

PROJECT INFORMATION

<b>Lead Principal Investigator</b>	John Burkhart
<b>Institute</b>	University of California, Merced, School of Engineering
<b>Project Title / Grant #</b>	Burkhart NILU-UAV (NILU-UAV)
<b>NSF Program and Manager</b>	NO\Research\Higher Ed\NILU, Ms. Renee Crain
<b>PFS Project Manager</b>	Katrine Gorham

LOGISTICS SUMMARY

This project involves the use of an unmanned aerial vehicle (UAV) to collect information that improves understanding of arctic albedo variability as well as pollutant-induced changes of albedo. The researchers will use a state-of-the-art UAV as a platform to measure albedo over a variety of Arctic terrain (sea ice, glaciers, ice sheets, etc.) during two campaigns, the first in 2009 in Ny-Alesund, Norway, and the second in 2010 at Summit Station, Greenland.

For the 2010 work, the project team will deploy the UAV at Summit for the period of mid-May through mid-August. A total of nine people will visit the station during the period, with an average on-site population of about five. They will occupy a Weatherport shelter set up near the taxiway, where the UAV will launch and land. Though the UAV will be flown autonomously, Summit science technical staff will provide support during each flight. Flights will be scheduled throughout the week to optimize timing with favorable weather / wind patterns, and will have increased frequency during unique episodes as forecasted by the research team's transport modeling system. In addition to the UAV flights, the field team will also be conducting ground truthing at sites at various distances from Summit.

For the 2010 Greenland work, CPS will provide ANG support, KISS and Summit user days, access to infrastructure and services at Summit Station, including science technical support and construction labor to set up a Weatherport shelter, as well as use of snowmachines and Nansen sleds. Researchers are providing fuel for the UAV. Costs associated with the support will be billed directly to the PI/institute. The PI will arrange/pay for all other support.

For the complete CPS online project record for this grant, including science objectives, go to: [http://www.polar.ch2m.com/arlss\\_reports/arlss\\_projectsdetail.asp?cbPropNum=NILU-UAV](http://www.polar.ch2m.com/arlss_reports/arlss_projectsdetail.asp?cbPropNum=NILU-UAV)

For up-to-date information on the project's schedule, please view the online Greenland calendar (<http://www.polar.ch2m.com/> > Greenland > Calendars/Schedules).

OUTSTANDING ACTIONS AND NOTES

Issue	Responsibility	Date Due	Date Completed
Review support plan for accuracy and distribute to all field team members	PI	5/1/2010	5/5/2010
Fieldwork will be covered by Summit group permit. Researcher is responsible for covering SAR and Medical Evacuation insurance.	PI	5/1/2010	5/5/2010
Visit all hyperlinks and review all documents referred to in the support plan	Entire Field Team	5/1/2010	5/5/2010
Contact the GEOSummit Science Coordination Office (SCO) <a href="http://sco.at.summitcamp.org">sco at summitcamp.org</a> regarding your project's plans for the season	PI	5/1/2010	Completed
Complete medical clearance process 6-8 weeks before desired deployment date	Entire field team	5/1/2010	5/5/2010
Provide cost estimate for billable support	CPS	5/1/2010	Completed
Develop a purchase order with CPS prior to field work	PI	5/1/2010	In progress

Provide bill for actual support	CPS	9/1/2010	Waiting
<b>Note: Passports are required for Air National Guard and international travel. Also, please bring TWO copies of your passport to Greenland with you.</b>	Entire field team	5/1/2010	5/5/2010
Complete Critical Success Factors	PI	5/1/2010	5/5/2010

