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# Greenland Overland Traverse Science Capabilities

Geo Summit Meeting  
Goddard Space Center  
January, 31, 2013  
Jay Burnside  
Polar Field Services



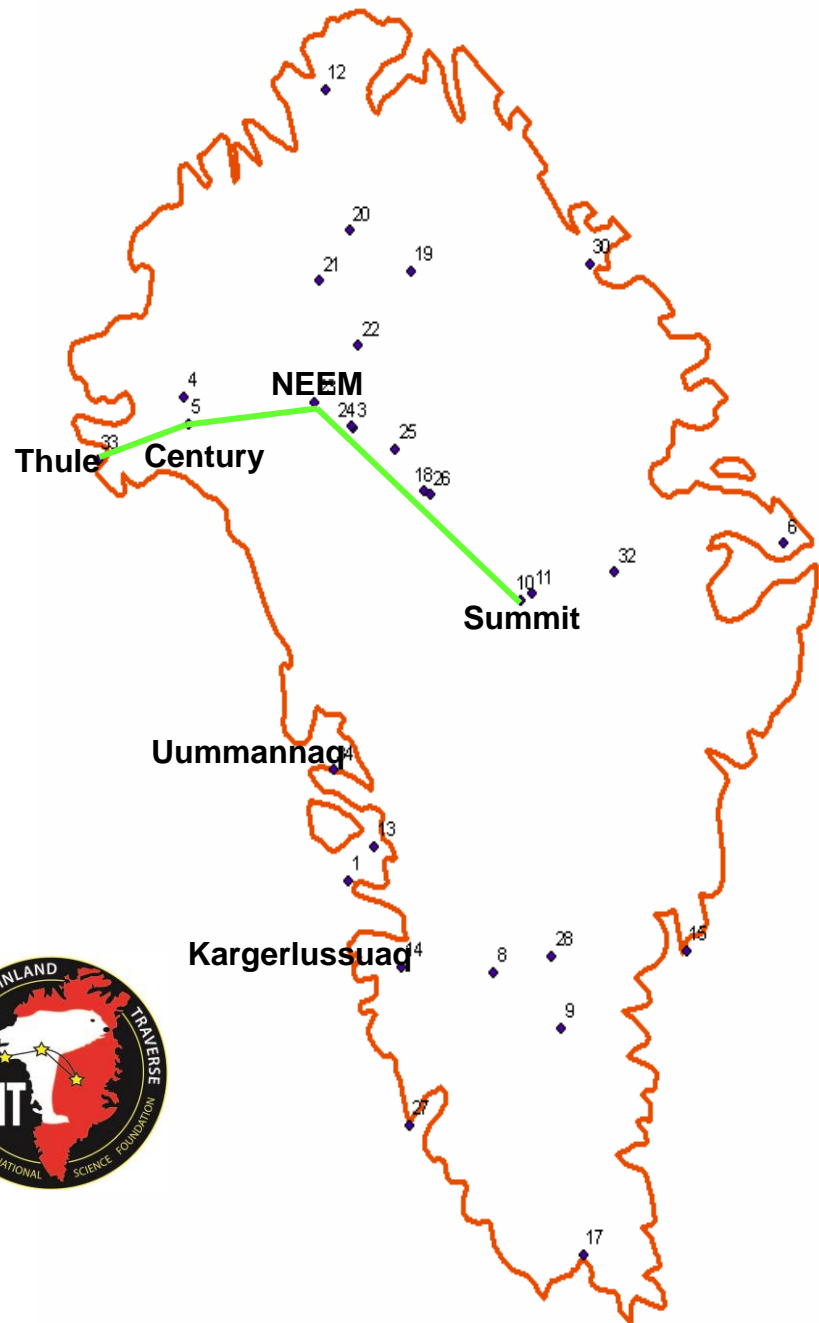
Photo by Pat Smith

GrIT is funded by the National Science Foundation as part of the Arctic Research Support and Logistics Services (ARSLS) Program



# The Route

- 1470 Miles round trip
- 70 miles of crevasse fields
- 0 – 10,660 ft altitude gain
- Large geographical area covered for science activities
- 6 – 8 weeks on ice



# Vision

The Greenland Inland Traverse (GrIT) will provide a multipurpose, flexible and scalable platform which will serve; to deliver fuel, cargo and equipment to any operations or research locations on the Greenland Ice Sheet and to support mobile scientific experiments and data collection. GrIT will operate in a safe, low environmental impact, timely and reliable manner.



