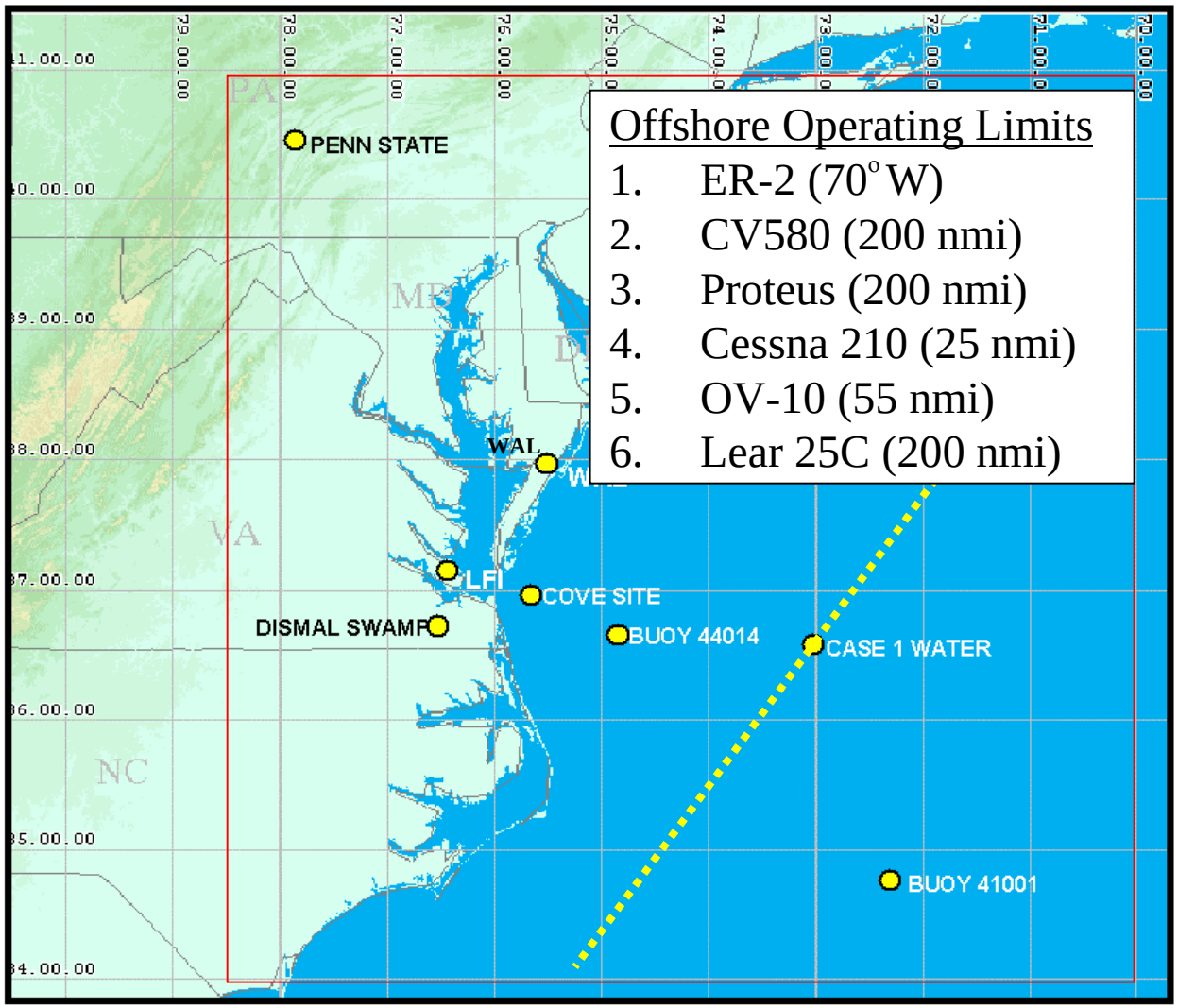
- Flight International, Inc. Lear 25C (Tail No. N54FN) meets all flight requirements
- Aircraft previously modified to accommodate nadir-viewing instrumentation (FAA-approved Supplemental Certificate STC# SA3622WE)
- No new aircraft modifications required for LAABS flight testing
- FII will design and build mechanical instrument/aircraft mounting interface and electronics rack
- All racks will be FAA DER approved
- LAABS instrument installation will be approved by FII Engineering, installed by FII technicians, and inspected by FII Quality Assurance personnel
- Ground Safety of Flight checklist will be accomplished before flight testing

CLAMS PARTICIPATING AIRCRAFT CERTIFICATIONS

	ER-2	OV-10	CONVAIR-580	PROTEUS	CESSNA 210	LEAR 25C
AIRCRAFT OWNER	NASA DRYDEN	NASA LANGLEY	UNIV OF WASHINGTON	SCALED COMPOSITES	I.K. CURTIS SERVICES	FLIGHT INTERNATIONAL
REPRESENTATIVE	Jeannette van den Bosch	Eric Roback	Bob Eatwell Ken McMillen	Allen Royal	Willy Mattoon	Mike Pitts
AIRCRAFT TAIL NO.	806	N524NA	N3UW	N281PR	N7568N	N54FN
AIRCRAFT CALL SIGN	NASA 806	NASA 524	Husky One	SCAT21	N7568N	FNT 254
OPERATING CERTIFICATE	US Government	Public Use	Public Use	Experimental Aircraft: Research and Development and Exhibition	FAR 23 Normal	RESTRICTED - Aerial Survey Modifications (Glass Window) per STC SA36622WE.
ORIGINAL CERTIFICATE DATE, or CURRENT STATUS	Current	Current	Current	5/14/1998	3/6/1979	11-03-95
WHO REVIEWS AIRCRAFT INSTALLS and MODS	NASA/LMLM	NASA QA	CER on Call	Project Engineer, Pilot in Command, and A&P Mechanic	A&P rated pilot	Flight Int'l QA
COLLISION AVOIDANCE SYSTEM or TRANSPONDER CAPABLE?	Yes	Yes Transponder No TCAS	Yes Transponder No TCAS,	Yes	Mode C transponder and TCAD	Transponder
SURVIVAL EQUIP ON BOARD FOR OVER OCEAN FLIGHTS	Yes	Yes	AB Maritime	Individual Life Rafts, EPIRBs, Flares, Die Markers	PFD's	Raft & Vest