## ALLOCATIONS AND SERVICES

### Allocations from Inventory

Quant/Unit	Item
2	Tables (for field shelter)
6	Chairs (for field shelter)
1	Broom/Dustpan (for field shelter)
1	Waste Basket (for field shelter)
1	VHF Radio Base Station and Radio (for field shelter)
1	Fire Extinguisher (for field shelter)
1	First Aid Kit (for field shelter)
1	Crash Recovery Kit for two people: shelter, sleep kit, stove/fuel, food/water, and first aid kit
3	Extension cord (to power compressor and field shelter)
1	4x4 inch by 8 ft Wooden Post
1	Auger
2	4-stroke snowmobiles. Note: These snowmobiles will be available for the team to use for the ground truthing work. These are not to be used for transportation around camp. In the event of a crash recovery traverse the need for a 2-stroke snowmobile will be evaluated by the Project Manager (Katrine Gorham) and Camp Manager (Ken Jessen).
2	Nansen sleds
1	Handheld GPS (for far ground truthing site and crash recovery traverse)
1	Iridium phone (for far site ground truthing site and crash recovery traverse)

For more information on satellite phones, radios, manuals and other field communications support, please visit the CPS communications Web site at <http://www.polar.ch2m.com/>.

### Other Services

Service	Comments
User days Kangerlussuaq	
User days Summit, including meals	The researchers will sleep in tents provided by CPS. Researchers will provide their own sleeping bags and ECW gear.  Personnel will use the Big House facilities for meals and observe regular meal times. They should notify the camp manager and chef if they plan to eat outside normal meal times. Any special diets or food allergies should be reported to the chef upon arrival at Summit. If possible, the science group can send an early email to <a href="mailto:manager@summitcamp.org">manager at summitcamp.org</a> to prep the cook for special diet requirements.
ANG travel Kanger-Summit-Kanger	For all team members
ANG travel Kanger-NY-Kanger	For two team members

Cargo Services

CPS Science Technician Support	CPS will provide science tech support at approximately 12 hours per week. This work must be planned/scheduled in advance with the CPS science technician in order to avoid conflicts with other science technician tasking.
Green House Bench Space	The researchers will be provided with bench space in the Greenhouse east lab. The researchers will be allocated the south bench in this lab. Researchers acknowledge that they will need to work around the science techs who may need access to this area for the daily tasking duties.
DISC Shop Space	The researchers will be allowed access to the DISC shop space in the event that repairs are needed for their equipment. This work space will be limited to the Science flex space that is designated on the north east side of the Shop. This work must be coordinated in advance with both the Mechanic and Camp Manager and will be secondary to activities that are critical to camp operations.
Weatherport facility	Prior to arrival of the field team, the Weatherport facility will be set up near the SE corner of the taxiway. The appropriate distance from the taxiway will be determined by the ANG. The Weatherport will serve as office and work space for the field team. It will be supplied with power and equipped with a wall mounted heater as well as power outlets. The researchers will be responsible for supplying their own power adaptors and converters.
Off Station Travel	The researchers will travel off station to work at both near and far ground truthing sites. All snow pits and snow disturbances will be backfilled upon completion. This work will be coordinated with the camp manager to ensure that proper off-station communication is established and maintained. The researchers will adhere to all travel policies and clean air sector protocols and will plan off station travel accordingly.
Safety protocols	PI's will adhere to all safety protocols outlined in the AHAs. This includes reading and signing off on relevant Activity Hazard Analysis (AHAs) prior to completing relevant tasks. Additionally, the researchers will adhere to the established clean air protocols and travel policies.

LOCATION INFORMATION

Please visit <http://www.polar.ch2m.com/> and navigate to the Greenland menu for en route and location-specific Greenland information. Prior to deployment, your entire field team should be familiar with the content of the *Greenland Guide* and, if traveling to Summit, with the guidelines provided in the *Summit Users' Guide*. Both are available electronically via our Web site's Greenland menu.

CARGO AND CUSTOMS

All cargo required for your project should arrive in Scotia, NY, **no later than 2 weeks prior** to the desired northbound Air National Guard (ANG) flight, must be entered into our online Cargo Tracking System, and must be properly registered with Customs.