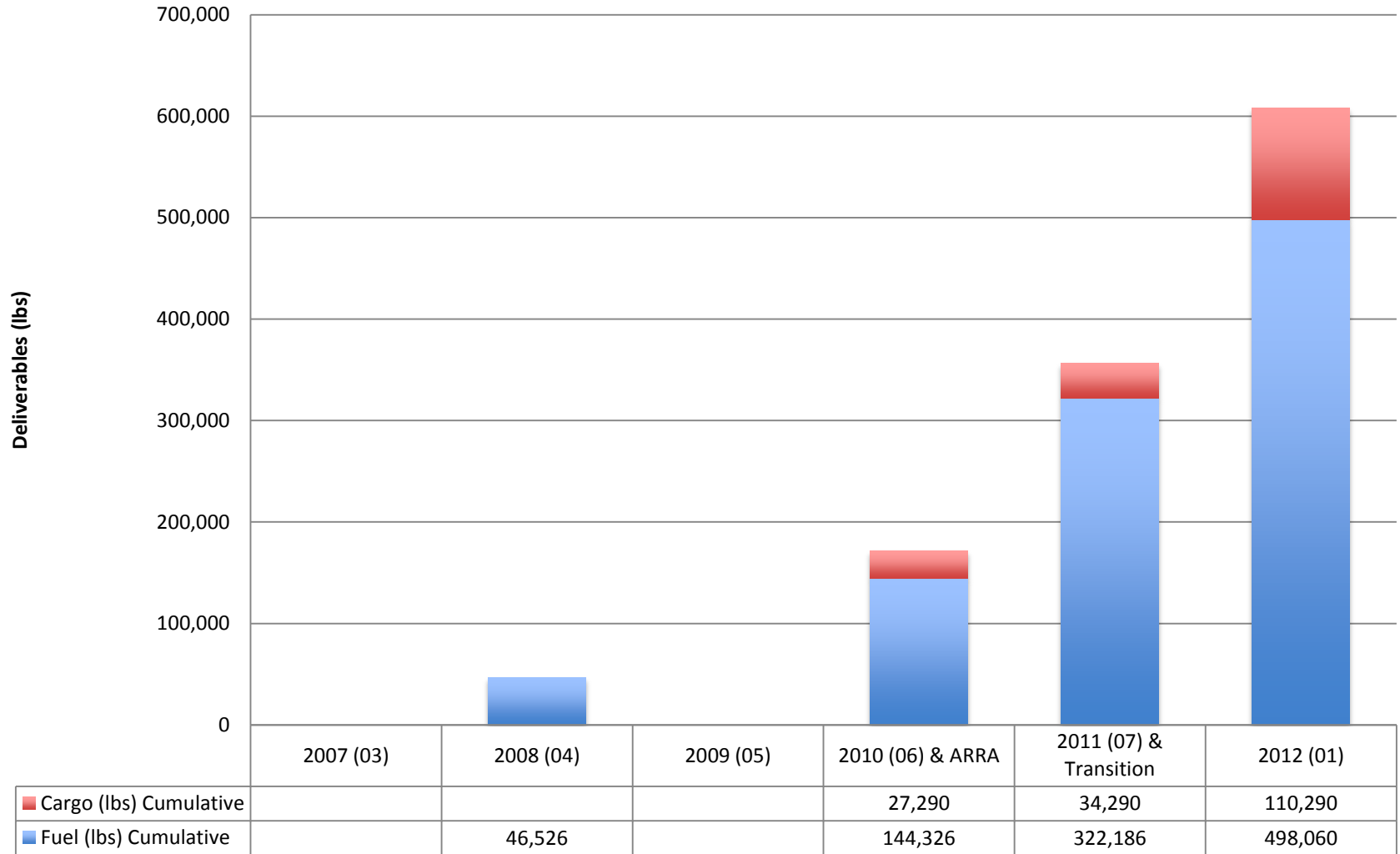
# Schedule

- Deploy in February
- Depart Thule early April
- Arrive Summit Early May
- Return to Thule Second Half of May
- Cargo vessel arrives Thule in late July

# GrIT Resume

- 4 trips made to date
- 4 Case Quadtrac 485's
- 1 Tucker
- 1 Pisten Bully
- 1 crew quarters
- 1 Survey Module
- 4 each 15' x 20' cargo decks (20,000 lb capacity)
- 30,000 gallon fuel deliverable
- Limited DNF capacity
- 5 -10 mph speed

# GrIT Deliverables 2008 - 2012



# Why Traverse?

- No significant weight or dimensional constraints
- An order of magnitude lower emissions
- Cost effective
- Can cover wide areas
- Doesn't need a runway!