CLAMS 2001 MISSION

CLAMS OPERATIONS AREA WITH MAJOR CLAMS NAVAIDS



Flight Patterns

- A-B Legs
- BRDF
- Vertical Spirals
- Crop-duster
- Descending Step

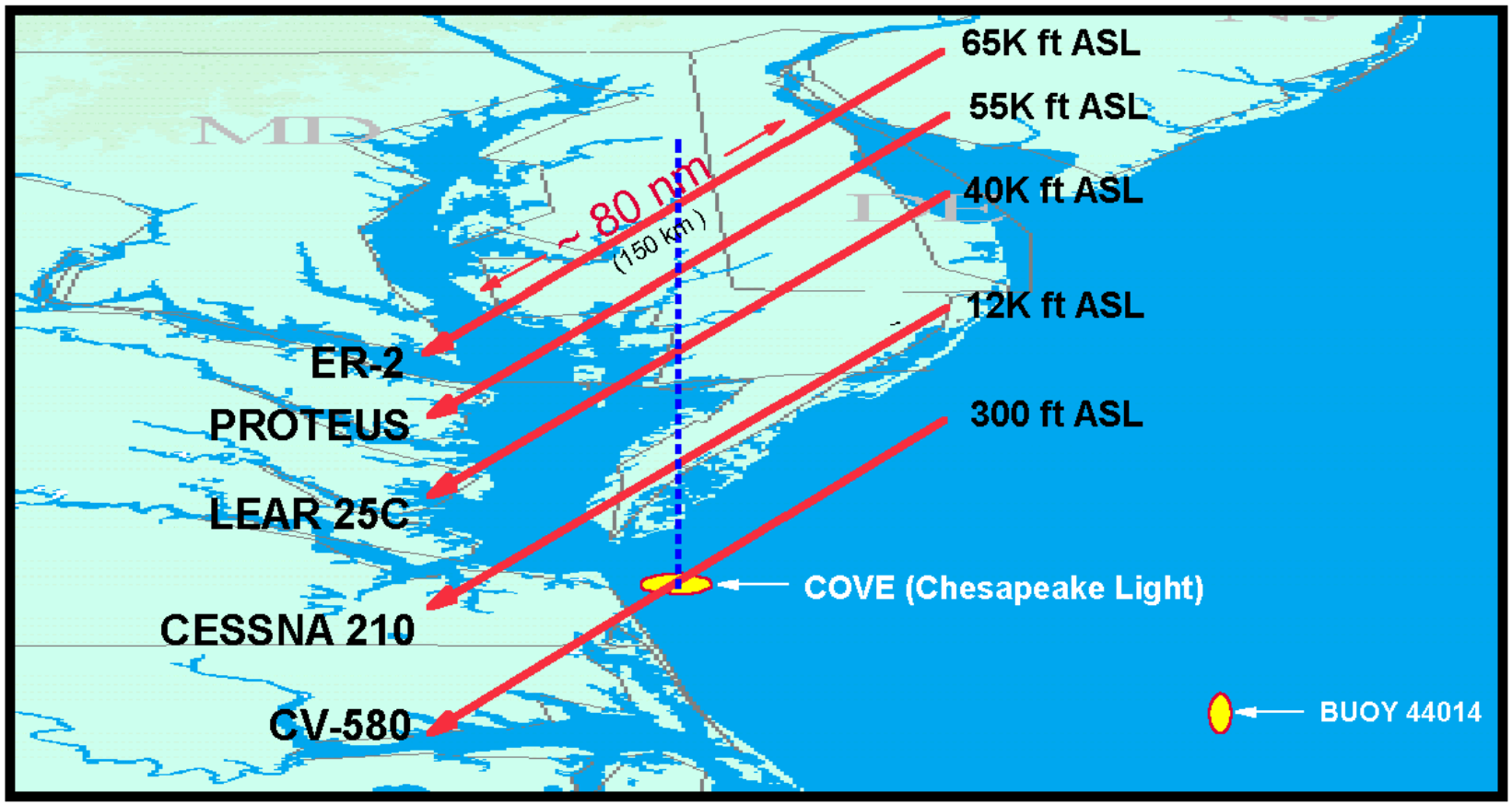
Flight Patterns

A-B Leg (All Aircraft except OV-10)

- Single-leg track flown point-to-point at a fixed flight level for durations of 10 to 30 minutes.
- Distances depend on aircraft speed, available airspace and may be shortened by flying reverse heading racetrack patterns.
- Altitudes may vary from 100 ft to 65,000 feet above sea level (ASL).
- Selected flight level is dependent upon the aircraft and daily mission science objectives.
- Targets include COVE, Buoys, adjacent cloud free areas and dismal swamp

CLAMS 2001 MISSION

A-B LEG PROFILE - VERTICAL STACKING



CLAMS A-B LEG PROFILE VERTICAL STACKING-08-01.PRE

Flight Patterns

BRDF (CV-580)

- Circular pattern, centered about a fixed waypoint and flown at a typical bank angle of 20 degrees.
- Diameter typically 3 km.
- Altitude typically 2000 ft but could be flown between 300 and 25,000 ft ASL depending on science objective.
- Targets include COVE, Buoys, adjacent cloud free areas and dismal swamp.

Flight Patterns

Vertical Spirals (CV-580, Proteus)

- Ascending and descending spiral profiles are flown at spiraling rates from 200 ft/min to several thousand ft/min, dependent upon science objectives and aircraft
- Altitudes range from 100 ft ASL to 10,000 ft (CV-580) and 55,000 ft (Proteus) ASL.
- Selected profile diameter for each mission may range from several nautical miles up to 30 nm.
- Targets include COVE, buoys and adjacent cloud free areas.

Flight Patterns

Crop-duster (All Aircraft)

- Profile consists of multiple parallel flight-legs, typically equally spaced to provide blanket coverage of desired target area.
- All flight legs are flown at constant altitude and may vary from 300 ft. ASL to 65,000 ft ASL.
- Box sizes may vary from several nm to several hundred nm.
- Targets include COVE, buoys and adjacent cloud free areas.

Flight Patterns

Descending Step (CV-580)

- Profile is a series of constant altitude straight leg or racetrack patterns descending in altitude.
- Flight levels depend on pre-determined vertical aerosol structure.
- Targets include COVE, buoys and adjacent cloud free areas.

CLAMS MISSION AIRSPACE & FLIGHT PLANNING GUIDELINES

● AIRCRAFT SEPARATION MINIMUMS

VERTICAL SEPARATIONS:

- Surface to 1000 ASL - 500 ft
- 1000 - 15K ft ASL - 1000 ft.
- 15K - 65K ft ASL - 2000 ft

HORIZONTAL SEPARATIONS:

- 4 nm at Same Altitude.
- Parallel or Trailing Flight - 500 ft Min Horizontal Separation AND 100 ft Min Vertical Separation Operating Below 5000 ft in Total VMC Conditions, with No clouds.

● FLIGHT PLANNING

- **Standardized Charts and Scales** (Project Supplied)
- **Standardized Planning Units**:
  Nautical Miles, (Degrees, Decimal Minutes), Local 12 Hour Time, Feet of Altitude, & Knots.
- **Aircraft Plans:**
  Re-Checked for Accuracy and Consolidated into the Daily Mission Plan using Master Overlay Planning Board Technique.

