

EXHIBIT F

**Silicon Valley Expert Witness Group, Inc.
Consultant Curriculum Vitae**

Stephen B. Heppe, D.Sc.

Expertise

- GPS and DGPS Technology
 - Direction-finding and Positioning
 - Communications Control Systems
 - Cellular communications
 - Mobile Satellite Services
 - Satellite Communications
 - Surveillance Systems
 - VHF Aeronautical Communications
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Professional Summary

Dr. Heppe has over 30 years of technical and managerial experience in aerospace, navigation and communications supporting private industry, FAA, DoD, NASA, and other US Government agencies and international clients. He currently operates Telenergy, Inc., an engineering consulting firm specializing in navigation and communication systems as well as spectrum management and product integration.

From 2002 until 2009, Dr. Heppe was Vice President and Chief Scientist for Insitu, Inc., a manufacturer of small robotic aircraft (SeaScan, ScanEagle/Insight, Integrator). His primary areas of responsibility included the aircraft avionics (radios, GPS navigation, satellite communications, video processing and RF transmission), engineering and flight safety reviews, support for technology roadmap development, management of the Company's portfolio of intellectual property, and spectrum planning.

Prior project experience includes:

- Support for the international development and standardization of a VHF radio communications protocol for aircraft networking and GPS positioning (VDL-4);
- Spectrum engineering and sharing studies for a Big LEO satellite communications system (Globalstar); Gateway siting and coordination; GPS/GNSS interference assessments; aeronautical support;
- Architectural development for a future mobile satellite communications system intended to support airborne users;
- Design and engineering support for various space-based Government systems, envisioned and operational, including Defense Satellite Communications System (DSCS), the Strategic Defense System (SDS), Space-Based Radar (SBR), Milstar, NASA's Tracking and Data Relay Satellite System (TDRSS) and its follow-ons;
- Various Naval satellite communications systems and the network for the US Air Force Consolidated Space Operations Center (CSOC).

Navigation Systems. Dr. Heppe's areas of technical expertise include GPS position and

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velocity determination for aircraft, spacecraft and ground vehicles, Differential GPS (DGPS) and Automatic Dependent Surveillance (ADS) systems, navigation accuracy determination, temporal and geographic studies of system effectiveness, architectural development, specification development, flight testing of hardware/software systems, and cost/benefit studies for government and commercial customers. Dr. Heppe participated in RTCA Task Force 1, which developed the aviation industry position on appropriate transition planning to a GNSS-based navigation and surveillance architecture. He was the Chairman of RTCA/SC-159 WG6 (Interference issues for GNSS) and teaches a course on DGPS data link technology.

Project experience in the area of navigation includes:

- Design, development and successful flight test of a DGPS precision approach and landing system for the US Marine Corps;
- Concept development for GPS-based navigation systems for the International Space Station, the Strategic Defense System (SDS), Space-based Radar (SBR) and commercial ground vehicles;
- Standards development for the DGNSS Instrument Approach System: Special Category I (DIAS:SCAT-I; RTCA/DO-217), and participation in RTCA SC-159 regarding the Wide Area Augmentation System and local augmentations for Category II/III operations;
- Support to the US Navy for the ground-based augmentation system (GBAS) intended to support GPS-based precision approach and landing;
- Support for the international development and standardization of a VHF radio communications protocol for aircraft networking and GPS positioning (VDL-4).

Communication Systems. Government/military work includes system design and analysis for multiple MILSATCOM systems including DSCS, Milstar, FLTSATCOM, AFSATCOM, Space-Based Radar, the Strategic Defense System (SDS), and non-military systems for NASA (TDRSS/TDAS) and the FAA. Commercial work includes design of a candidate SATCOM system for Saudi Arabia, design of a VSAT network for domestic US customers, and support for the Globalstar mobile satellite service system noted above. Dr. Heppe also led the communications engineering effort for the design, development and successful flight testing of a line-of-sight data link for a precision approach landing system relying on differential GPS, and concept development, testing/analysis, and demonstration of a commercial implementation of VDL-4. Dr. Heppe participated in the development of standards for DGPS data link (WAAS and LAAS) which currently define the infrastructure of GPS augmentation in the US National Airspace. Areas of technical expertise include protocol development, multi-access techniques, rain adaptation, fault detection/isolation/response, routing algorithms and overall network management.