# Why Thule?

- Deep water port
- Heavy airlift capable
- Infrastructure capabilities
  - Can-do operations contractor
  - Heated workspace
  - Warm & cold Storage
  - Equipment: cranes, loaders, trucks, etc



# A Challenging Start

- 15 mile gravel road to the ice edge
- Crevasses, up/down and side hills for the first 70 miles
- 10% grades
- Open only 2 months
- Choke point

# CRREL: Efficiency Through Engineering

- Route Finding
  - GPR assistance
  - Imagery analysis
  - Yetti
- Sled Efficiency
  - Plastics analysis
  - Finite Element Modeling
- Information Hub
  - Annual workshop coordination to leverage development between USAP and RSL
- Cargo Sled Development
  - Tube in pouch (Air bladder) development
  - Cargo deck engineering
- Material testing and Analysis
  - Plastics
  - Fabrics
  - Fuel bladders
  - Thermal

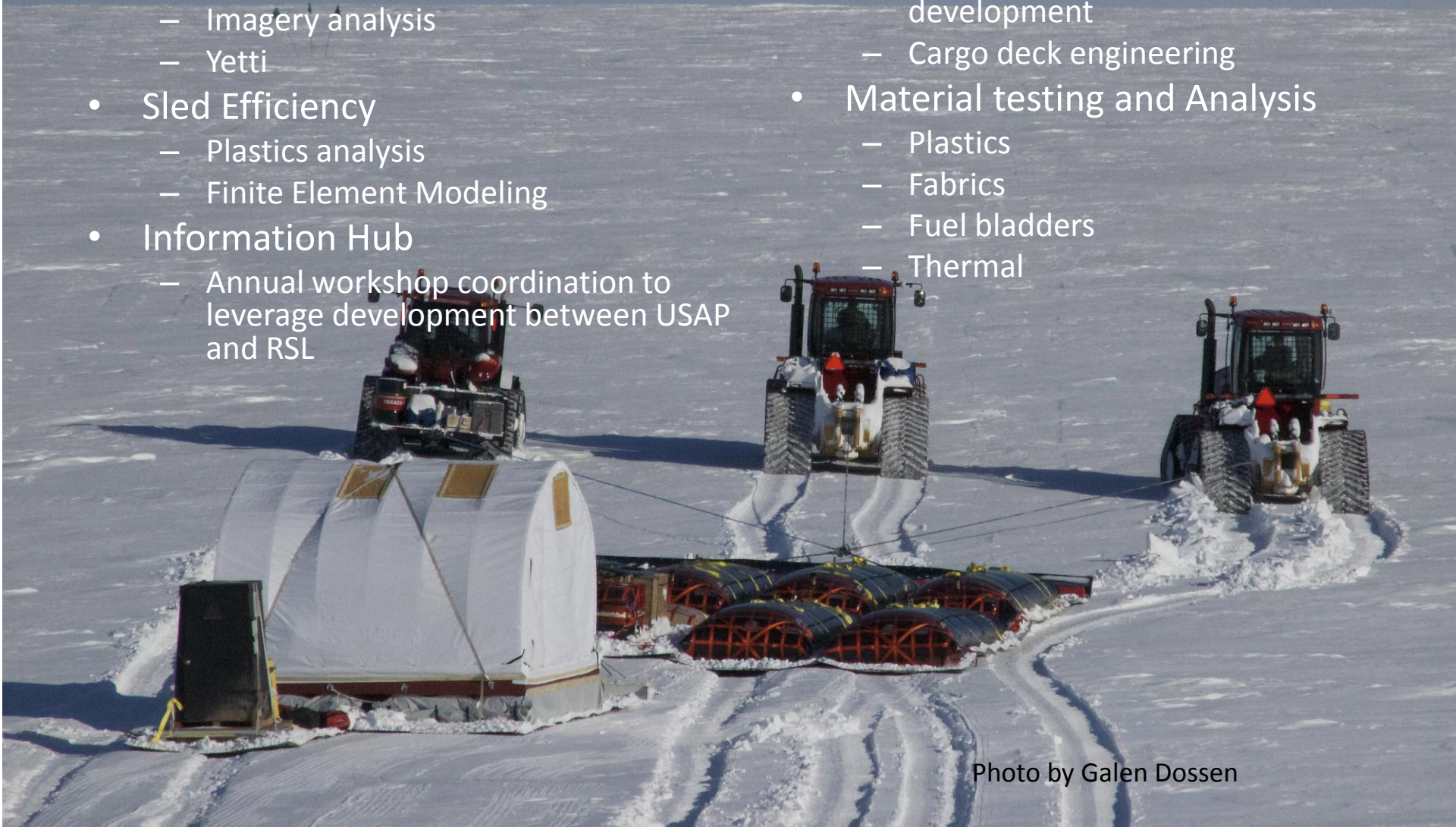
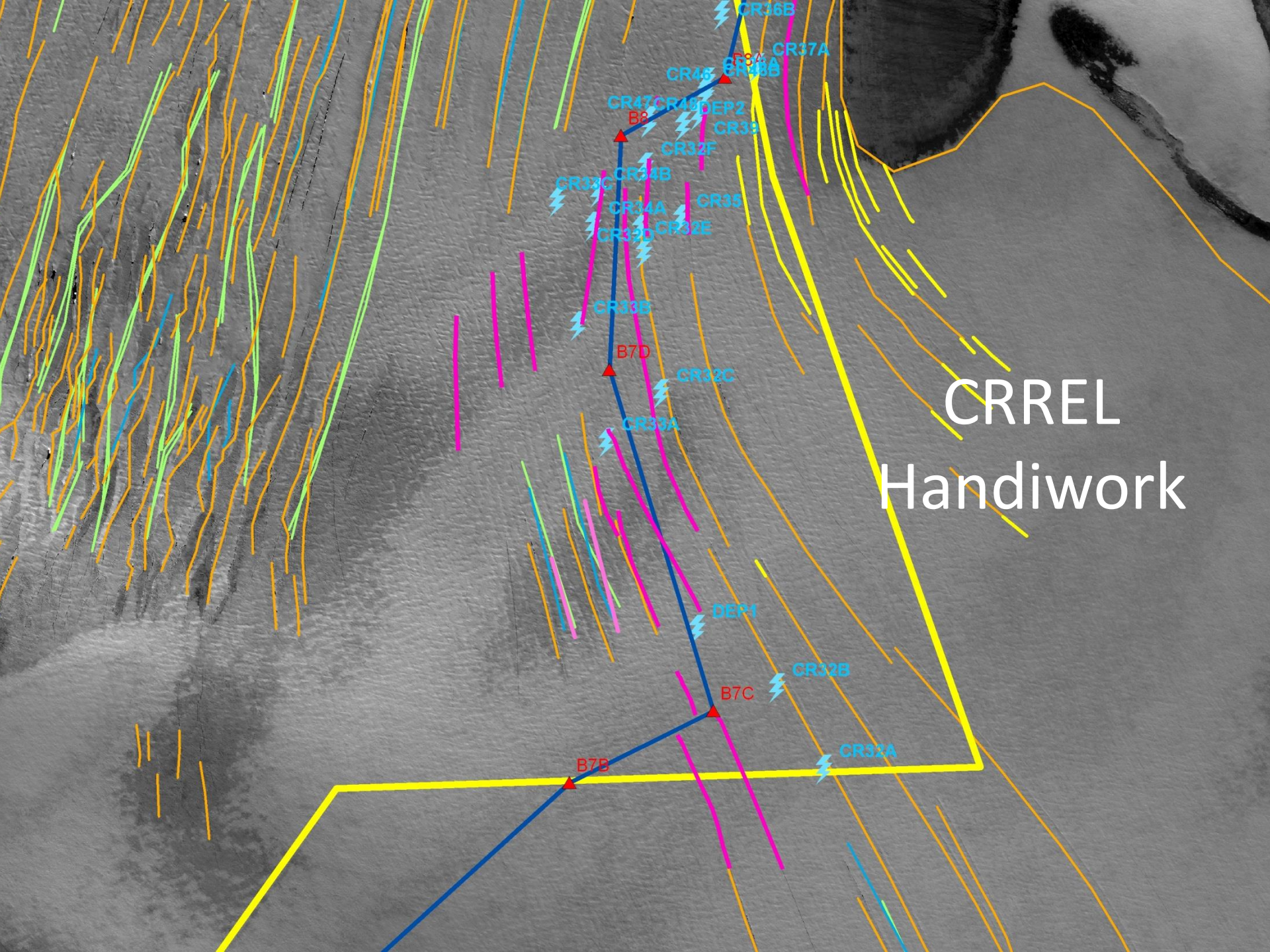