CLAMS 2001 MISSION

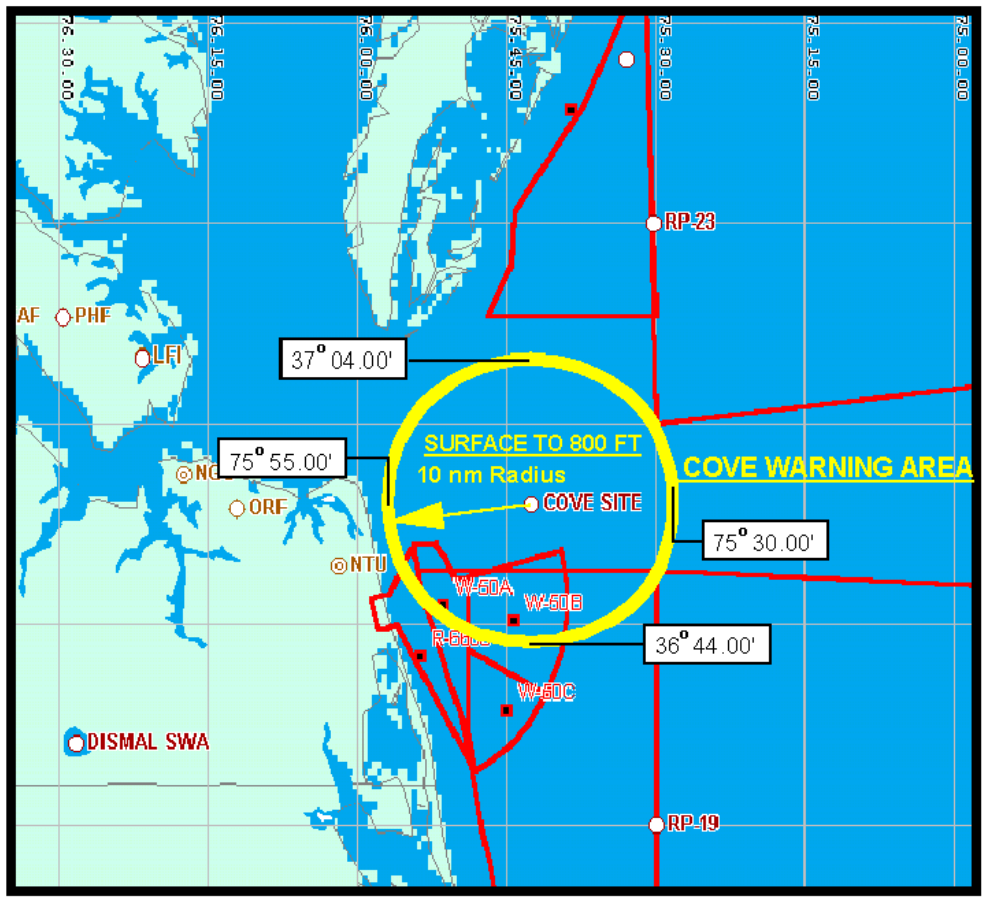
COVE OPERATIONS 10 nm WARNING AREA

COVE WARNING AREA

CLAMS AIRCRAFT APPROACHING THE COVE SITE BELOW 800 FT ASL, MUST CONFIRM BY RADIO THAT THE OV-10 AIRCRAFT HAS CLEARED TO THE EAST OF THE COVE SITE, BEFORE ENTERING THE COVE WARNING AREA..

CONFIRMATION MAY BE TO/FROM THE AIRCRAFT EGRESSING THE COVE AREA, OR THROUGH VOICE RELAY TO/FROM ANOTHER CLAMS AIRCRAFT OR BASE.

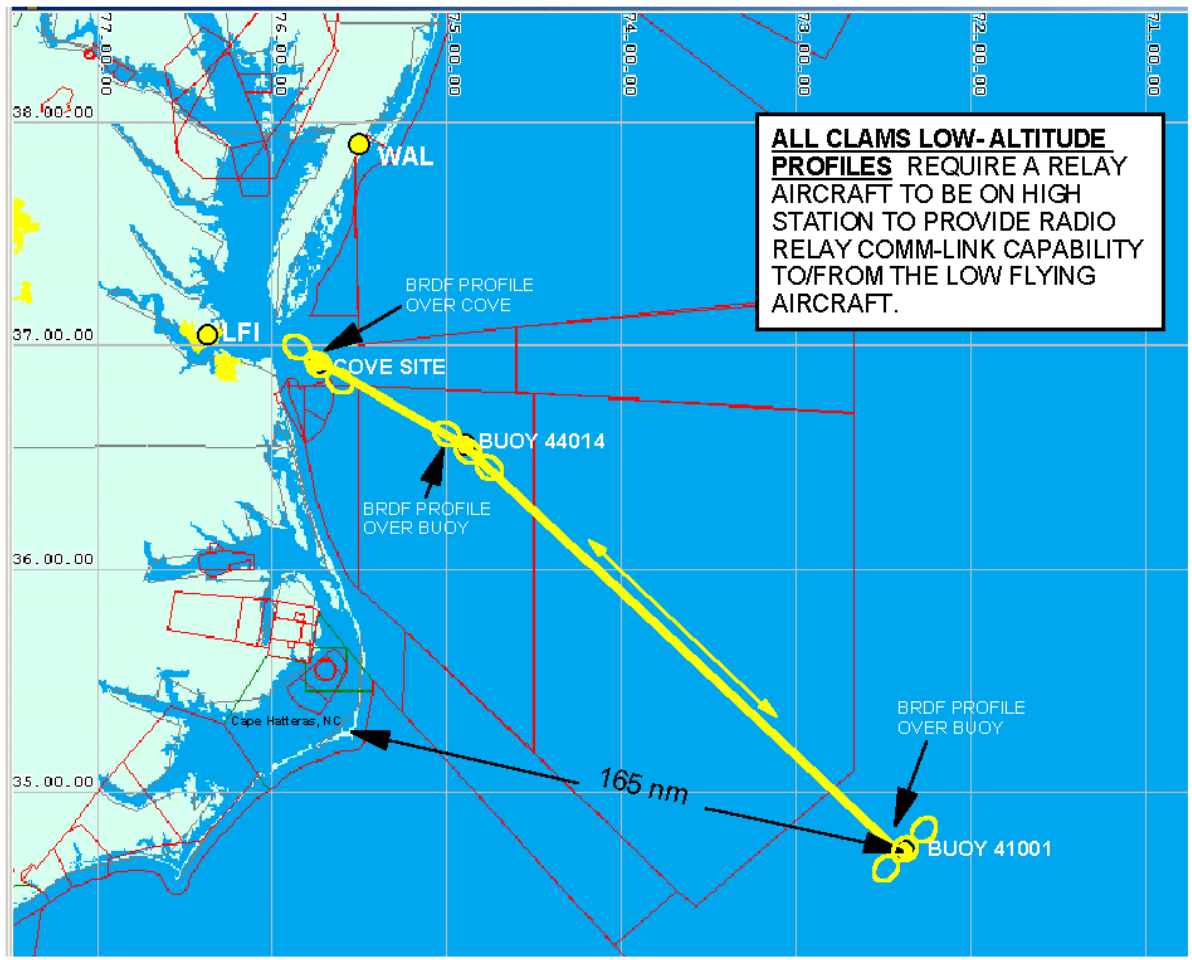
A LOCAL NOTAM FILED WITH FAA WILL ACTIVATE THE COVE WARNING AREA DURING THE MISSION PERIOD.



CLAMS 2001 MISSION

GACP - AVHRR & PROFILE COVE To BUOY's 44014 & 41001, with BRDF PROFILE.