For the most current ANG flight schedule go to <http://www.polar.ch2m.com/> and navigate to Greenland > Calendars/Schedules.

If you are a **new user** requiring access to the Cargo Tracking System, contact [Jason Buening](#).

(If you need **technical support** with the Cargo Tracking System, contact [Mike Dover](#) .

Customs instructions are available on our Web site at <http://www.polar.ch2m.com/> (go to Greenland > Customs). More information is available via the *Greenland Guide*, under Greenland on the CPS site.

The following is our current understanding of your overall cargo requirements:

**Cargo List**

Items	Weight/Cube
Zarges Box (NILU)	52 lbs / 1.9 cu ft
Taped Poles (NILU)	~ 60 lbs / 10 ft long
Cardboard Box (NILU)	18 lbs / 1 cu ft
Zarges Box (NILU)	77 lbs / 6.4 cu ft
Zarges Box (NILU)	55 lbs / 6.5 cu ft
Large Ski Bag (NILU)	33 lbs / 5 cu ft
Plastic Box (NILU)	66 lbs / 5 cu ft
Pelican Case (NILU)	12 lbs / 0.5 cu ft
Case (Norut)	220 lbs / 36 cu ft
Case (Norut)	220 lbs / 36 cu ft
Zarges Box(Norut)	88 lbs / 8 cu ft
Zarges Box (Norut)	44 lbs / 8 cu ft
Zarges Box (Norut)	88 lbs / 8 cu ft
PC Case (Norut)	22 lbs / 2.5 cu ft
PC Case (Norut)	22 lbs / 2.5 cu ft
Box (Norut)	33 lbs / 10 cu ft
Catapult (Norut) (Shipped via Scotia w/ ANG)	330 lbs / 20 ft long
NPI Cargo (2 lg. Zarges Boxes, 1 med. Zarges Box, 1 sm. Wooden Crate)	330 lbs / 18 cu ft

## SUPPORT SCHEDULE

Approx Date	Location	Activity
05/12/10	Kangerlussuaq	Arrival deadline for cargo to Summit on 5/19/10 LC-130 flight
05/18/10	Kangerlussuaq	Bogren, Burkhart, Tollefsen, and Solbo arrive in Kangerlussuaq via commercial air
05/19/10	Summit	Bogren, Burkhart, Tollefsen, and Solbo and cargo arrives at Summit
06/02/10	Kangerlussuaq	Forsstrom arrives in Kangerlussuaq via commercial air
06/02/10	Kangerlussuaq	Arntsen arrives in Kangerlussuaq via ANG
06/04/10	Summit	Arntsen and Forsstrom) arrive at Summit
06/09/10	Kangerlussuaq	Bogren leaves Summit for Kangerlussuaq
06/10/10	Stratton ANGB	Bogren flies to NY via the ANG
06/21/10	Kangerlussuaq	Bogren arrives in Kangerlussuaq via ANG from NY
06/21/10	Kangerlussuaq	Houge arrives in Kangerlussuaq via commercial air
06/23/10	Summit	Bogren and Houge arrive at Summit
06/23/10	Kangerlussuaq	Solbo leaves Summit for Kangerlussuaq
06/25/10	Kangerlussuaq	Solbo leaves Kangerlussuaq via commercial air
06/27/10	Kangerlussuaq	Johansen arrives in Kangerlussuaq via commercial air
06/28/10	Kangerlussuaq	Arntsen leaves Summit for Kangerlussuaq
06/29/10	Summit	Johansen arrives at Summit
06/29/10	Kangerlussuaq	Tollefsen leaves Summit for Kangerlussuaq
07/01/10	Kangerlussuaq	Tollefsen leaves Kangerlussuaq via commercial air
07/01/10	Kangerlussuaq	Arntsen leaves Kangerlussuaq via ANG
07/20/10	Kangerlussuaq	Burkhart and Storvold arrive in Kangerlussuaq via commercial air
07/22/10	Summit	Burkhart and Storvold arrive at Summit
07/22/10	Kangerlussuaq	Houge leaves Summit for Kangerlussuaq

