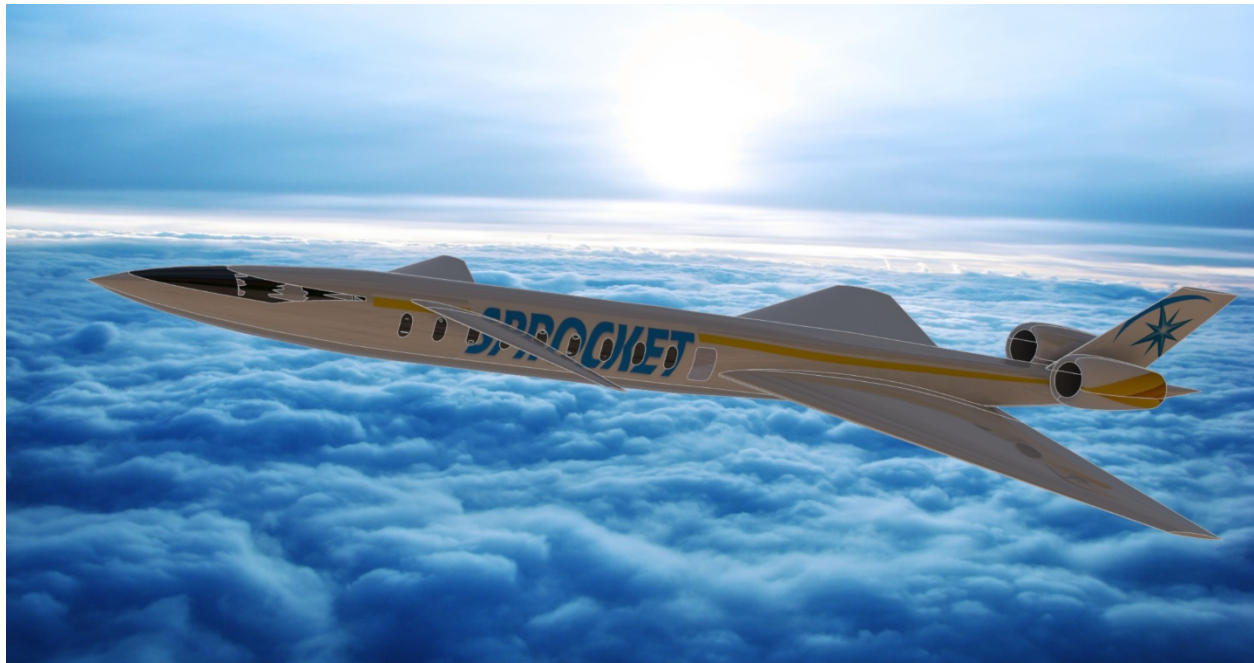


University of California, Davis

Undergraduate Senior Design



**SUPERSONIC SPROCKET**

Supersonic Business Jet Design Competition

Prepared for: NASA

**Prepared by:** Supersonic Sprocket

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## ABSTRACT

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This report is the detailed design of the Supersonic Sprocket, a supersonic business jet made for the 2016-2017 NASA Advanced Air Vehicles Student Competition. It discusses the means used to achieve range, payload, noise and efficiency design goals as well as the engineering decisions based on trade studies and comparative aircraft, and the preliminary sizing conclusions. The Supersonic Sprocket uses a lifting canard, two low bypass mixed flow turbine engines, and a notched delta wing to address the challenges of high speed environmentally friendly business travel. Capable of transporting 18 passengers over 4,231 nm at a cruise speed of Mach 1.6 on 1.73 pounds of fuel per passenger per mile, the Supersonic Sprocket meets all of the design requirements from the NASA Request For Proposal. From a preliminary sizing analysis, the aircraft has a max takeoff weight of 129,580 lbs, max takeoff thrust of 21,000 lbf, and a takeoff wing loading of 82.49 lbf/ft<sup>2</sup>. With these parameters known, aerodynamics, stability and controls are calculated and used for performance evaluations. The resulting Supersonic Sprocket is priced competitively against the current market at \$123 million base price and offers feasible, innovative, alternatives to the business of small commercial air travel.