CV-580 (300 ft ASL) & LEAR (40K ft ASL)



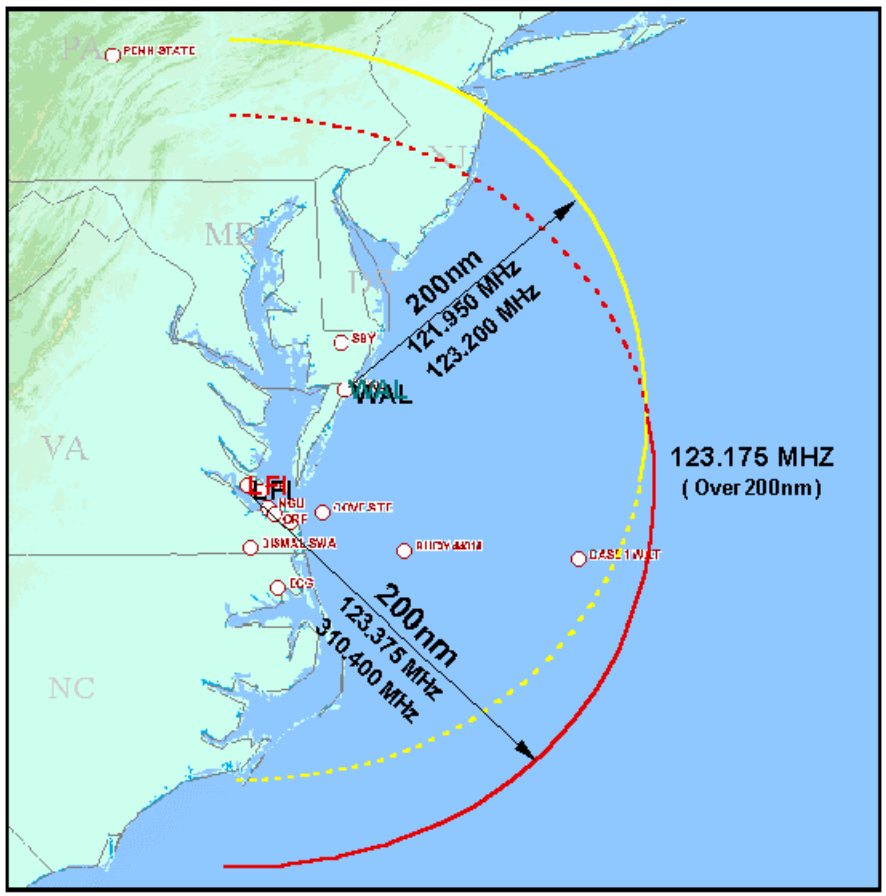
CLAMS 2001 MISSION

CLAMS AIRSPACE COORDINATION AND CONTROL

- Project Defines Airspace Requirements.
- Project Coordinates Airspace & Plans with LaRC, WFF, and Files Requests with FAA, VACAPES, and other Airspace Control Agencies.
- Wallops Test Director / ATC Directly Participate in CLAMS Daily Flight Planning Sessions to Facilitate Filing of Flight Plans and Activation of Previously Requested Airspace with VACAPES FAA, and others.
- WFF Radar <u>can</u> be active to 200 nm of WFF on Mission Days should CLAMS desire A/C Tracking.

CLAMS 2001 MISSION

AIRCRAFT COMMUNICATIONS FREQUENCIES
and 200 nm Range Limits



CLAMS Flight Operations Communications Frequencies

LOCATION	USE	VHF	UHF
WALLOPS	CLAMS PRIMARY	**121.950 MHz**	**NA**
FLIGHT	**CLAMS ALTERNATE-1**	**123.200 MHz**	**NA**
FACILITY	PATUXENT APPROACH	127.950 134.100 119.175 24HR.	NA
WALLOPS IS, VA	WALLOPS I TOWER, ATC	126.500	NA
LANGLEY	**CLAMS ALTERNATE-2**	**123.375 MHz**	**NA**
RESEARCH	**CLAMS ALTERNATE-3**	**123.175 MHZ**	**NA**
CENTER	**CLAMS ALTERNATE-4**	**NA**	**310.400 MHz**
Langley AFB Hampton, VA	NORFOLK APPROACH	124.900/24HR, 125.700/24HR, 126.050/24HR, 127.900/24HR.	
	LANGLEY AFB TOWER, ATC	125.000	NA
	NASA FLIGHT OPERATIONS	123.375	NA

FACILITY	TYPE	APPROACH	TOWER ATC
SALISBURY-OC (SBY)	PUBLIC	127.950	119.425
NEWPORT NEWS (PHF)	PUBLIC	125.700	118.700
OCEANA NAS (NTU)	MILITARY	119.600	120.875
NORFOLK INT'L (ORF)	PUBLIC	118.900	120.800
ELIZEBETH CITY (ECG)	PUBLIC	127.900	120.500
CHERRY PT. NC (NKT)	MILITARY	119.350	121.300

Hazards Analysis

- Brainstormed mission level hazards (14)
  - Midair collision (CLAMS A/C, Other A/C, Birds)
  - CFIT/LOC (wx, wake vortex, A/C equip failure, pilot error, proximity to lighthouse/ships
  - Ground collision
  - Uncontrolled energy emissions
  - Personnel injury on ground and during CFR/SAR
  - Minor damage due to birdstrike and weather
- Constructed a fault tree
- Determined controls
- Scored each hazard based on probability of occurrence and severity
- Assigned Risk Assessment Code (RAC) to each hazard

RISK ASSESSMENT MATRIX

HAZARD SEVERITY			POTENTIAL CONSEQUENCES		PROBABILITY OF OCCURRENCE			
	CATEGORY	DESCRIPTIVE WORD	PERSONNEL INJURY/ILLNESS	EQUIPMENT LOSS ($)	A FREQUENT	B OCCASIONAL	C REMOTE	D IMPROBABLE
	I	CATASTROPHIC	DEATH, PERMANENT DISABILITY AND/OR EXTENDED HOSPITALIZATION	>500K	1	1	2	3
	II	CRITICAL	SEVERE LOST-TIME INJURY OR ILLNESS	25K - 500K	1	2	3	3
	III	MARGINAL	MINOR INJURY OR ILLNESS	1K - 25K	2	3	3	3
	IV	NEGLIGIBLE	NO INJURY OR ILLNESS	<1K	3	3	3	3

HAZARD SEVERITY

CATEGORY	DESCRIPTIVE WORD	POTENTIAL CONSEQUENCES
I	CATASTROPHIC	MAY CAUSE DEATH, PERMANENT DISABILITY, EXTENDED HOSPITALIZATION, AND/OR SYSTEM OR EQUIPMENT DAMAGE IN EXCESS OF $500K (TYPE A MISHAP).
II	CRITICAL	MAY CAUSE SEVERE LOST-TIME INJURY OR ILLNESS AND/OR SYSTEM OR EQUIPMENT DAMAGE BETWEEN $25K AND $500K (TYPE C MISHAP).
III	MARGINAL	MAY CAUSE MINOR INJURY OR ILLNESS AND/OR SYSTEM OR EQUIPMENT DAMAGE BETWEEN $1K AND $25K (REPORTABLE INCIDENT).
IV	NEGLIGIBLE	WILL NOT RESULT IN INJURY, OCCUPATIONAL OR SYSTEM DAMAGE (NON-REPORTABLE INCIDENT).

PROBABILITY OF OCCURRENCE

LEVEL	DESCRIPTIVE WORD	POTENTIAL CONSEQUENCES
A	FREQUENT	LEVEL ASSIGNED WHEN NEITHER A SAFETY FEATURE NOR APPROVED PROCEDURES EXIST TO PREVENT THE UNDESIRED EVENT FROM OCCURRING. LIKELY TO OCCUR REPEATEDLY DURING THE LIFE CYCLE OF THE SYSTEM (TEST/ACTIVITY/OPERATION).
B	OCCASIONAL	LEVEL ASSIGNED WHEN A SAFETY FEATURE DOES NOT EXIST BUT THE USE OF APPROVED PROCEDURES SHOULD PREVENT THE UNDESIRED EVENT FROM OCCURRING. LIKELY TO OCCUR SOMETIME DURING THE LIFE CYCLE OF THE SYSTEM (TEST/ACTIVITY/OPERATION).
C	REMOTE	LEVEL ASSIGNED WHEN APPROVED PROCEDURES DO NOT EXIST BUT AN EXISTING SAFETY FEATURE SHOULD PREVENT THE UNDESIRED EVENT FROM OCCURRING. MAY OCCUR DURING THE LIFE CYCLE OF THE SYSTEM (TEST/ACTIVITY/OPERATION).
D	IMPROBABLE	LEVEL ASSIGNED WHEN BOTH A SAFETY FEATURE AND APPROVED PROCEDURES, OR TWO INDEPENDENT SAFETY FEATURES EXIST WHICH, COLLECTIVELY, SHOULD PREVENT THE UNDESIRED EVENT FROM OCCURRING. LIKELY NOT TO OCCUR DURING THE LIFE CYCLE OF THE SYSTEM (TEST/ACTIVITY/OPERATION).

