L-3 Communications, CS-W
Special Temporary Authorization
Date: 06/30/2016

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Application Background:

The purpose of this project is to ground and flight test with point-to-point data links for application to mobile communications with hotspots for military applications. This application is very similar to File No. EL745412; STA File No.: 0824-EX-ST-2016; License WJ9XYX. This new application adds an airborne element to the test scenario.

Concept of Operations:

There will be up to 4 test stations operating up to 3 different simultaneous data links. The test stations are both ground based and airborne based. The aircraft is a PA-31-350 Piper Navajo Super Chieftain. Maximum altitude is 12.5kft or 3810m MSL with typical altitude being 10kft or 3048m MSL. The three links are referred to as the Discovery Link, the E-band link, and the Rover link.

Figure 1 illustrates the concept of operations for ground-to-ground-to-airborne testing where the green arrow is the Discovery Link, the red arrow is the E-band link, and the black arrow is the Rover link. Testing may include ground-to-ground tests, airborne-to-ground tests, or ground-to-ground-to-airborne tests.

The 4 test stations and associated data links are defined below:

- Station #1 will operate a Discovery link and E-band link simultaneously and is ground based.
- Station #2 will operate a Discovery link and E-band link simultaneously and is ground based.
- Station #3 will operate a Discovery link, an E-band link, and a Rover-Vortex link simultaneously and is airborne based.

- Station #4 will operate a Rover-TNR link and is ground based. Station #4 may at times be co-located with Station #2.

Spectrum Requirements:

Discovery Link:
The discovery link will operate in the unlicensed 900 MHz ISM band (902.2464-927.8208 MHz). The radio is a commercial off the shelf product (MM2-EX family) made by Freewave Inc. The radio uses a spread spectrum frequency hopping waveform. The radio is connected to an omni antenna.

E-band Link:
The E-band link will operate in either the 71-76 GHz or 81-86 GHz frequency bands. The radio is an L-3 custom product designed for these bands. Four data rates are included in the E-band radio which uses S-OQPSK for the 2 higher data rates and DPSK for the 2 lower data rates. All waveforms use 7/8 LDPC FEC with root raised cosine filtering α=0.33. The radio is connected to an axially displaced ellipse directional tracking antenna with 39 dBi gain, RHCP polarization, and 1.6° 3 dB beamwidth.

Rover Link:
The Rover link is comprised of two radios; an airborne L-3 Vortex transceiver (DD1494 J/F 12/09626) and a ground based L-3 Tactical Network ROVER (TNR) transceiver. The Rover-Vortex link will operate in C-band (4.4-4.94 GHz) for the down link and the Rover-TNR link will operate in S-band (2.2-2.29 GHz) for the uplink. The radios are both connected to omni antennas. DD1494's are available for both radios.