07/24/10	Kangerlussuaq	Houge leaves Kangerlussuaq via commercial air
08/13/10	Kangerlussuaq	Bogren, Forsstrom, Burkhart, Storvold, and Johansen leave Summit for Kangerlussuaq
08/15/10	Kangerlussuaq	Bogren, Forsstrom, Burkhart, Storvold, and Johansen leave Kangerlussuaq via commercial air

For the most up-to-date information on the project's schedule, please view the online Greenland calendar (<http://www.polar.ch2m.com/> > Greenland > Calendars/Schedules).

## FIELD TEAM INFORMATION

Name	Location	Date In	Date Out	Email
Burkhart, John (1)	Kangerlussuaq Summit	05/18/10 05/19/10	06/04/10 06/06/10	<a href="mailto:john.burkhart@nilu.no">john.burkhart@nilu.no</a>
Burkhart, John (2)	Kangerlussuaq Summit	07/20/10 07/22/10	08/15/10 08/13/10	<a href="mailto:john.burkhart@nilu.no">john.burkhart@nilu.no</a>
Bogren, Wiley (1)	Kangerlussuaq Summit	05/18/10 05/19/10	06/10/10 06/09/10	<a href="mailto:wiley.bogren@nilu.no">wiley.bogren@nilu.no</a>
Bogren, Wiley (2)	Kangerlussuaq Summit	06/21/10 06/23/10	08/15/10 08/13/10	<a href="mailto:wiley.bogren@nilu.no">wiley.bogren@nilu.no</a>
Forsstrom, Sanja	Kangerlussuaq Summit	06/02/10 06/04/10	08/15/10 08/13/10	<a href="mailto:sanja@npolar.no">sanja@npolar.no</a>
Storvold, Rune	Kangerlussuaq Summit	07/20/10 07/22/10	08/15/10 08/13/10	<a href="mailto:rune.storvold@itek.norut.no">rune.storvold@itek.norut.no</a>
Tollefsen, Andreas	Kangerlussuaq Summit	05/18/10 05/19/10	07/01/10 06/29/10	<a href="mailto:andreas@norut.no">andreas@norut.no</a>
Solbo, Stian	Kangerlussuaq Summit	05/18/10 05/19/10	06/25/10 06/23/10	<a href="mailto:stian.solboe@norut.no">stian.solboe@norut.no</a>
Houge, Torbjørn	Kangerlussuaq Summit	06/21/10 06/23/10	07/24/10 07/26/10	<a href="mailto:torbjorn.houge@rocketrange.no">torbjorn.houge@rocketrange.no</a>
Johansen, Kjell-Sture	Kangerlussuaq Summit	06/27/10 06/29/10	08/15/10 08/13/10	<a href="mailto:kjell-sture.johansen@norut.no">kjell-sture.johansen@norut.no</a>
Arntsen, Alexandra Eva	Kangerlussuaq Summit	06/02/10 06/04/10	07/01/10 06/29/10	<a href="mailto:aarntsen@uvm.edu">aarntsen@uvm.edu</a>

## PROJECT CONTACT INFORMATION

### Research Team

Role	Name	Email	Phone / Fax
Principal Investigator	John Burkhart	<a href="mailto:john.burkhart@nilu.no">john.burkhart@nilu.no</a>	209 658.7142 /

