

A Multidisciplinary University Research Initiative (MURI)

Sponsored by the Department of Defense

MATERHORN

The Technology Component (MATERHORN-T)

Ronald Scott Coppersmith

Mike Zenk



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The Technology Component (MATERHORN-T)

Ronald Scott Coppersmith

Mike Zenk

University of Notre Dame

- UAV and autopilot purchased – not yet delivered
- Some instrumentation complete, some in development
- New instrumentation – FASS (Pat Dunn),
- CTA signal conditioning for UAV (based on Stas Gordeyev circuit)
- Exact flight path still under discussion
- Exact phenomenon to be measured still under discussion
- More questions than answers today
- Multi-department project

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UAV

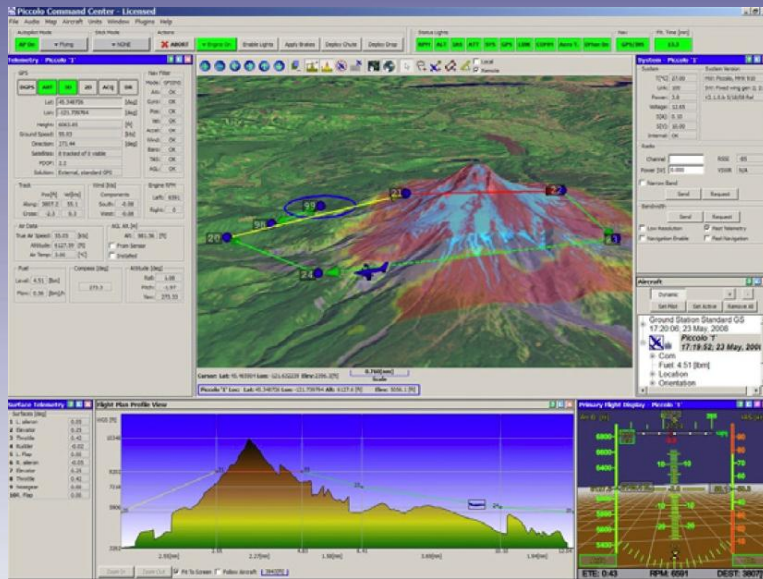


- Flamingo F-15 UAV manufactured in Australia by Silvertone Electronics
 - Wing Span4 Meters
 - Length2.9 Meters
 - Dry Weight10 Kg
 - Max Flying Weight20 Kg (with fuel and payload)
 - Top Speed90 mph – 144 kph
 - Stall Speed36 mph – 58 kph
 - Flight Timeup to 7 hours

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Autopilot

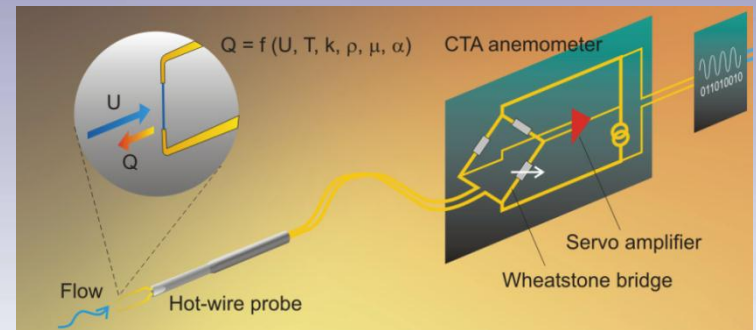
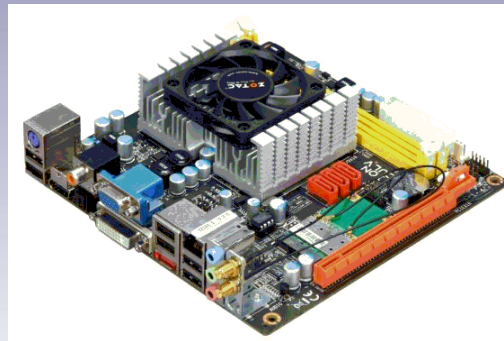
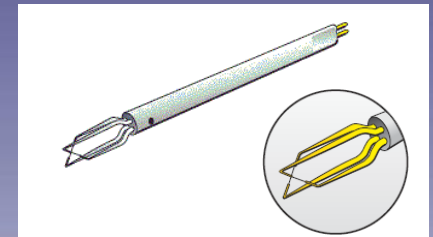