NET PROBABILITY TABLE

PRECEDING EVENT PROBABILITY \ LOCAL EVENT PROBABILITY	A	B	C	D
A	A	B	B	C
B	B	C	C	C
C	B	C	D	D
D	C	C	D	D

PHASE OF OPERATION

T - TAKEOFF
I - INFLIGHT
L - LANDING
A - ALL
M - MAINTENANCE
G - GROUND

RISK ASSESSMENT CODES (RACs)

RAC	ACTION REQUIRED
1	IMPERATIVE TO SUPPRESS RISK TO A LOWER LEVEL
2	WAIVER REQUIRED
3	OPERATION PERMISSIBLE -- 14 CLAMS Hazards

CLAMS DAILY BRIEFING SCHEDULE

- **8:15 am - WFF CCTV Weather Briefing (each day).**
- **Noon - Contact VACAPES for 24 Hour Warning-Area Assignments.**
- **1:00 pm - Weather Brief and Forecast.**
- **1:30 - 4:00 pm - Planning Discussion:**
  - **Weather, VACAPES, Instrument & Aircraft Status.**
  - Make Preliminary GO/NO-GO Decision for the Next Day.
  - IF GO: (1) Finalize Flight Plans.
    (2) Review / Modify Flight Cards.
- **4:00 PM ALL HANDS BRIEFING in CLAMS Briefing Room, Location: Hangar D-1, First Floor, Room S-115.**

FLIGHT DAY

- **6:00 am - Weather Check, Final GO/NO-GO Decision, Notify Crews.**
  (Notify ER-2 4-Hours prior to Take Off.)
- **7:00 - 8:00 am - Pre-flight Maintenance, Instruments, Systems.**
- **8:00 am - ALL HANDS MISSION BRIEFING, Rm S-115.**
  - Weather UpDate and Briefing.
  - Review Pre-flight. Brief Mission Flight Cards.
- **10:00 am - ER-2 Take Off, Others as Scheduled.**
- **4:00 - 5:00pm - ALL HANDS Mission DE-BRIEFING, Rm S-115.**
  - Weather UpDate for Next Day.

All Mission Times Local EDT

CLAMS 2001 MISSION

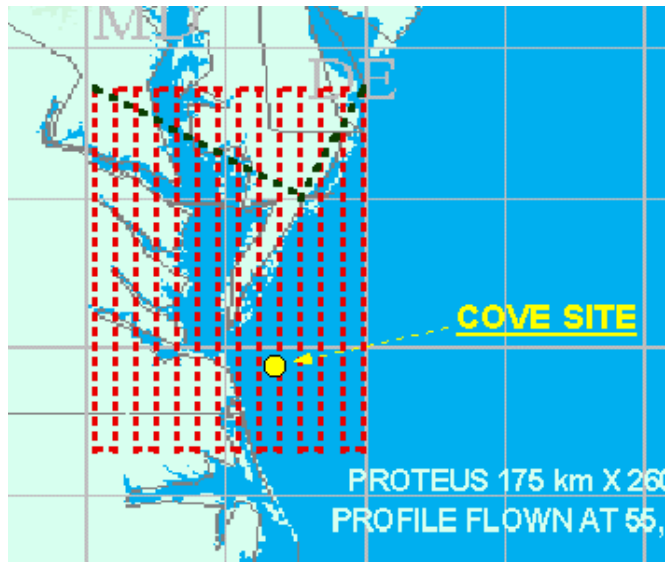
GSFC/WALLOPS FLIGHT FACILITY PRE-MISSION BRIEFINGS

- AIRCRAFT SAFETY WALK-AROUND / BRIEFING - WFF ASO
- FIRE AND EMERGENCY PREPAREDNESS BRIEFING - WFF FIRE CHIEF
- HAZARDOUS CHEMICALS BRIEFING - WFF FIRE CHIEF
- FLIGHT PLANS AND FLIGHT OPERATIONS BRIEFING - WFF TEST DIRECTOR

NAST/Proteus Flight Patterns:CLAMS

- **Mapping Flights (50-56kft):** A single grid of north-south, or east-west legs, depending upon prevailing winds centered over Chesapeake Bay area or CLAMS observation area.

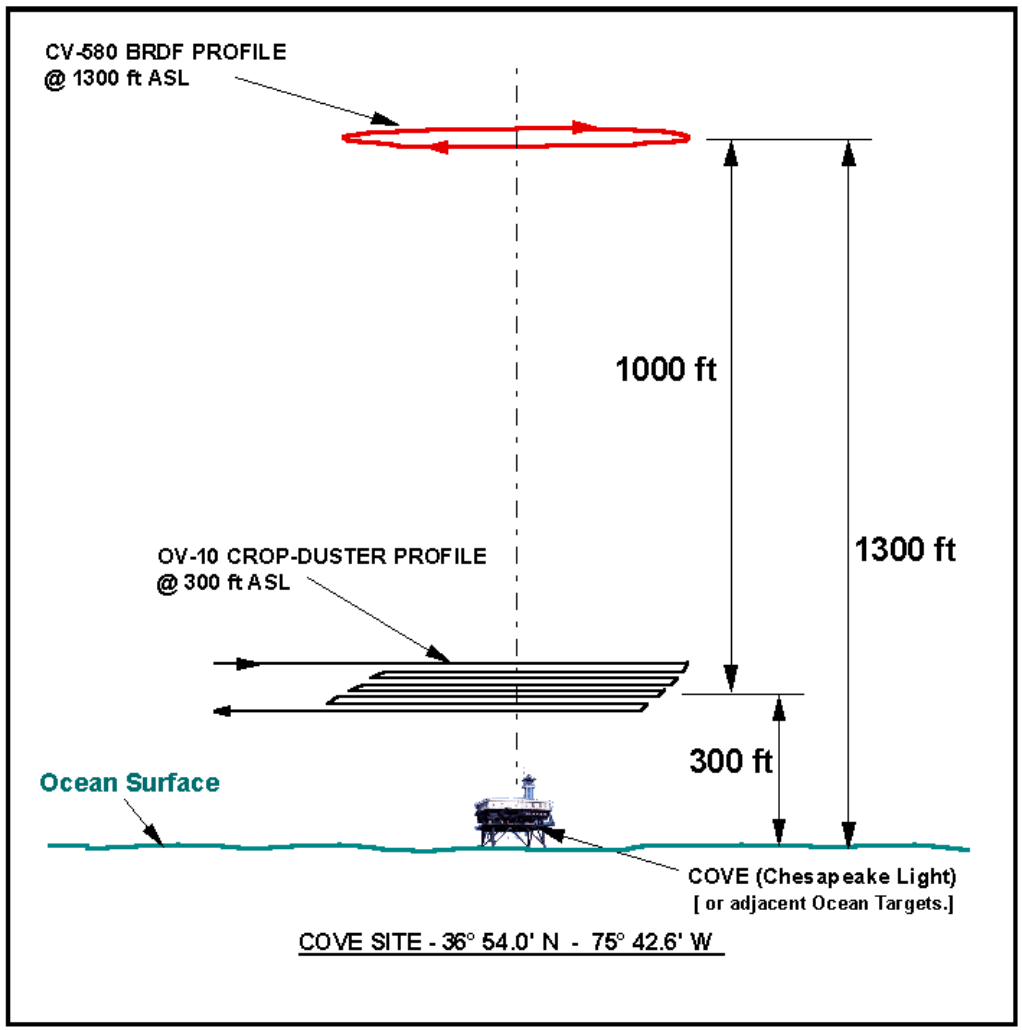
Grid 1: 260 km x 175 km (20 km spacing)
duration 6-8 hours
Grid 2: 100 km x 80 km (20 km spacing)
duration 7 hours



