VEXAG's VENUS BRIDGE FOCUS GROUP. J.A. Cutts[1] and the VEXAG Venus Bridge Focus Group, [1](james.a.cutts@jpl.nasa.gov) Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Drive, Mail Stop 321-B60, Pasadena, CA 91109

The Venus Exploration Analysis Group (VEXAG) established a Venus Bridge Focus Group in the spring of 2017 in response to an inquiry made by NASA's Science Mission Directorate as to whether viable Venus missions could be conducted within a $200M cost-cap. This Focus Group objectives are to evaluate: (1) if useful Venus exploration can be performed within a $200M cost-cap, and (2) if there are viable and cost-effective options for continuity between NASA's most recent mission to Venus (Magellan 1990-1994) and any future medium-to-large class U.S.-led mission to the planet Venus in the late 2020s. This effort also recognizes the need to address technology advancements that would further the success of large-scale missions to Venus launched subsequent to 2025. Thus, the Venus Bridge Focus Group is considering science, architectures, and technologies that could be pursued via small spacecraft (SmallSats or CubeSats) carrying payloads with masses of 30 kg to 120 kg, that could perform significant science investigations as defined in VEXAG's *Goals, Objectives, and Investigations for Venus Exploration* [1] with launch dates in the early-to-mid 2020s.

Mission concept architectures that are being addressed include stand-alone missions (including launch vehicle), ride-alongs on other planetary missions, or missions that fly by Venus for gravity assists. Thus, low-cost mission architectures could be implemented via fly-bys, orbiters, probes, or landers. As the study of new technologies is an important target for the Venus Bridge missions, the Focus Group is addressing the most recent advances in propulsion, communications, atmospheric-probes, aerial-platforms, and lander technologies.

A dozen mission concepts were collected in response to a community call. These concepts are being collated into basic architectures with the emphasis on linkages between mission elements. These linked mission elements could enable cost-effective feasibility-advancing Venus missions that might not otherwise arise. Noting that a successful probe or lander mission would likely require a telecom relay via an orbiter already on-station, the Focus Group is addressing mission architecture studies linking orbiters and in-situ elements.

Two complementary mission concept feasibility studies will be completed this year. The first study linking a Surface Element (lander) and Orbiter Relay will be performed by the COMPASS Team at NASA Glenn Research Center. The second study linking an Orbiter and Atmospheric Element (Probe or Aerial Platform) will be performed by JPL's Team-X. Based on these studies, the Venus Bridge Focus Group will establish feasible combinations of mission architectures that agree with the *Roadmap for Venus Exploration* [2]. A Final Report will be delivered to NASA in early 2018.

In summary, Venus Bridge is a unique opportunity to examine low-cost mission concept architectures with linked mission elements that would enable the acquisition of new Venus science in the early 2020s, ahead of the next generation of medium-to-large NASA/U.S. Venus missions.

References

[1] *Goals, Objectives, and Investigations for Venus Exploration*, VEXAG, August 2016. http://www.lpi.usra.edu/vexag/reports/GOI-Space-Physics-Update-0816.pdf

[2] *Roadmap for Venus Exploration*, VEXAG, May 2014. http://www.lpi.usra.edu/vexag/reports/Roadmap-140617.pdf

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