Photo by Galen Dossen

# CRREL Handiwork



**Fuel transport**  
**168,000 lbs/ 24,000 gallons per tractor**



# Air Ride Cargo Sled\*



**\*In development/ Lower payload per tractor**

Photo by Robin Davies

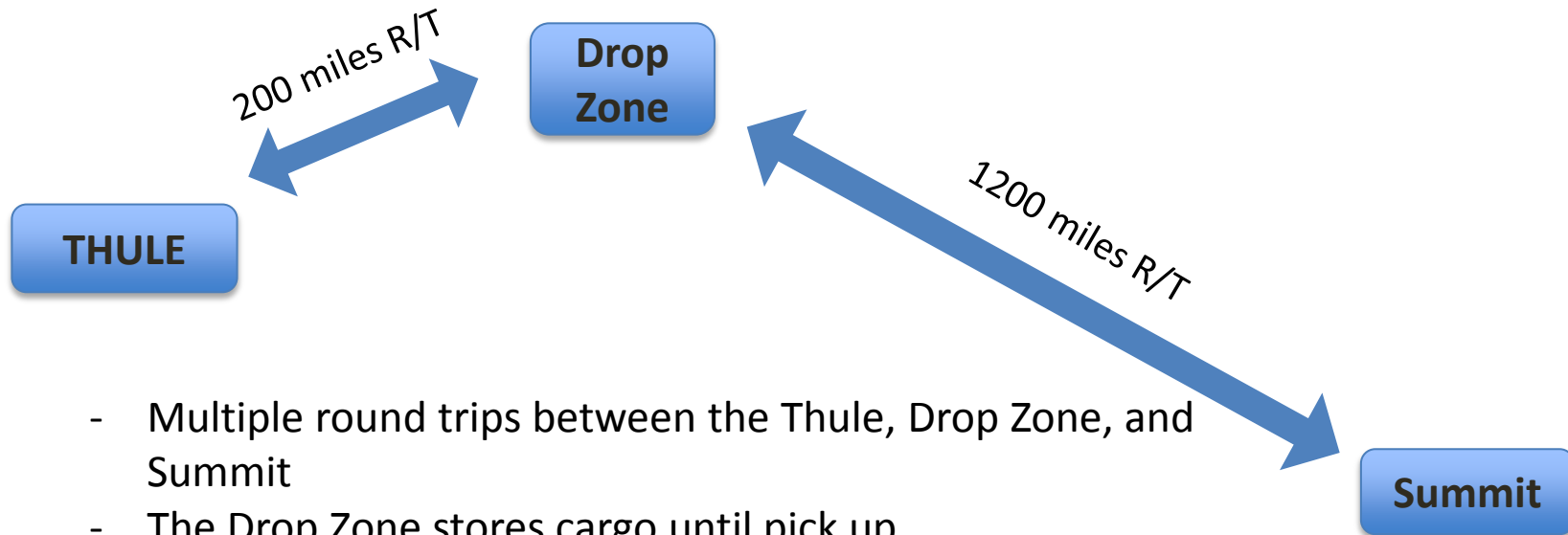
# 2014 At A Glance

- Single Round Trip
- 158,900 lb fuel delivery
- 239,300 lb cargo delivery
- 2 science project support
- Summit Retrograde
- 2-3 tractors winter at Summit for '15 NEEM relocation
- Potential route change for Science fuel cache
- No '15 traverse/ Preparing for a '16 Split Fleet



# Split Traverse Model

4 tractor version



- Multiple round trips between the Thule, Drop Zone, and Summit
- The Drop Zone stores cargo until pick up
- Upper Fleet machines are maintained and stored at Summit/Isi Station
- Thule Fleet consists of one tractor and all necessary SCAT equipment (Tucker and Pisten Bully)
- Upper Fleet returns to Thule the following season after SCAT cleared the route in March

# Split Fleet

## Pros

- Higher deliverable with the same fleet
- Can be used for other purposes when not fully tasked
- Reduced risk associated with tightly constrained schedule in crevasse zone
- Reduced cost per pound expected following development of a resource loaded schedule
- Likely to see better towing conditions due to packed trail

## Cons

- Capital cost to implement
- Increased duration of operation
- Winter Maintenance impact to Summit/Isi Station



Photo by Robin Davies



# Research Supported

- Hawley
  - GPR record NASA Ice Bridges
  - Snow Studies
- Smirnov
  - Sun photometer
- Go North!
  - Safe passage
  - Hauled dogs, people and food
- GrIT
  - Snow studies and mobility