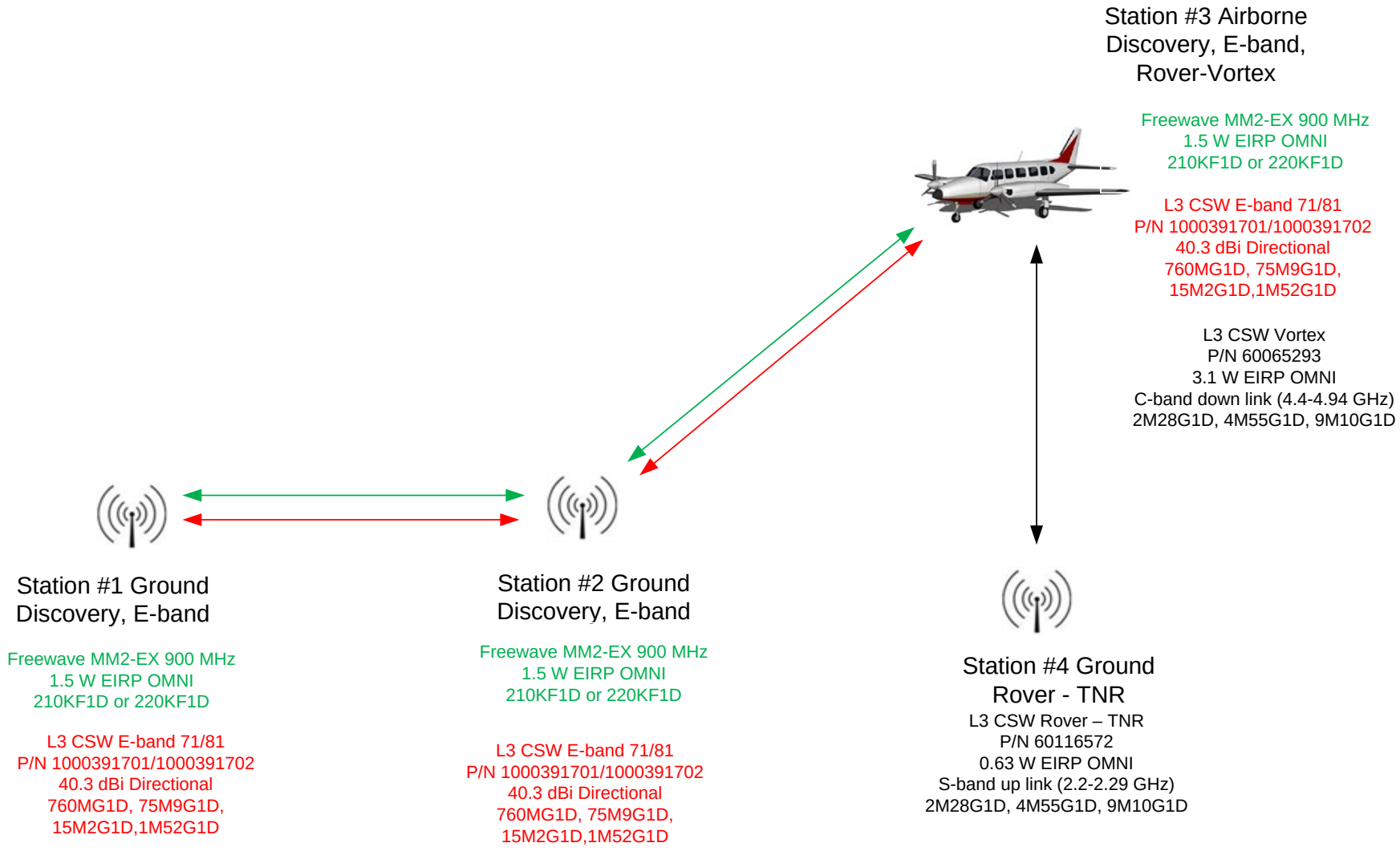

Figure 1 Concept of Operations – Ground & Flight Test

Ground & Flight Testing Summary

Location of Ground Equipment:

The approximate locations of the ground stations are shown in Figure 2.

- Ground station #1, Discovery and E-band, approximate location:
  Lat: N 40^0 54’ 39.04”, Long: W 111^0 50’ 37.35”, Alt 6357 feet (in the foothills above Bountiful, UT).
- Ground station #2, Discovery and E-band, approximate location:
  Lat: N 40^0 47’ 01.46”, Long: W 111^0 57’ 07.65”, Alt 4269 feet (on the L-3 CSW campus).
- Ground Station #4, Tactical Network Rover, approximate location:
  Lat: N 40^0 28’ 45”, Long: W 111^0 50’ 18.50”, Alt 6220 feet (in the foothills above Draper, UT).

