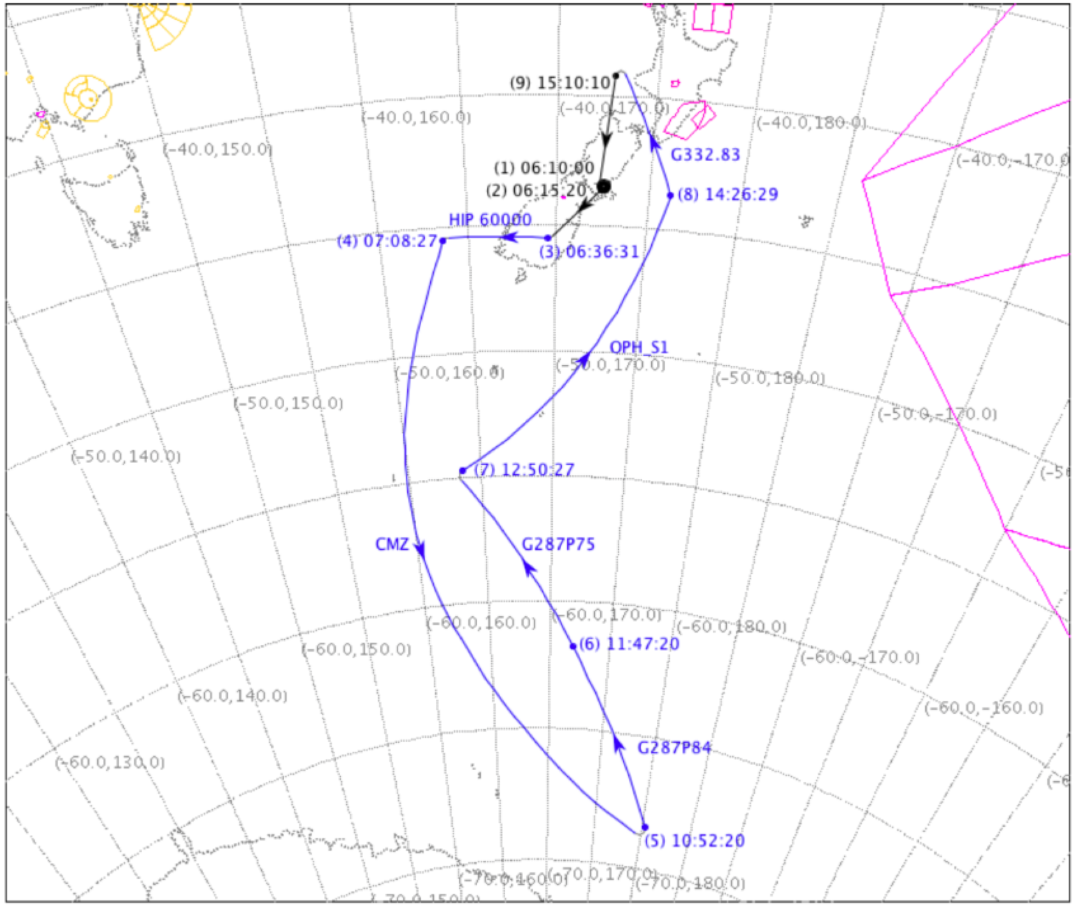
Notes on observing efficiencies

Andy Harris

University of Maryland

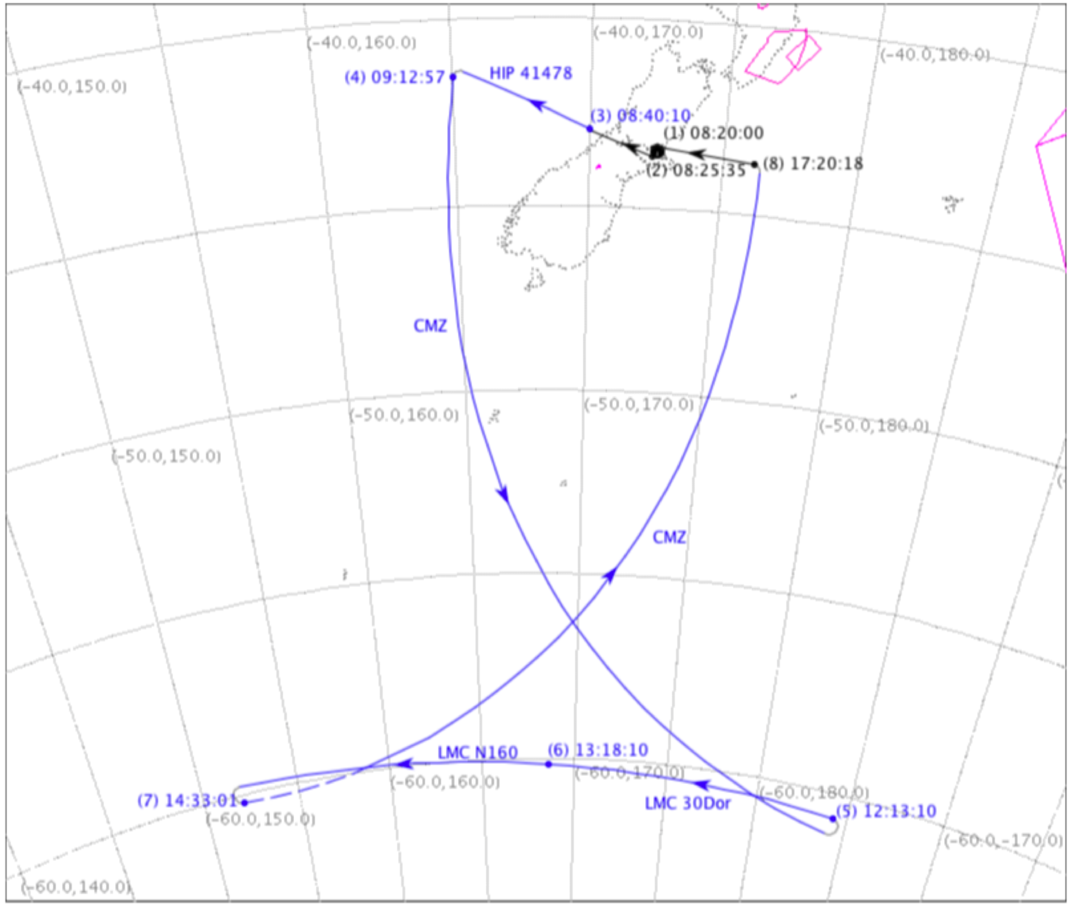
A set of personal and probably only partially correct observations and questions, based in large part on flying with GREAT for 5 flights from New Zealand

Flight planning



- Quite a jigsaw puzzle!
- Timed to the minute
- No wasted motion

Flight planning



- Quite a jigsaw puzzle!
- Timed to the minute
- No wasted motion
- Is altitude (atmospheric transmission) folded into planning?
- If project is not working out, how long does it take to replan flight plans accordingly?

Instrument observing efficiency

Total time estimate, from USPOT

$$t_{\text{total}} = \left(t_{\text{exp}} + a t_{\text{exp}} + b\right) n_{\text{rep}}$$

t_{total} Time estimate

t_{exp} Exposure time (typically on + off)

a Per - exposure scaling

b Per - exposure setup time

n_{rep} Number of repetitions or map points

Instrument observing efficiency

Instrument/mode	a (multiplier)	b (setup) [sec]
EXES	0	900/1200
FIFI-LS	1.666 (single point, mapping) 2.333 (bright object) 4.333 (spectral scan)	300
FORCAST imaging FORCAST grism	1.057/4.396 (chop modes) 1.057/1.943/5.888 (LWC; chop modes) 1.432/2.566/8.542 (SWC; chop modes)	30
GREAT	1	120
HAWC	1.5 (imaging) 2.75 (polarization) 2.5 (OTF)	300

$$t_{\text{total}} = \left(t_{\text{exp}} + a t_{\text{exp}} + b\right) n_{\text{rep}}$$

Are the instrument-operation teams right?

- GREAT has excellent staffing – my count was 9 experts on board for every aspect of this highly complex instrument
- Experts for aircraft subsystems (telescope, computer, mechanical systems) fly to monitor, and just in case something goes wrong
- Do other instruments have sufficient levels of support to produce high-quality data at high efficiency?