- Cloud Cap Technology – Piccolo SL
- 900 MHz Radio
- 4 Hz GPS, Analog/Digital/RS232 I/O
- Portable Ground Station

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Instrumentation

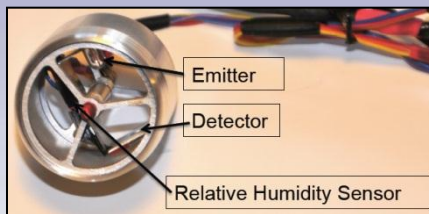


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Instrumentation

- Zotac IONITX-P-E Celeron 1.2 GHz dual-core Mini ITX Motherboard
- National Instruments PCIe-6343, 32-ch 500 kS/s 16-bit Data Acq.
- RM Young 81000 Ultrasonic Anemometer with Dual X-Hot Film CTA
- Fog Aerosol Sampling System (FASS)
- OCZ 480 GB Solid State Hard Drive for Data Storage using LabView
- Custom CTA Bridges and Instrumentation Signal Conditioning for UAV
- LiPoly Battery Power Supply



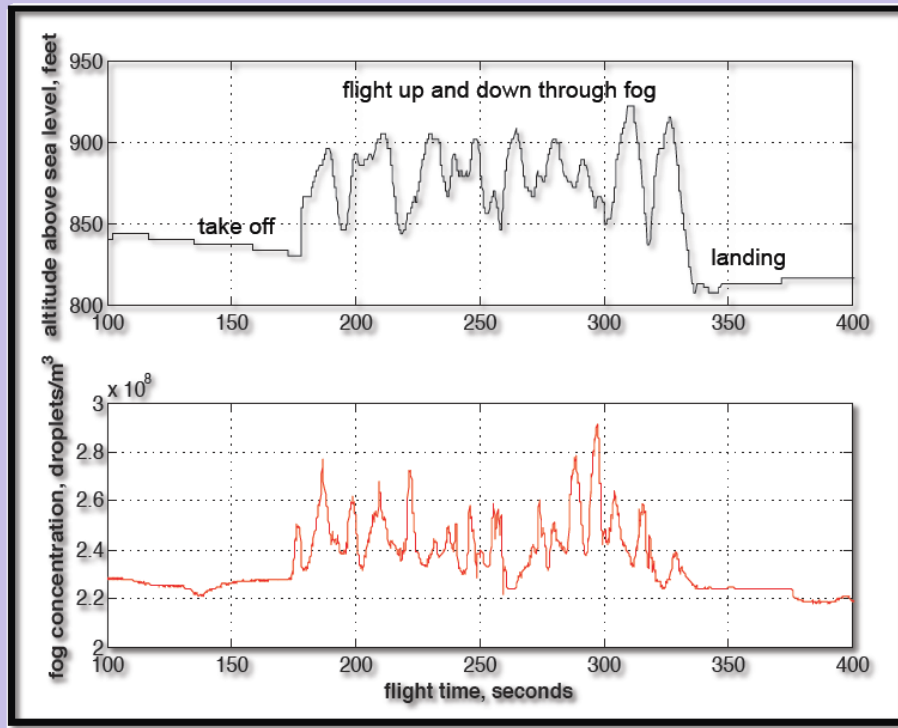
← FASS



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FASS-RPV Flight Test Result

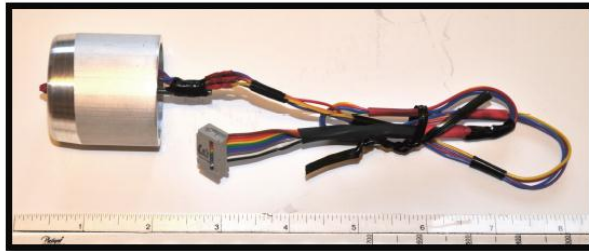


Flight altitude and fog concentration as RPV flies up and down through cloud of fog above runway.