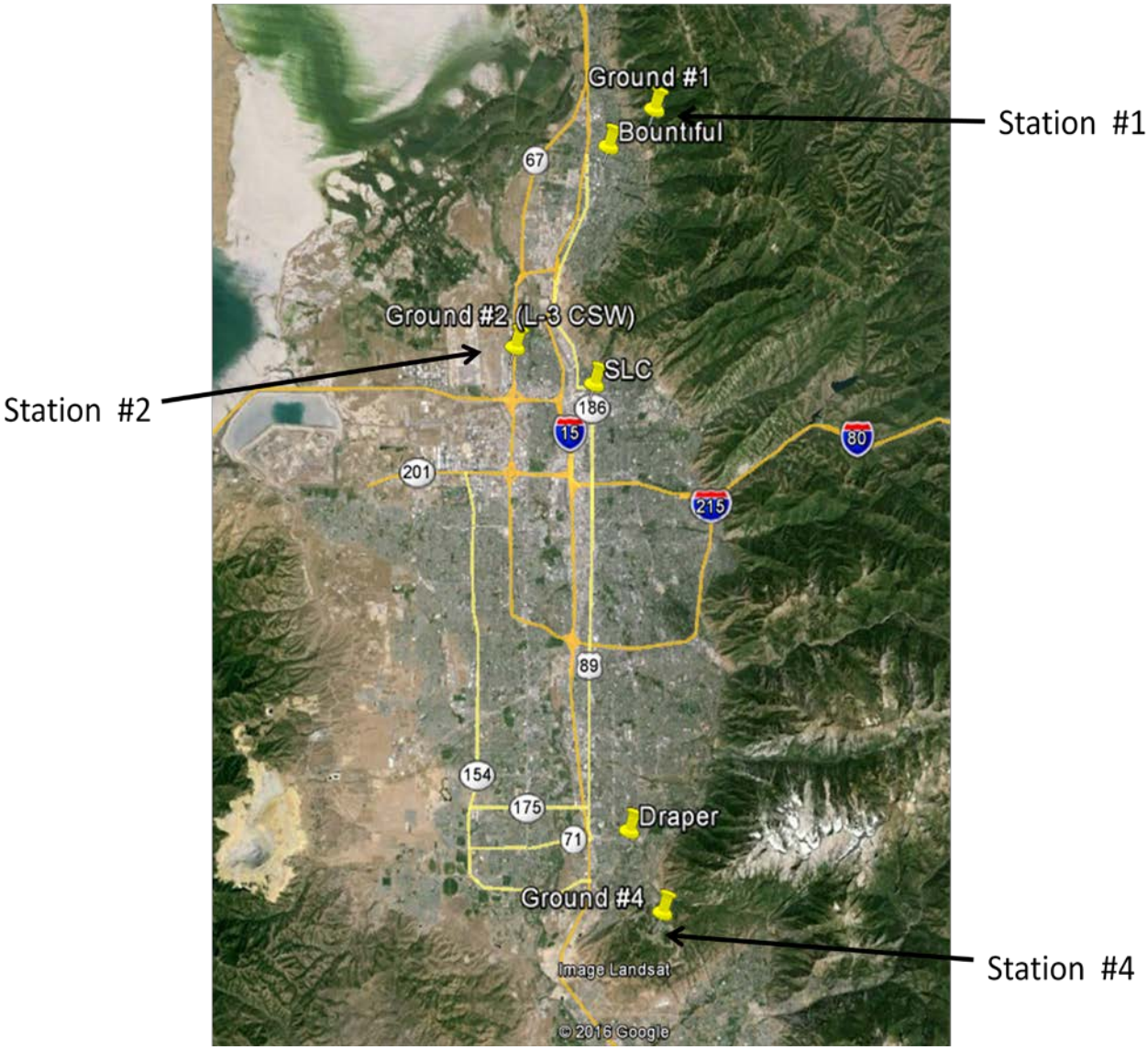

Figure 2 Locations of Ground Test Equipment

Location of Airborne Equipment:

The approximate location of the aircraft flight profile is shown in Figure 3. Typical altitude is 10 kft MSL. Approximate waypoints are listed below:

WP1: (Lat: N 40^0 44’ 00”, Long: W 111^0 53’ 00”)
WP2: (Lat: N 40^0 27’ 00”, Long: W 111^0 53’ 00”)
WP3: (Lat: N 40^0 27’ 00”, Long: W 111^0 47’39”)
WP4: (Lat: N 40^0 44’ 00”, Long: W 111^0 47’ 39”)

Racetrack center at Lat: N 40^0 35’30”, Long: W 111^0 50’10”)
Approximately 20 miles north to south length
Approximately 5 miles west to east width