### CPS Team Members

Contact for	Name	Email	Primary Phone
Summit science planning & support	Katrine Gorham	<a href="mailto:Katrine@polarfield.com">Katrine@polarfield.com</a>	Denver: 303.349.2884
Greenland science planning & support	Susan Zager	<a href="mailto:Susan@polarfield.com">Susan@polarfield.com</a>	Denver: 720.320.6159
Greenland science planning & support	Robin Abbott	<a href="mailto:Robin@polarfield.com">Robin@polarfield.com</a>	Denver: 303.748.8507
Kangerlussuaq base operations	Kathy Young	<a href="mailto:Kathy@polarfield.com">Kathy@polarfield.com</a>	Denver: 720.320.6160 Greenland: 011.299.524218
Scotia (Stratton Air Base) operations & customs	Earl Vaughn	<a href="mailto:EarlVaughn@gmail.com">Earl Vaughn@gmail.com</a>	Scotia cell: 518.605.0979

Sat phones & comms	Roy Stehle	<a href="mailto:Roy.Stehle@sri.com">Roy.Stehle at sri.com</a>	Menlo Park: 650.859.2552
Remote Medical (kits & service) and edical/Dental Clearance (PQ)	Robbie Score	<a href="mailto:Robbie@polarfield.com">Robbie at polarfield.com</a>	Denver: 303.906.0093

**CPS Offices**

<b>Denver</b>	<b>Kangerlussuaq</b>	<b>Scotia</b>
Polar Field Services 8110 Shaffer Parkway Suite 150 Littleton, CO 80127 Tel: 303.984.1450/1439 Fax: 303.984.1445	CH2M HILL Polar Services Attn: Name of Employee/Researcher Postboks 1015 DK-3910 Kangerlussuaq, Greenland Tel: 011.299.841598 Fax: 011.299.841599	Earl Vaughn C/O 109 <sup>th</sup> Aerial Port Bldg. 20 Stratton Air Base Scotia, NY 12302-9752 Tel: 518.344.2635 Cell: 518.605.0979 Fax: 518.344.2537

**Summit Station**

<b>Winter</b>	<b>Summer</b>
Polar Field Services Attn: Name of Employee/Researcher 8110 Shaffer Parkway Suite 150 Littleton, CO 80127 Tel: 303.984.1450/1439 Fax: 303.984.1445	CH2M HILL Polar Services Attn: Name of Employee/Researcher - Summit Station C/O Earl Vaughn 109 <sup>th</sup> Aerial Port Bldg. 20 Stratton Air Base Scotia, NY 12302-9752 Tel: 518.344.2635 Fax: 518.344.2537

**Other**

<b>Organization</b>	<b>Internet</b>	<b>Phone</b>
Medical Advisory Service (MAS) <b>(see below for Remote Telemed #)</b>	<a href="http://www.medaire.com/corp_medlink.html">http://www.medaire.com/corp_medlink.html</a>	Office: 480.333.3771
Summit Science Coordination Office (SCO)	<a href="http://www.geosummit.org">http://www.geosummit.org</a> <a href="mailto:sco@summitcamp.org">sco at summitcamp.org</a>	John Burkhart +47 96 82 5011

## SAFETY, ENVIRONMENT, HEALTH and PERMITS

Effective January 1, 2010 the Government of Greenland assumed responsibility for the permitting process for research in Greenland. All science teams planning to conduct research in Greenland must complete an **annual application** in order to obtain approval from the Government of Greenland. The application forms are available from the Department of Domestic Affairs, Nature and Environment at <http://www.nanog.gl/expeditions> or by sending an email to [ekspeditioner at gh.gl](mailto:ekspeditioner@gh.gl). Applications are submitted directly through the Department of Domestic Affairs, Nature and Environment. Be advised that a new fee of 4000 DKK has been put in place for permits. For assistance with the application process, contact:

Martin Schiøtz  
 Head of Section  
 Section of Nature  
 Department of Domestic Affairs, Nature and Environment P.O. Box 1614  
 3900 Nuuk  
 Greenland  
 e-mail: [ekspeditioner at gh.gl](mailto:ekspeditioner@gh.gl)

**Medical Clearance**

Arctic Program participants traveling into the Greenland field generally must pass a National Science Foundation-mandated physical and dental exam. All field team members should plan to complete their Physical Qualification (medical and dental clearance) process 6-8 weeks prior to travelling to Greenland. For more information, refer to CPS' *Greenland Guide*, available at <http://www.polar.ch2m.com/> under Greenland.