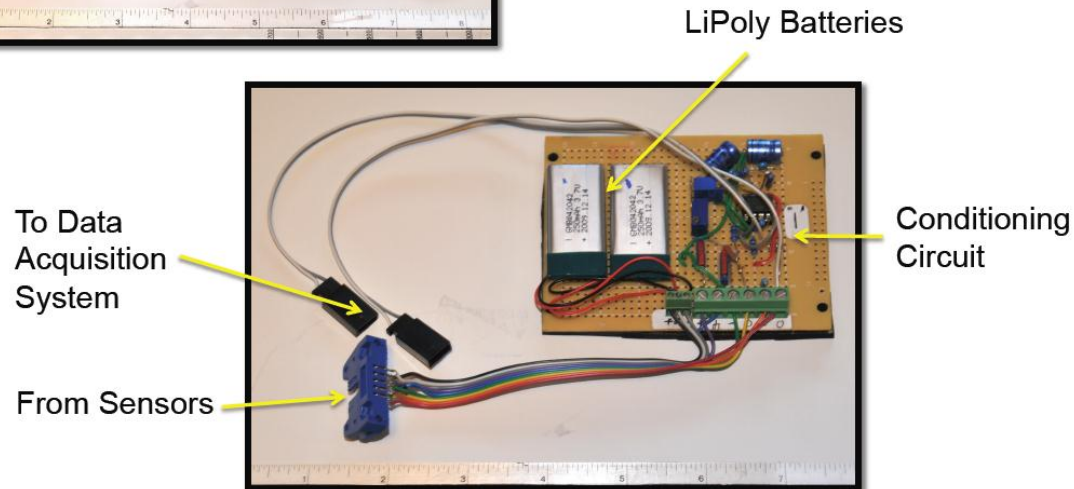
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Prototype Fog Sensor (side view and circuit board)



Weight of FASS and circuitry: 0.7 lbf.
Duration of autonomous operation: ~1 h.



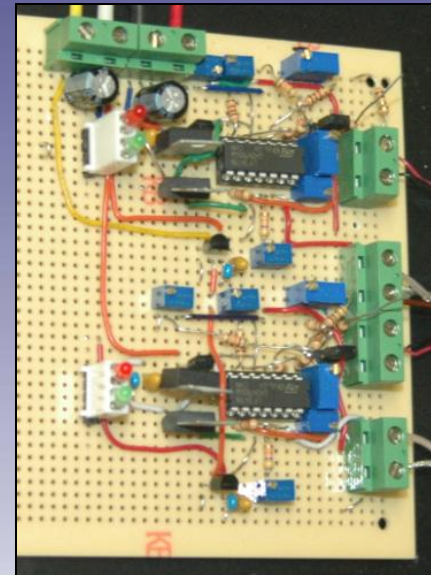
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CTA Hot Film Circuits



From Rack-Mount
to UAV-Mount



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Instrumentation

- Other Instruments:
 - Fine-wire Thermocouples (inside and outside UAV)
 - Pitot Tube
 - Relative Humidity Sensor
 - Data From Autopilot System, Accelerometers, Pitch, Yaw, Roll, Airspeed, Position (GPS)
 - Triggered Data Acquisition