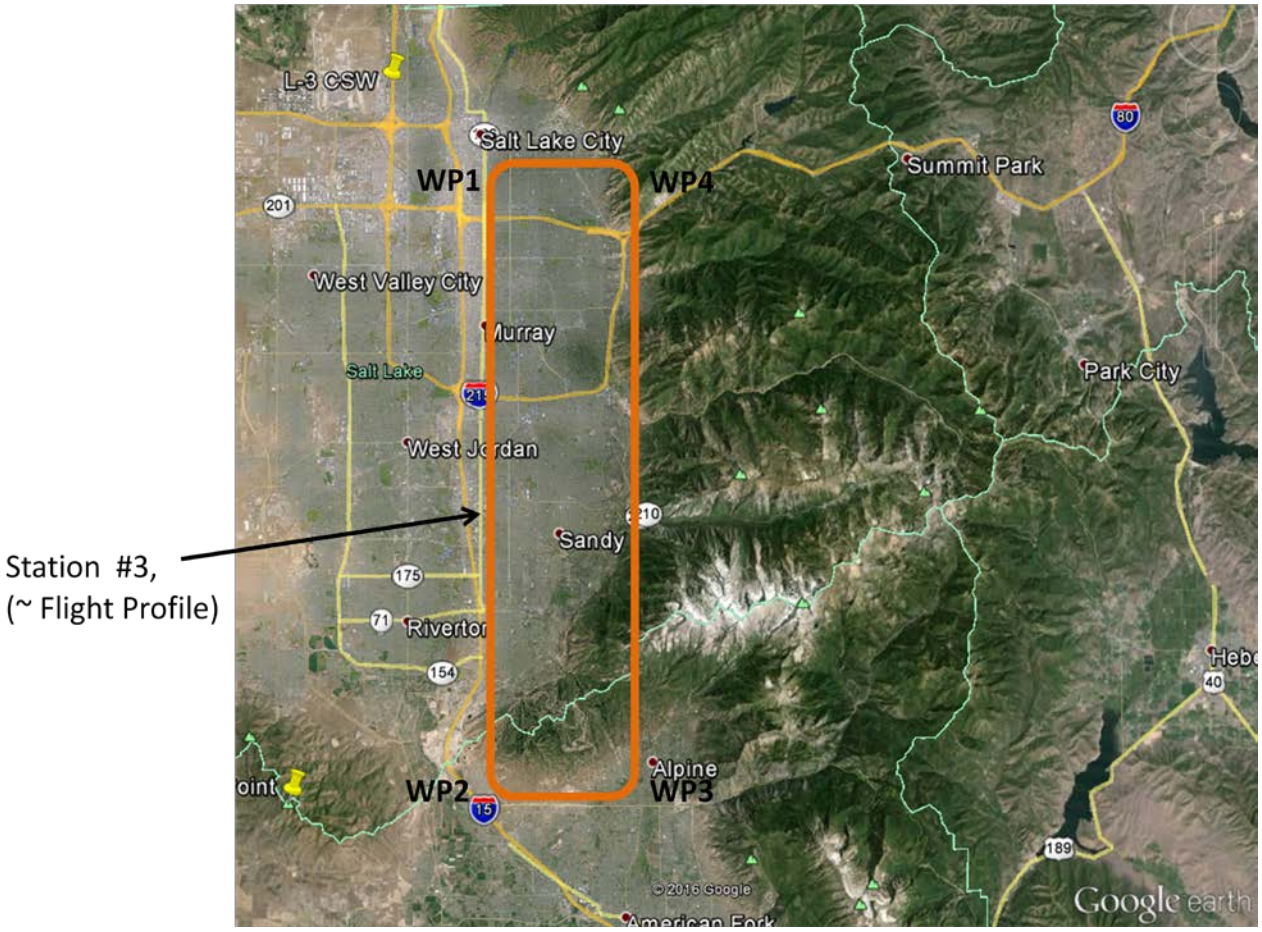

Figure 3 Location of Flight Test Equipment