**Medical Advisory Service (MAS) Support**

If you need medical advice/assistance, do not hesitate to contact Medical Advisory Service (MAS) using the card included with the medical kit or the information below. Be sure that each team member knows where the kit is located and understands how to use the MAS service in the field. For further information on MAS, please visit our Web site <http://www.polar.ch2m.com/> and navigate to Medical>Remote Medical Services/Kits.

**MAS 24/7 Telemed Service**

Worldwide Phone: 1.480.333.3876  
 Fax: 1.480.333.3821  
 Member ID: CH2M HILL Polar Services

**RISK ASSESSMENT**

See Appendix for Risk Factors and Mitigation.

**CRITICAL SUCCESS FACTORS**

Please list the factors that are most important for the success of your science. We track these factors in order to measure the success of CPS' support. Examples might be the availability of the helicopter or camp gear.

<b>Factors</b>
Delivery of cargo from Kanger to Summit
Establishment of weatherport for working near Skiway (power, coms, heat, inclusive)
CPS support (communications, snowmobiles, and science tech support) for traverses to off station ground truth sites
Use of snowmobiles during campaign
Science support on flight days
Laboratory bench space in the Greenhouse
Occasional use of shop space, as outlined in the "other services" table
Retro of cargo to Kanger
PAX transport

**GOVERNMENT AND PERFORMANCE REPORTING ACT OF 1993 (GPRA)**

NSF/OPP requires your help in complying with the Government Performance and Reporting Act of 1993 (GPRA). One measure of CPS' performance is a "facility-performance metric" which counts the number of productive days your project has in the field while relying on CPS facilities or support. Please keep track of any "lost days" and report these to us at the end of the season.

**APPENDIX**

Risk Assessment and Mitigation

**RISK FACTORS and MITIGATION**

<b>Factor</b>	<b>Mitigation and Control</b>
Heavy lifting/body strains and sprains	-Use proper lifting techniques
Snowmobile Travel	-Participate in a snowmobile training -Have SAR plan in place -Use appropriate personal protection equipment/helmets -Carry survival gear on extended trips -Use radio communications between snowmachines -Carry a PLB (personal locator beacon) -Carry a GPS (global positioning system) unit
Cold Related Injuries-Weather	-Team members participate in a cold weather injury training course such as Wilderness First Aid or Wilderness First Responder -Wear proper clothing - Appropriate camping gear, insure sleeping bags are adequately rated -Check the forecast before going out of camp/town -Watch the weather while out -Be mindful of hydration, carry sufficient food -Develop and share you travel plans -Have and share an emergency plan for bad weather
Emergency Plan	-Compile a list of emergency contacts for your field team and share it with critical participants including your home institution and CPS. -Share your satellite phone number as a means for others to contact you.
Communications	-Carry the appropriate communications system (satellite phone) -Assure your phone and/or radio is fully charged before going out and carry a spare battery.
Foot/ski travel	-Have a communication plan in place (carry a radio) -Have a check out policy in place
Fuel Handling	-Participate in fuel handling training -Review current AHA (Activity Hazard Analysis) -Have a plan for fuel spills/first aid
Gas Cylinder Handling	- Review Haz Comm - Review MSDS (Material Safety Data Sheet)
Generator	-Attend generator training -Review current AHA (Activity Hazard Analysis)
Hazardous Materials	-Haz Comm SMS (Safety Management Standard) -Identify items for hazardous material transportation -Review MSDS (Material Safety Data Sheet)
High Altitude	-Participate in high altitude training -Have medical call in service available -Have SAR plan in place -Have oxygen available in high altitude camps -Develop plan to acclimatize -Consult with physician on use of medication for acclimatization
Power Tools	-Participate in a power tools training -Review current AHA (Activity Hazard Analysis)