- **Vertical Profiling:** spiral ascents/descents between 1 kft – 56 kft over Chesapeake Light, Wallops or nearby cloud free areas with variable climb rates (~ 400-1000 fpm), and horizontal pattern ranges (~50 - 75 km); ~ 1 – 4 ½ hrs.

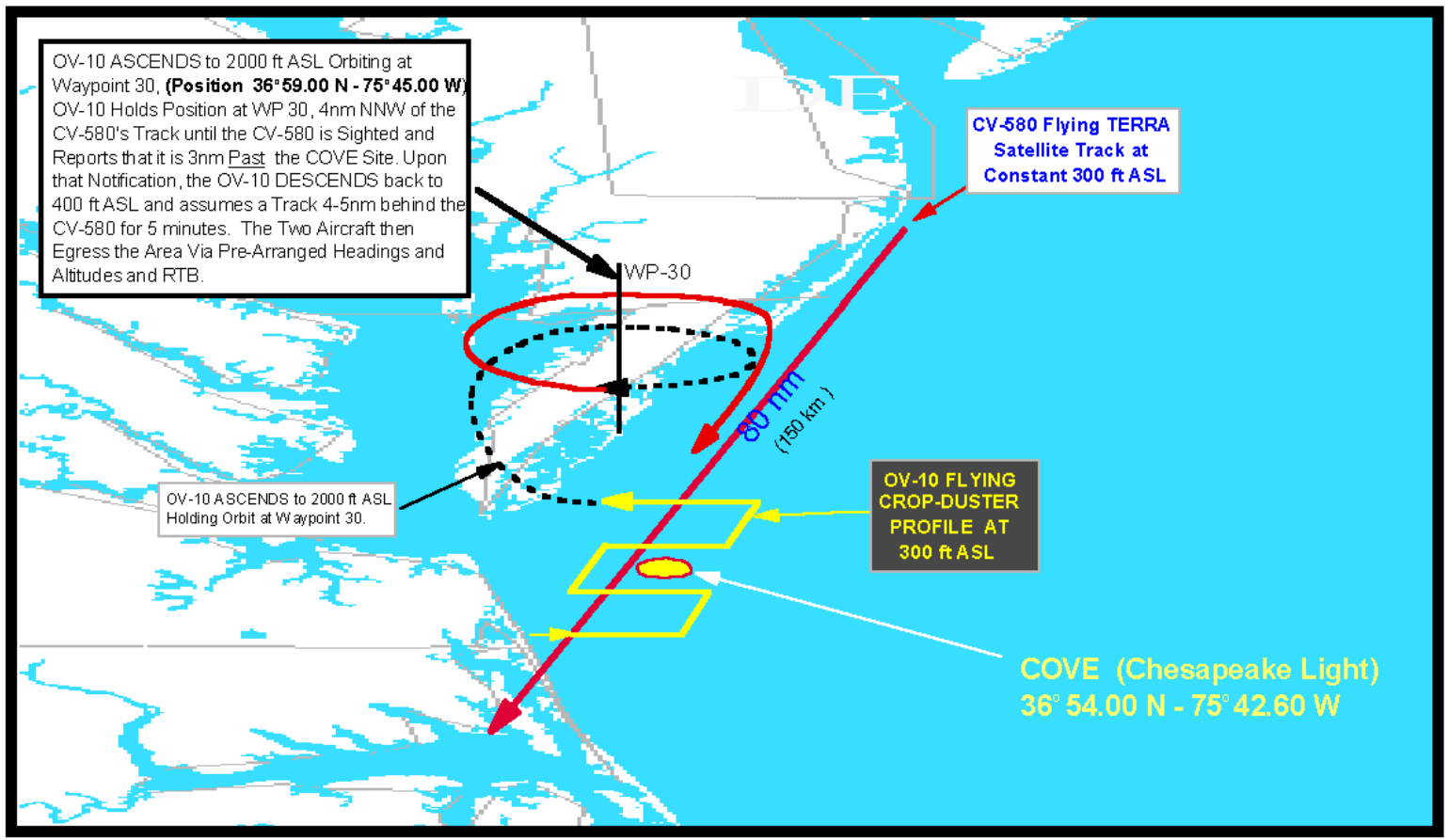
CLAMS 2001 MISSION

COVE BRDF OVER CROP DUSTER PROFILE



CLAMS 2001 MISSION

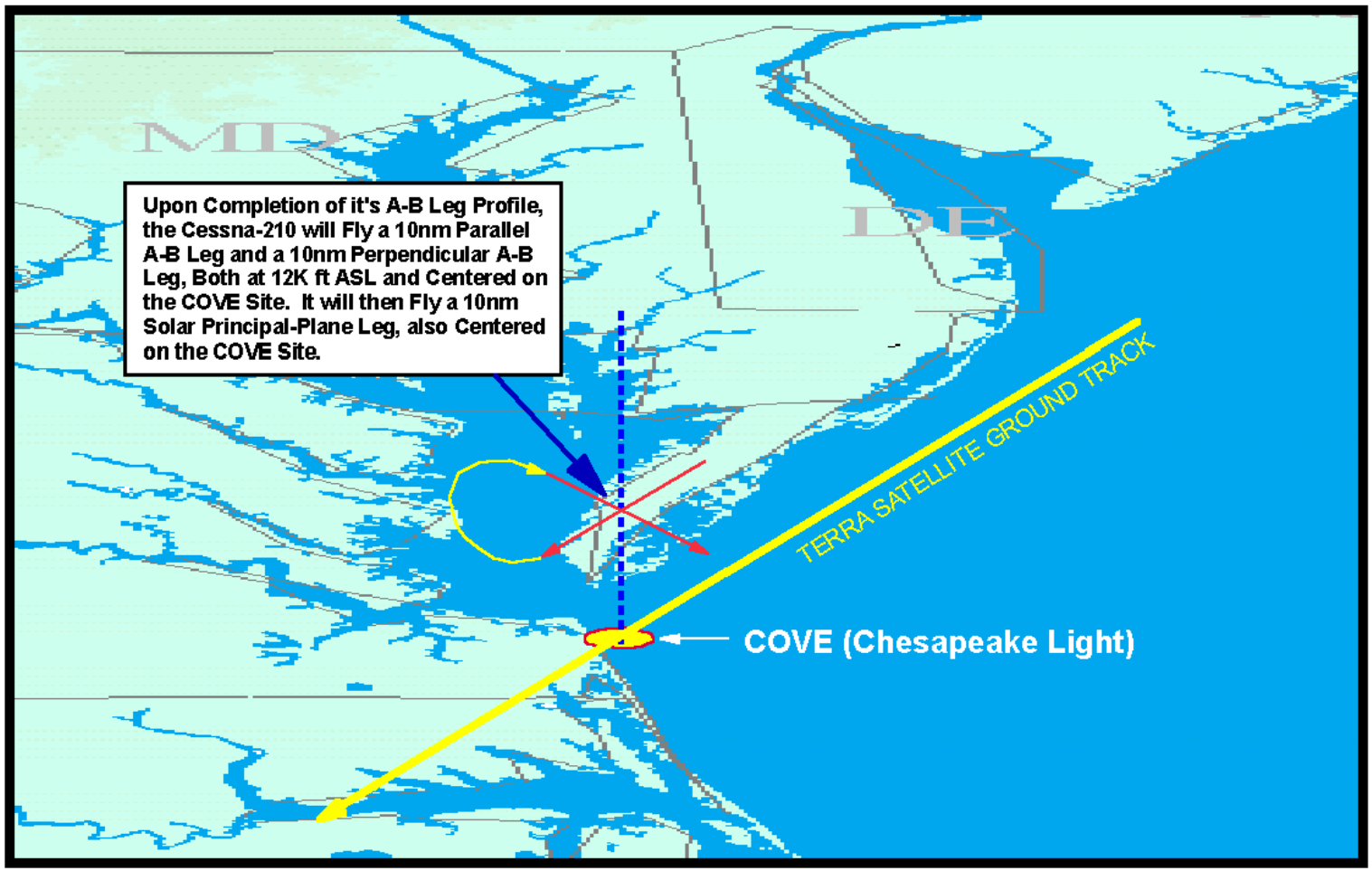
OV-10 CROP-DUSTER PROFILE with FOLLOW-ON to CV-580