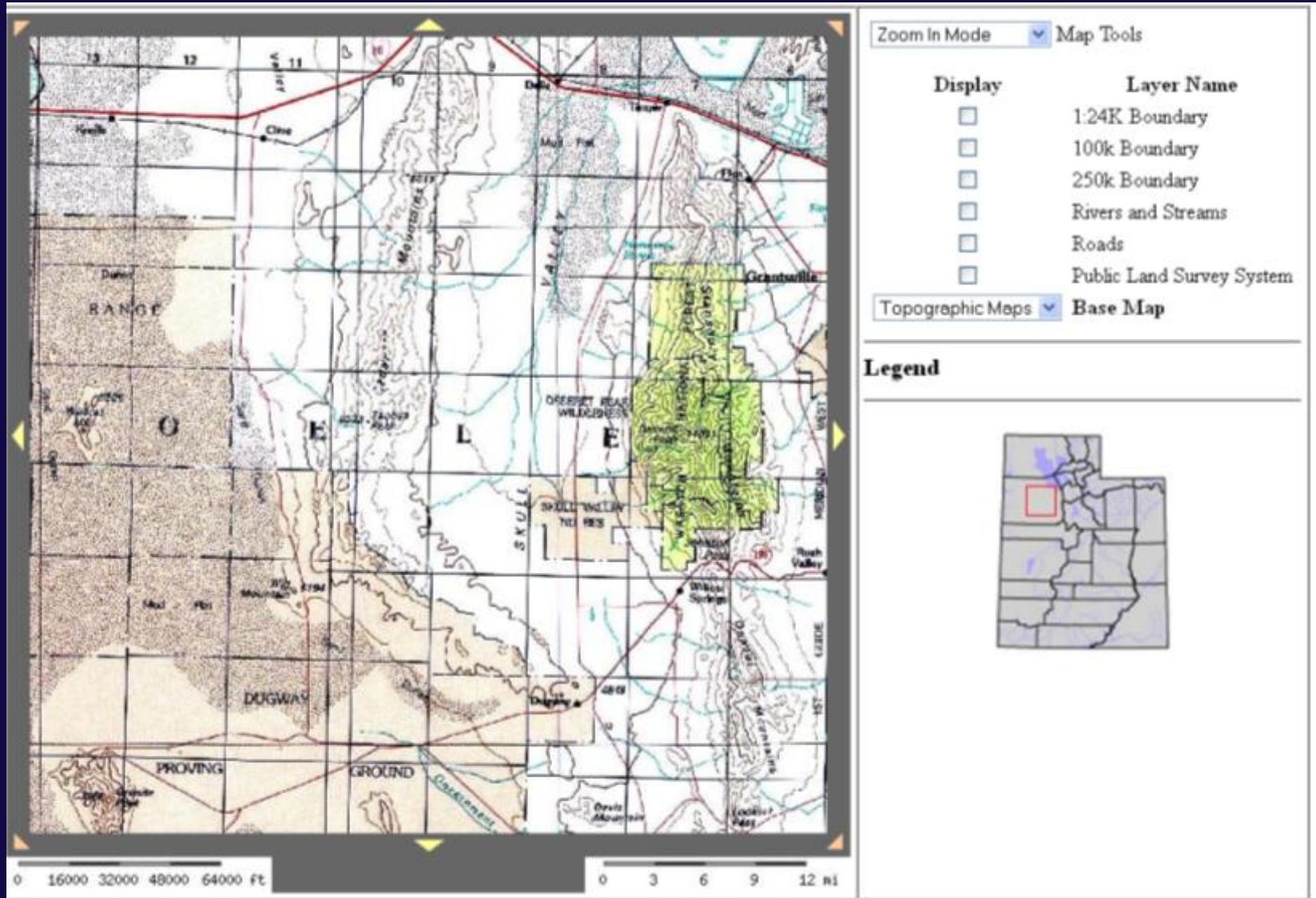
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