# Considering Science with GrIT?

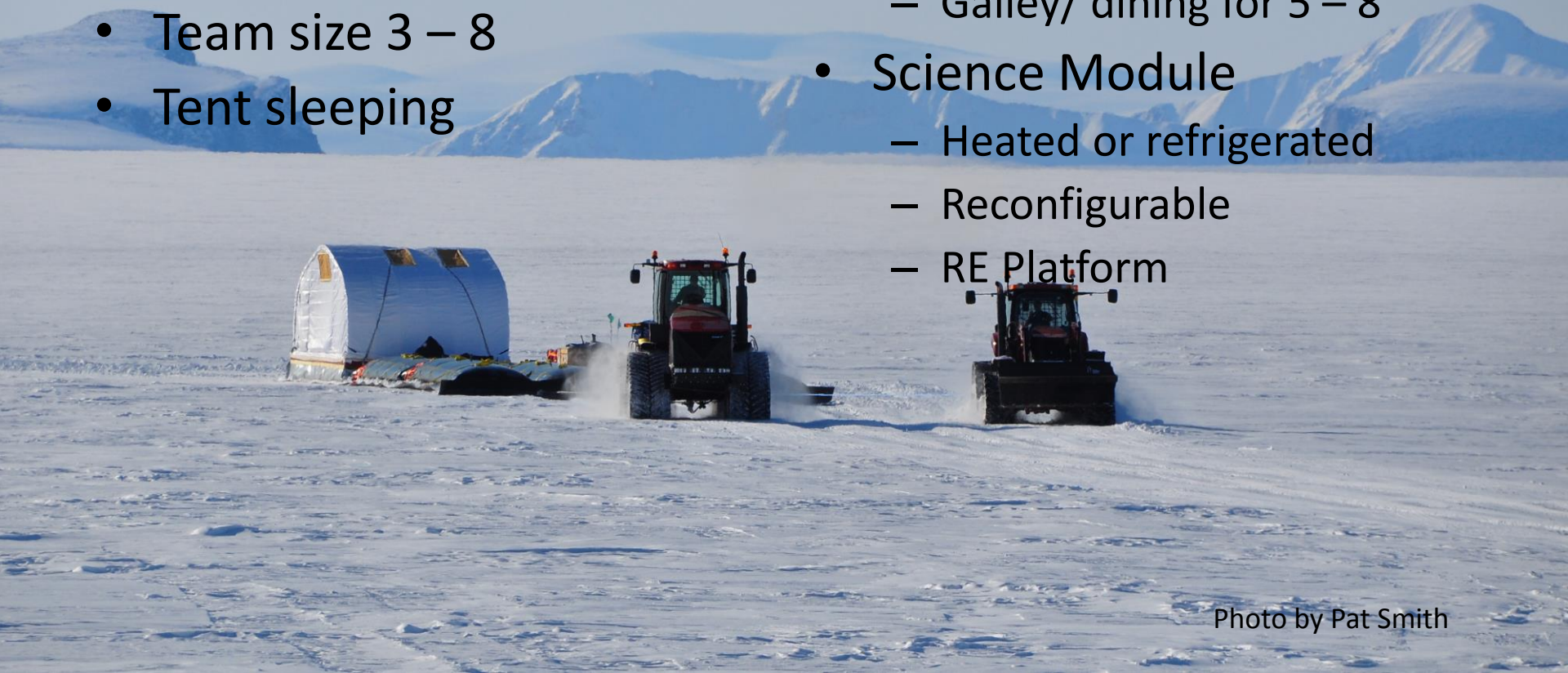
- Safe passage through the crevasse zone
- Fuel/ food depots
- Skilled crew
- Wide area to sample
- Lots of payload
- Fuel cache capability
- Compressed Timeline
  - Consider minimum science goals and bonus science goals
  - 4 weeks up/ 2 weeks back
  - Snow conditions and ambient temperature can wreak havoc with the schedule
- Route
  - Adjustments can be discussed to accommodate science needs
- Equipment
  - Limited heated housing
  - Limited equipment for science to launch from the GrIT

Photo by Pat Smith



# SCO Concept Science Camp

- Tucker/ Prime Mover
- 2 Snowmobiles minimum
- 1-2 cargo sleds
- Team size 3 – 8
- Tent sleeping
- Living Module
  - Power system/ RE
  - Comms
  - Galley/ dining for 5 – 8
- Science Module
  - Heated or refrigerated
  - Reconfigurable
  - RE Platform



# Many Thanks!



Photo by Pat Smith