Specific areas of technical expertise in the area of communications engineering include:

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- Spacecraft and space system design including project experience in:
 - Payload design (FAA satcom system design)
 - Spacecraft bus elements (TDAS, Brilliant Pebbles, ISS video-conferencing)
 - Constellation (Navy proliferated satcom, FAA, MILSATCOM architecture)
- Communications analysis over linear and nonlinear channels
 - Militarily significant channels (highly ionized/disturbed/obstructed)
 - Commercial channels (multipath/fading for communications and GPS)
- Anti-jam and low probability of intercept system design (DSCS, Milstar, BP)
- Detailed communications engineering disciplines including:
 - coding theory
 - modulation theory
 - network analysis
 - traffic loading studies
 - propagation studies

Experience in the area of communications control includes protocol development for the STDMA system noted above, as well as network design and control segment design for DSCS, Milstar, SBR, the SDS, and commercial SATCOM networks.

Surveillance Systems. Experience in the area of surveillance includes concept development and engineering analysis of GPS-based Automatic Dependent Surveillance (ADS) systems for en route and surface applications. Additional experience in the area of surveillance, specifically radar signal processing and direction finding, derives from Dr. Heppe's doctoral research and dissertation entitled "Iteratively Convergent Methods of Signal Characterization Based on Eigenspace Analysis." This work combines the popular MUSIC technique for signal characterization with adaptive beamforming and optimization strategies to simultaneously enhance DF performance for low-level signals, while reducing computational load.

Employment History

From: 1994 **Telenergy, Inc.**
To: Present Hood River, OR
Position: *President*

Dr. Heppe provides consulting services through Telenergy in the area of telecommunications, satellite communications and GPS positioning and navigation. His project experience includes:

- Support for development of new standards for command and control of unmanned aircraft in the US National Airspace;
- Systems engineering and standards development for a GNSS-based time-synchronized self-organizing TDMA concept for VHF data link communications in support of civil aviation;

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- Tradeoff analysis of alternative data link technologies at VHF and L-band;
- Evaluation of GPS-based and GNSS-based navigation performance in an environment containing RF interference;
- Support for the development of new international frequency standards associated with low-Earth orbiting (LEO) Mobile Satellite Service (MSS) systems;
- Interference studies between LEO MSS systems and the Microwave Landing System (MLS).

In the area of international standards development and spectrum coordination, Dr. Heppe was a member of the U.S. delegation to WRC-95, has experience in ITU SG4, WP4A and WP8D, and has participated in ICAO/AMCP, ICAO/GNSSP and the ICAO Special COM/OPS Divisional meeting (1995).

Dr. Heppe teaches several courses on GPS, RF communications and interference and jamming with Navtech Seminars and GPS Supply.

From: 2002 **Insitu, Inc.**
To: 2009 Bingen, WA
Position: *Vice President and Chief Scientist*
Roles include the corporate technology roadmap, concept development for new engineering initiatives, design reviews, safety reviews, incident analysis and maintenance of the company's IP portfolio. Dr. Heppe was responsible for the RF communications and GPS subsystem of the company's small robotic aircraft product line.

From: 1997 **ADSI**
To: 2002 Bethesda, MD
Position: *President*
Dr Heppe was President of ADSI, a start-up company dedicated to air/ground data networking for civil aviation using VDL4. Over a five year period, ADSI was successful in developing flight-qualified hardware and software which resulted in successful flight testing of the radio technology and associated networking software. Dr. Heppe's responsibilities included system architecture development, system simulation, international standardization, test planning, technical marketing and investor relations.

From: 1978 **Stanford Telecommunications, Inc.**

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