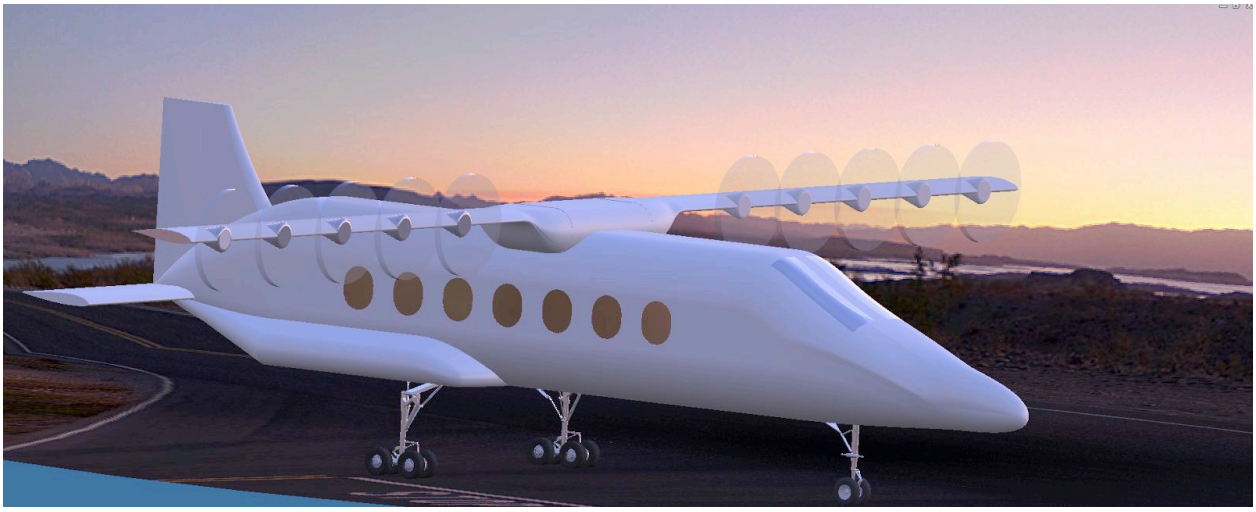
Response to the NASA Aeronautics Research Mission Directorate:

University Engineering Design Challenge

May 23, 2016



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I. Team Members

The team consisted of seven senior undergraduate students from Virginia Polytechnic Institute and State University and is pictured below:

Back row, left to right: Jordan Schafer, Gavin Norris, Brennan Graves, Luke Routhier
Front row, left to right: Mohammad Murshed, Sam McKinley, Charles Walsh-LeRoy

Sam McKinley-	Team Lead, Propulsion Assistance
Brennan Graves-	Propulsion Lead, Power Control and Distribution Lead
Mohammad Murshed-	Aerodynamics Lead, Stability/Control Assistance
Gavin Norris-	Stability/Control Lead, CAD
Luke Routhier-	Structures Lead, Cost/Manufacturing Lead
Jordan Schafer-	Subsystem Design/Integration Lead, Aerodynamics Assistance
Charles Walsh-LeRoy-	Presentation and Review Coordinator, Structures Assistance

II. Abstract

Blitz is proud to present the Ion, a commuter airliner utilizing Distributed Electric Propulsion (DEP) technology. The Ion will carry 19 passengers and their cargo 800 miles (695 nm) at a cruise speed of 250 mph (217 knots). It will utilize the blowing effect in order to reduce fuel consumption, required runway length, and noise emissions when compared with traditional turboprop aircraft.

The blowing effect occurs as the dynamic pressure over the wing is increased, allowing a reduction in chord length while retaining lift. Additionally, interactions between propellers reduce vortices off the propeller blades and wing tips. This combines to reduce drag at cruise.

The Blitz Ion will employ two 1270 kW turboelectric generators to power ten low-maintenance 260 kW Siemens electric motors, each running at up to 80% power and driving propellers. The propellers will cover 90% of the wingspan, allowing the Ion to utilize the blowing effect when necessary, then fold away six propulsors during cruise. The resultant reduced drag will allow the Ion to use just 50% of the fuel required by its competitors for an 800 mile journey while using runways 70% as long. The electric motors will also utilize smaller, slower rotating props which will lead to less noise pollution. These will enable Ion to land during more hours of the day and at approximately 2000 more runways, allowing passengers to arrive closer to their final destinations. The Ion will be a customer favorite because it saves money by increasing fuel efficiency and reducing maintenance costs.

Given DEP technology's unique advantages and the uncompromising aircraft design of the Ion that achieves greater fuel efficiency and aerodynamic abilities while eliminating drag inducing surfaces, the Blitz team believes the Ion will provide a future for more effective and efficient commuter travel in response to NASA's request for proposal. Displayed below is the Ion's compliance with the RFP and comparison with the primary comparator.

RFP Criterion	Required	Ion	Comparator: Beechcraft 1900D
Passenger Capacity (passenger + baggage = 225 lbs)	19	19	19
All-weather capability	Required	Met	Met
Cruise Speed	250 mph (217 knots)	250 mph (217 knots)	322 mph (280 knots)
Cruising Altitude	NA	19,000 ft	20,000 ft
Service Ceiling	28,000 ft	29,545 ft	25,000 ft
Range w/ Max. Payload	800 miles	800 mi + 45 min reserve @ cruise	1,200 miles (11 pax)
TO/Landing Field Length (max. TO weight, SSL)	3,000 ft	TO: 2,697 ft Landing: 2,426 ft	TO: 3,740 ft Landing: 2,800 ft
Structural Design	+2.5/-1.0G w/ FoS of 1.5	+2.5/-1.0G w/ FoS of 1.5	+3.0/-1.2G
Propulsors	≥6	10	2 * PT6A-67D turboprops (1279 shp, 955 kW each)
Turboelectric Generator System	≥1	2	