

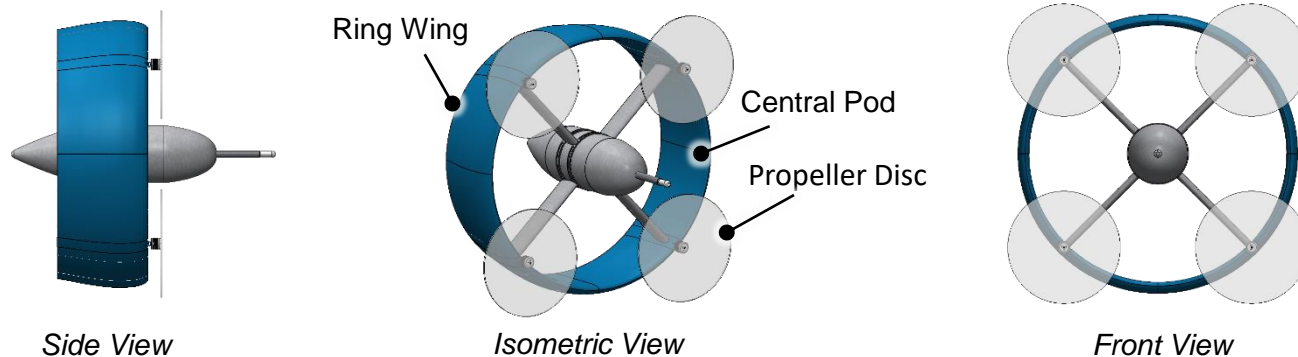
Mission and Motivation

Creare is developing the Venus Sonde, a drone-based sonde, to support future high-altitude balloon missions to Venus (52 to 62 km). The primary mission for the current design focuses on near-infrared (IR) nighttime imaging of the Venusian surface from below the cloud deck (46 to 48 km). Near-IR imagery reveals surface characteristics including age and composition, and imaging the surface from below the cloud deck has the benefit of significantly improving the possible spatial resolution of the data, from kilometers to meters. Current mission objectives require deployment of the drone from an altitude as high as 54 km and descent to a minimum altitude of 46 km. Alternative missions include (1) fetch and return of surface samples from an ascent vehicle to the balloon for processing with the onboard instrumentation, (2) atmospheric profiling, and (3) visual inspection of balloon surface to detect damage atmospheric aerosols.

Venus Sonde Drone

The Venus Sonde drone utilizes a quadcopter propeller arrangement and a novel nonplanar ring-wing design to improve flight control characteristics during hover and to improve structural rigidity. The ring wing enables low-power, fixed-wing flight below the cloud deck and during the return ascent for improved mission endurance, and the quadcopter enables agile vertical flight for docking with the balloon. The central pod contains all instrumentation, power systems, and avionics required to complete the mission and a passive thermal management system needed to survive high-temperature conditions at lower altitudes. The balloon platform also includes ancillary equipment for high-bandwidth communications and electrical and thermal recharging of the drone.

Creare is currently developing the Venus Sonde drone design concept under NASA funding. Future work plans include demonstration of the system through testing and evaluation of alternative mission concepts.



Concept of Operation for Near IR Surface Imaging