Door reliability

- The original concept was that the rigid door would always close, with typical redundancy in mechanism, and at least some contractors were chosen accordingly
- The door-drive contractor delivered a flawed product, and there were many problems, most if not all since resolved
- Return to base for potential door problems in conditions with potential precipitation kills off the highest altitude (often best) part of the flight
- Particularly difficult in winter flights from New Zealand
- Result: full-cost flight for partial flight time
- What is necessary for the door be declared reliable?

Weather problems that cancel flights

- Rain is a problem
- Christchurch has ceiling restrictions for all aircraft, needs an upgrade to its ILS to become all-weather (fog)
- Likely not nearly as much of a problem for Palmdale
- My impression is that the aircraft can land in zero visibility given the appropriate equipment on the ground; if so, there is nothing further the Program can do on this front

Fuel consumption estimates

- Notes from Troy Asher's, Nov. 2017 SIS meeting presentation: Fuel planning would normally run on a dispatch system owned by UAL that did not convey. Very detailed data from last 5 years, now using this to build models, which are going into flight planning software. Less fuel weight, climb to altitude more rapidly, better model during flight. Pilots tend to return early based on fuel estimate. Now carrying an extra 10,000 lb, about a half hour flight time. Reduced weight would give faster climb to altitude, allows 2500 lb/flight savings (~$10,000).
- Progress here?

Summary

- Efficiency looks pretty good overall
- But time is time
- All of these efficiency problems are multi-faceted
- How are systems-level efficiency questions organized and monitored?
- Can the SIS help?