OPTIMIZED GROUND SOLUTIONS TO SUPPORT UNIQUE SMALL SATELLITE COMMUNICATION REQUIREMENTS

34TH SPACE SYMPOSIUM, TECHNICAL TRACK

Jennifer Blasko
Director, Business Development for U.S. Civil Programs
SSC Space U.S., Inc.

April 16, 2018

AGENDA

- Introduction
- SSC Global Ground Network
- SSC Small Satellite Support: SWRI CYGNSS Constellation Example
- Conclusion

INTRODUCTION

ONE-SIZE-FITS-ALL DOES NOT NECESSARILY APPLY TO SMALL SATELLITES

Key criteria to support mission communications requirements:

- Availability – Strategically placed ground stations decreases the delivery time to receive critical data.
- Redundancy – Multiple antennas allow for flexibility and ensure availability of service in the case of rescheduled or late notice scheduled passes.
- Performance – SSC has a range of antennas (7m – 13m) to support different performance requirements. SSC has in house engineering capabilities to develop system enhancements.
- Scheduling – Customers can incorporate SSC's scheduling data into its systems which reduces scheduling time. SSC is in the process of further automating its systems to enable its customers to schedule passes through a secure web based portal.

SSC GLOBAL GROUND NETWORK

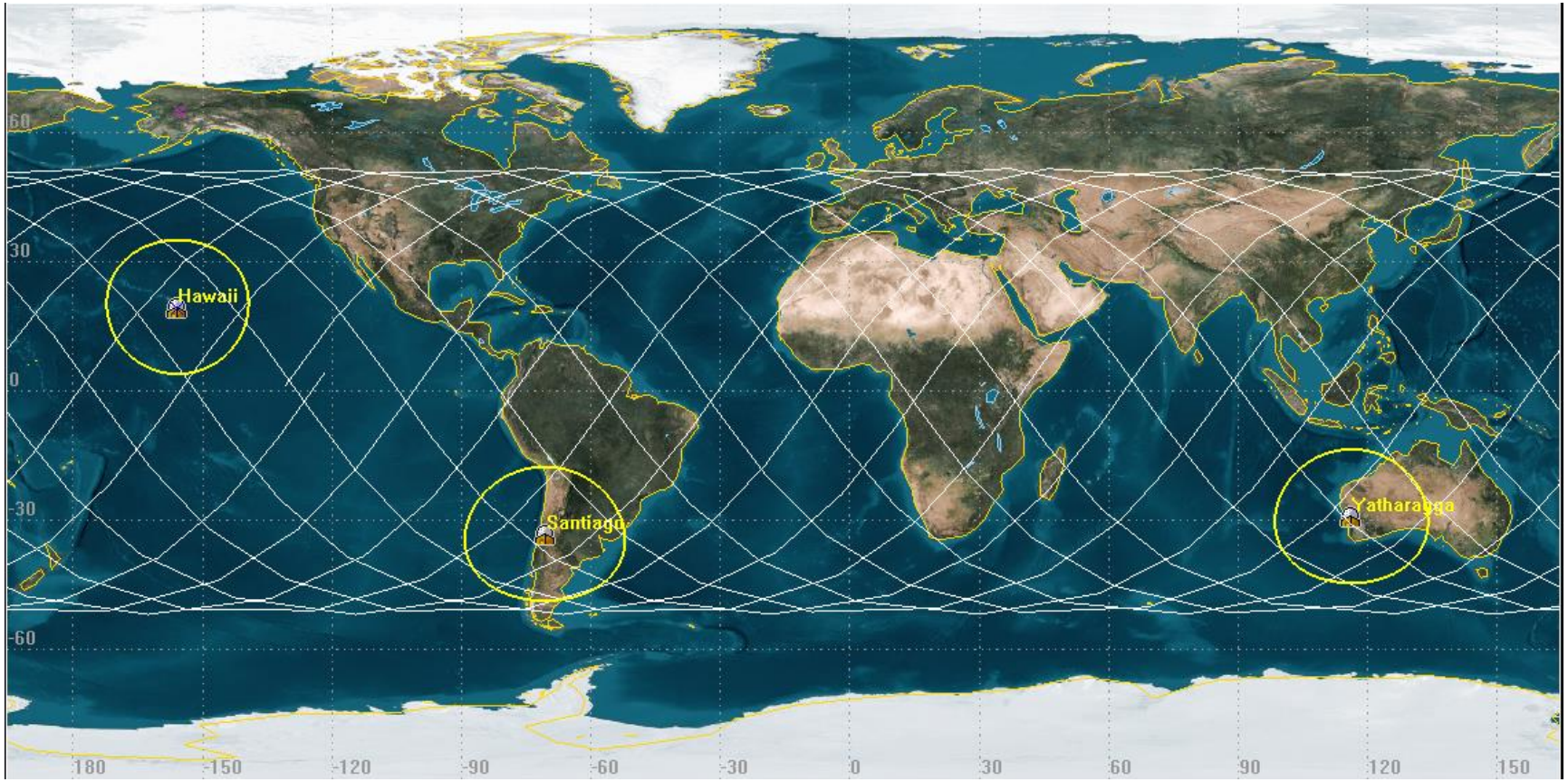
SSC SMALL SATELLITE SUPPORT CASE STUDY

SWRI CYGNSS MISSION

- 8 microsatellite spacecraft in LEO orbit
- Weather/hurricane science objectives
- All spacecraft support same nominal TX and RX S-band frequency
- Nominal operational concept of 1 contact every X hours per spacecraft specified by customer
- Real time command and telemetry with X minute latency on science data specified by customer
- Additional short notice contacts needed during hurricane activity
- SSC supports all spacecraft from 3 ground stations
  - Western Australia, Hawaii and Santiago
  - 3 equatorial and geographically diverse stations
  - Primarily use one 13m aperture at each station

INDICATIVE STATION COVERAGE

ASSUMING ISS LEO ORBIT



SSC CYGNSS MISSION TIMELINE

Activities supported:

Link budget analysis, 2 RFCTs, software development, FOR, ORR, etc.

BENEFITS OF ENGAGING EARLY IN THE MISSION DEVELOPMENT PROCESS

With proper planning, SSC was able to develop with the customer an optimized operations protocol:

- Reduced the time to achieve first contact with the spacecraft by 50%
- Supported multiple spacecraft during one contact with the ground
- During early operations, the SSC network was able to contact 5 different spacecraft during a single 15 minute station view using a single ground antenna.
- Ability to maximize the ground performance during a contact to deliver the most amount of data as possible

CONCLUSION

- A commercial ground services provider can be a valuable partner to a small satellite operator
- In addition to leveraging existing infrastructure, an experienced provider can develop engineering enhancements to improve mission success
- If possible, engage early on in the process
- When initiating new programs, small satellite developers should consider the downstream financial impact of identifying any issues and possible improvements up front
- In most cases, a financial analysis would show that it is worth investing some amount of budget for ground mission establishment if that investment yields more actionable data from the constellation.