CLAMS-OV-10-CROP-Duster-and-CV-580-Follow-On PROFILE 6-13-01.PRZ

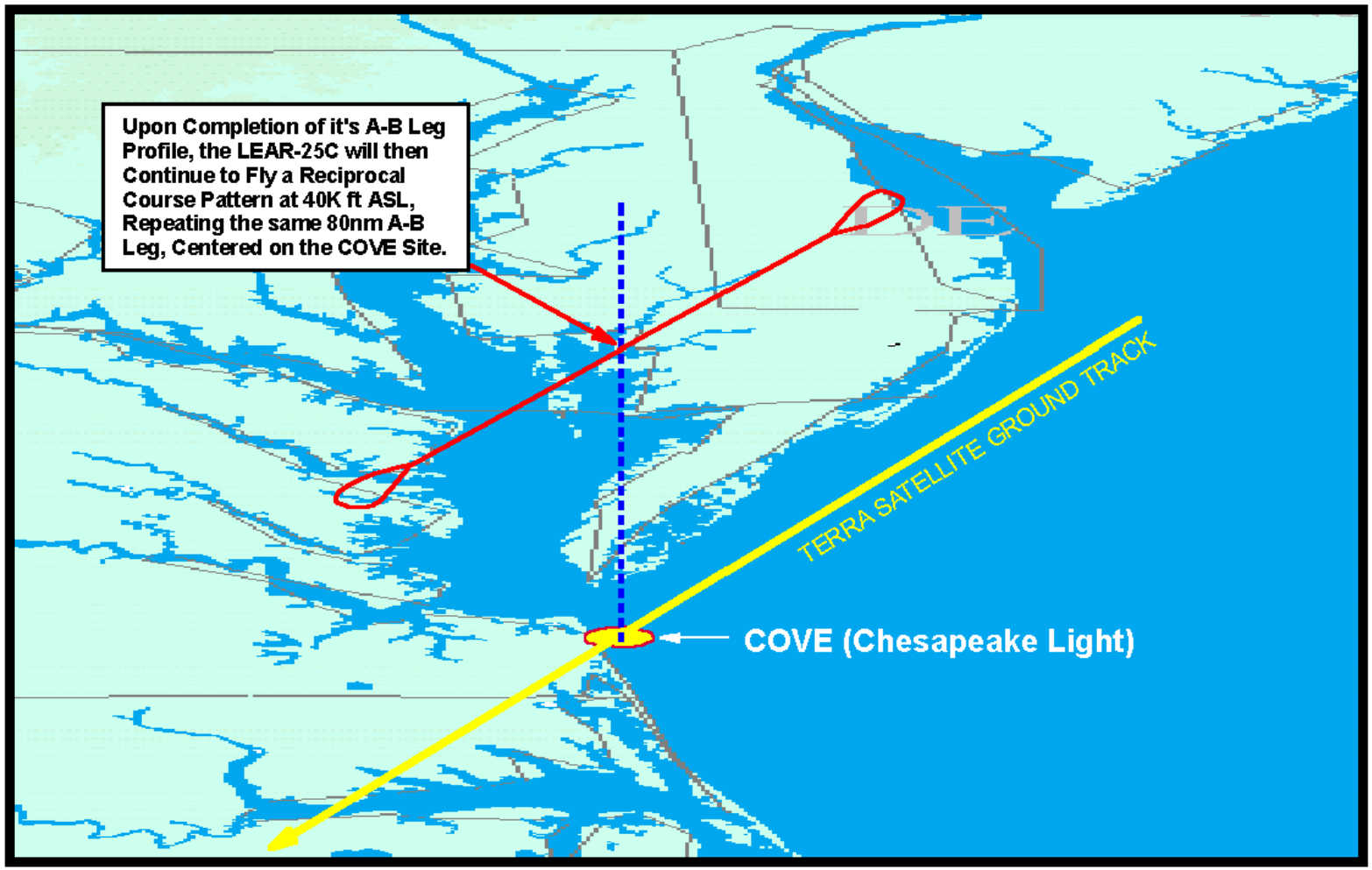
CLAMS 2001 MISSION

CESSNA-210 12K FT COVE PROFILE



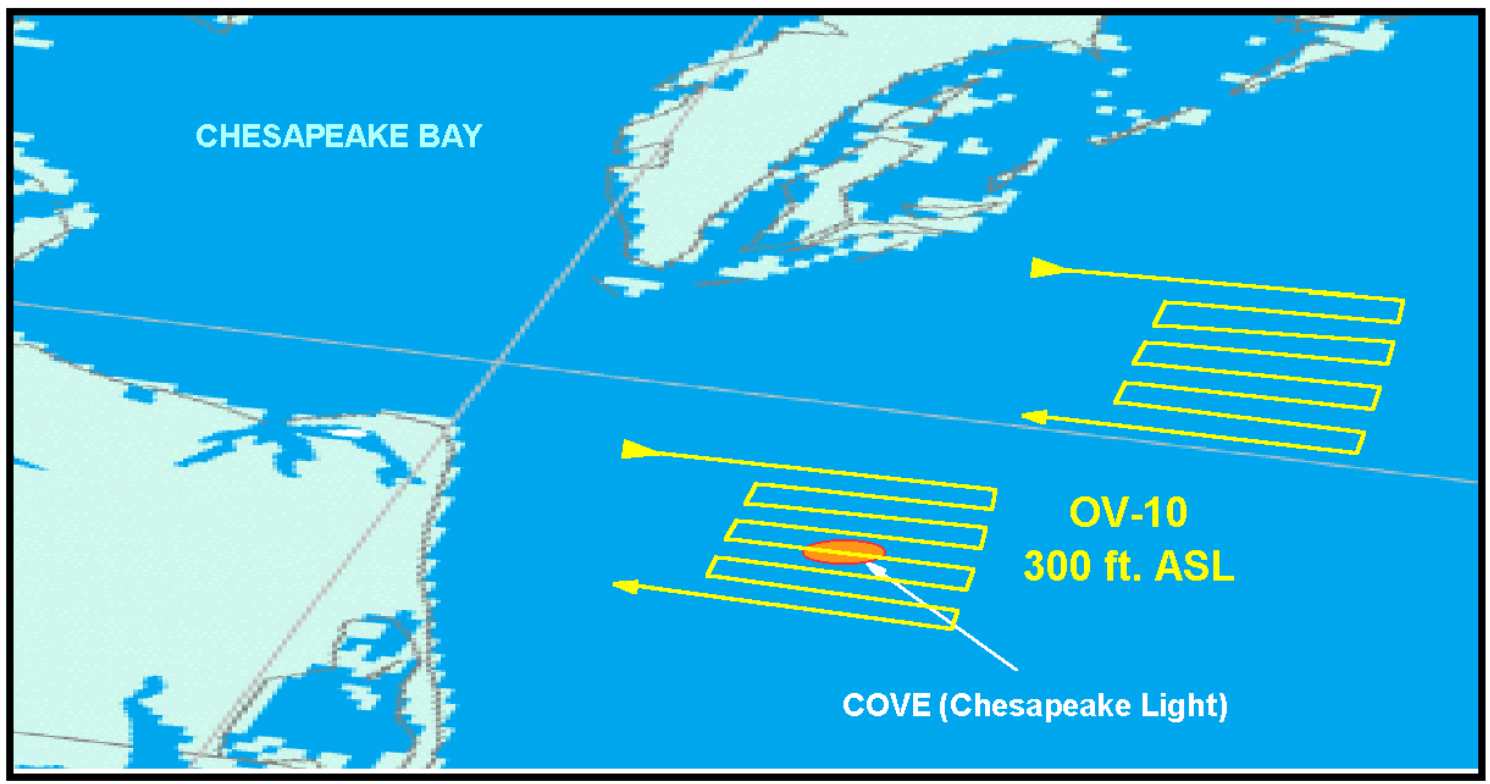
CLAMS 2001 MISSION

LEAR-25C, 40K FT COVE RACETRACK PROFILE



CLAMS 2001 MISSION

OV-10 CROP-DUSTER PROFILE



Aircraft (P.I)/Science Instrumentation	Instrument Investigator (Institution)
ER-2 (Jeannette van den Bosch)	
MAS	King/Remer/Martins (GSFC)
AirMISR	Kahn (JPL)
CPL	McGill (GSFC)
S-HIS	LaPorte (UW)
OV-10 (W. Smith Jr.)	
ASD FR Fieldspec (SW) up & down	Smith (LaRC)
Eppley Broadband (LW & SW) up & down	Smith (LaRC)
CV-580 (Peter Hobbs)	
AATS-14	Redemann (ARC)
Eppley Broadband (LW & SW) up & down	Hobbs (U. of Wash.)
Omega IR Radiometer	Hobbs (U. of Wash.)
TSI APS, PMS FSSP's , PMS PCASP, PSAP	Hobbs (U. of Wash.)
nepholometer(s)	Hobbs (U. of Wash.)
Filter Measurements	Martins (GSFC)
PROTEUS (W. Smith)	
NAST-I, NAST-M	Smith (LaRC)
CESSNA 210 (B. Cairns)	
RSP	Cairns (Columbia U., GISS)
LEAR 25C (M. Pitts)	
LAABS	Pitts (LaRC)

Observations	Instruments	Investigator/Institution
Radiation and Aerosols		
Broadband fluxes, albedo total, direct, diffuse	Eppley LW (BSRN)	Rutledge/LaRC
	Modified Epply SW	Haeffelin/LaRC
	Kipp & Zonen SW (BSRN)	Rutledge/LaRC
Spectral solar, direct, diffuse, and aerosol optical thickness	ASD FieldSpec	Rutledge/LaRC
	Sun Photometers	
	-Schultz	AERONET/GSFC
	-Cimel	Su, Charlock/LaRC
	Shadowbands	
	-MFRSR	Denn/LaRC
Aerosols (vertical profile)	Micropulse Lidar	Rutledge/LaRC
Ocean Parameters		
Incident up, down, subsurface spectral radiance, irradiance	Satlantic SMSR, SPMR	Cota/ODU
Spectral absorption, attenuation	WET Labs AC-9 (2x)	Cota/ODU
Spectral backscatter	HOBI Labs HS-6	Cota/ODU