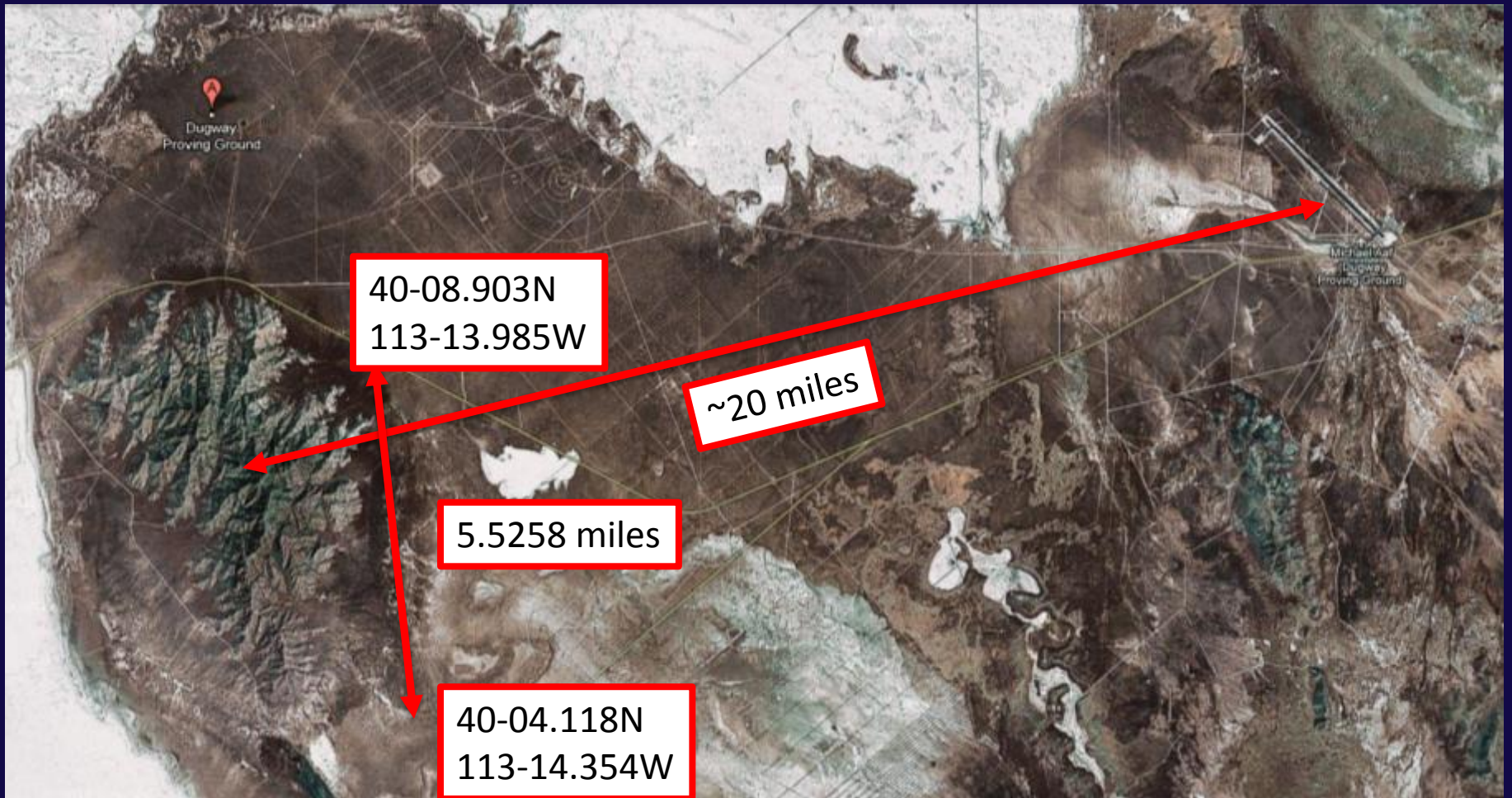
➤ Links:

- Silvertone - <http://www.silvertoneuav.com/new/index.php>
- Cloud Cap Technology - <http://www.cloudcaptech.com/>
- National Instruments - <http://www.ni.com/>
- ZOTAC Global - <http://www.zotacusa.com/>
- TSI CTA Systems - <http://www.tsi.com/en-1033/index.aspx>
- R.M. Young - <http://www.youngusa.com/>

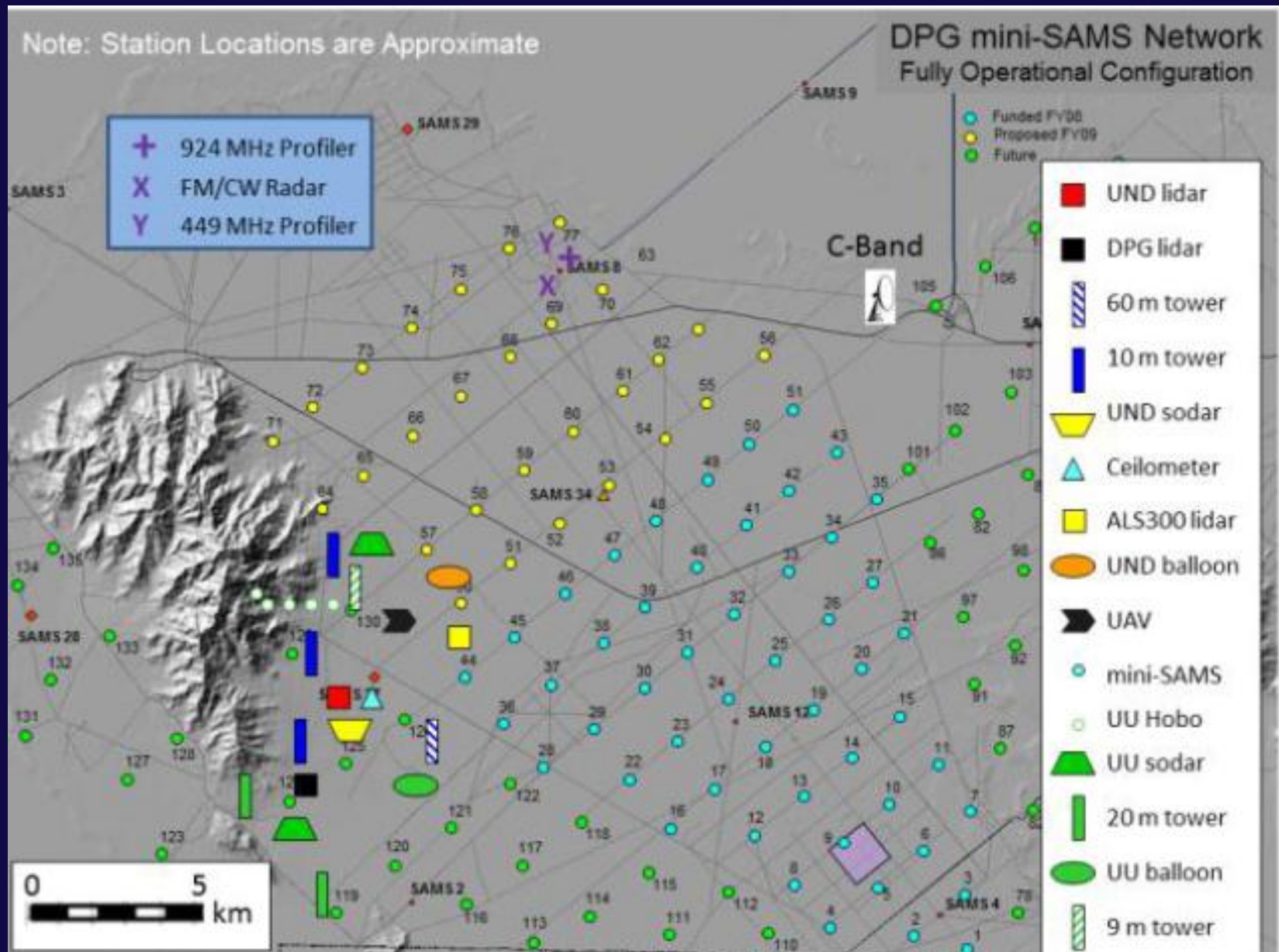
Salt Lake City to Dugway Proving Ground



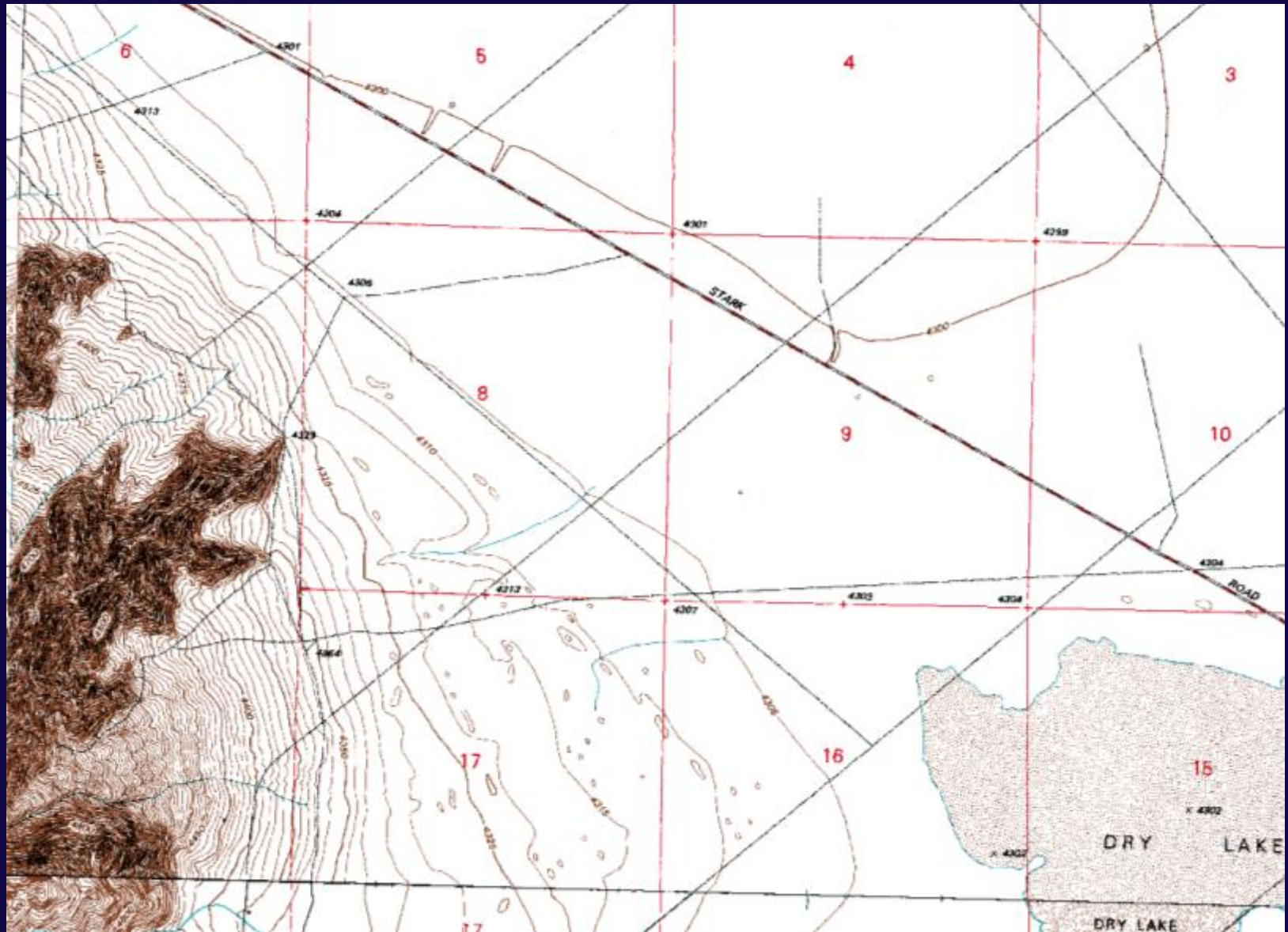
Michael AAF to Granite Mountain Proposed flight path