Chlorophyll a & phaeophytin	Turner Design flourometer	Cota/ODU
CDOM, particulate and phytoplankton abs. spectra	Shimadzu 2401	Cota/ODU
Particle size spectra	Elzone	Cota/ODU
Water leaving radiance	Schultz sunphotometer	Su, Charlock/LaRC
Wave activity	IR wave sensor (standard)	NOAA
Meteorology		
Surface (T, P, RH, U, V)	NOAA standard met.	NOAA
Profiles (T, P, RH)	Rawinsondes (Vaisala 80)	Maddigan/LaRC
Integrated water vapor	GPS	Maddigan/LaRC
Other	Whole sky, sea cameras	Rutledge/LaRC

PARTICIPATING AIRCRAFT DATA

CLAMS JUL 10 - AUG 2, 2001 rev: 06/01/01

AIRCRAFT	AIRCRAFT POC	VHF FREQ RANGE	UHF FREQ RANGE	Hour Budget	DURATION / AIRSPEED kias
CONVAIR-580	**Peter Hobbs** phobbs@atmos.washington.edu **206-543-6027**	**118.050 - 135.950 Mhz**	**220.000 - 389.975 Mhz**	**40 hrs.**	**7.0 Hours / 280 Kts Research Airspeed 195 kts**
ER-2	**Jeannette Van Den Bosch** jeannette.vandenbosch@dfrc.nasa.gov **661-276-2273**	**108.000 to 151.975 Mhz**	**225.000 to 399.975 Mhz**	**32 hrs.**	**6.0 Hours / 400 Kts Research Airspeed 400Kts**
OV-10	**Bill Smith Jr.** W.L.Smith@larc.nasa.gov **757-864-8577**	**116.000 to 151.975 Mhz**	**225.000 to 399.950 Mhz**	**30 hrs.**	**2.0 Hours / 180 Kts Research Airspeed 155 kts**
PROTEUS	**Allen Royal** A.C.Royal@larc.nasa.gov **757-864-7927**	**118.000 - 136.975 Mhz**	**Hand-Held UHF**	**40 hrs**	**6.0 Hours / 250 Kts Research Airspeed TBD**
CESSNA-210	**Brian Cairns** bc25@columbia.edu **212-678-5625**	**118.000 - 136.000 Mhz**	**Hand-Held UHF**	**40 hrs.**	**6.0 Hours / 170 Kts Research Airspeed TBD**
LEAR 25C	**Michael Pitts** m.c.pitts@larc.nasa.gov **757-864-2693**	**117.000 to 135.970 Mhz**	**200.000 to 399.975 Mhz**	**10 hrs.**	**3.0 Hours / 225 Kts Research Airspeed 225 Kts**

Possible Flight Profile Scenario over COVE