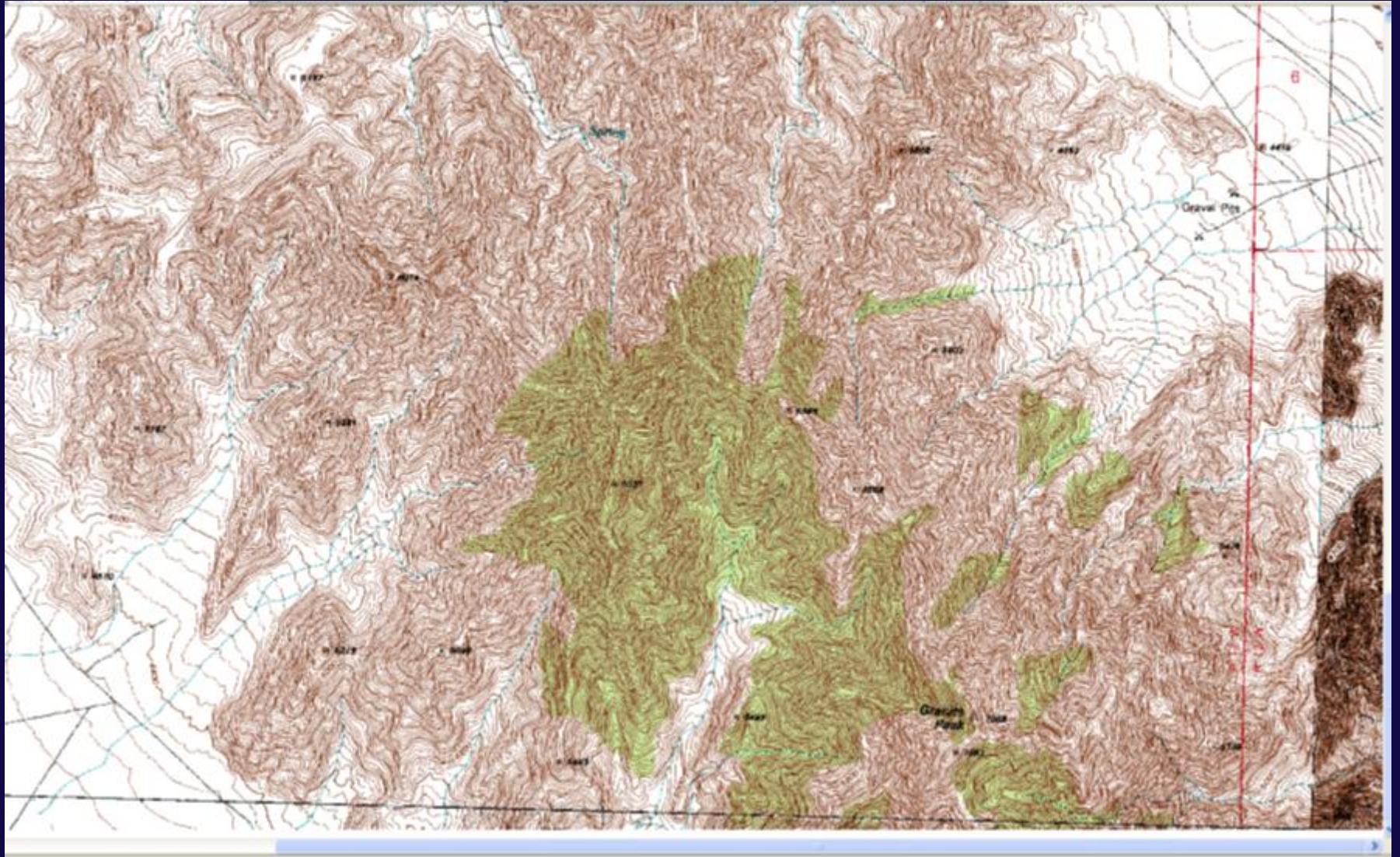
Instrumentation Locations



East Face of Granite Mountain



Granite Mountain Peak



Granite Peak Elevation Contours

4500ft to 7000ft

