

Development of UAM Vehicle in Hanwha

Sehwan Park
Hanwha Systems

Feb 10, 2023
Yeosu, Korea



Vectored Thrust



Lift-plus-Cruise



Wingless

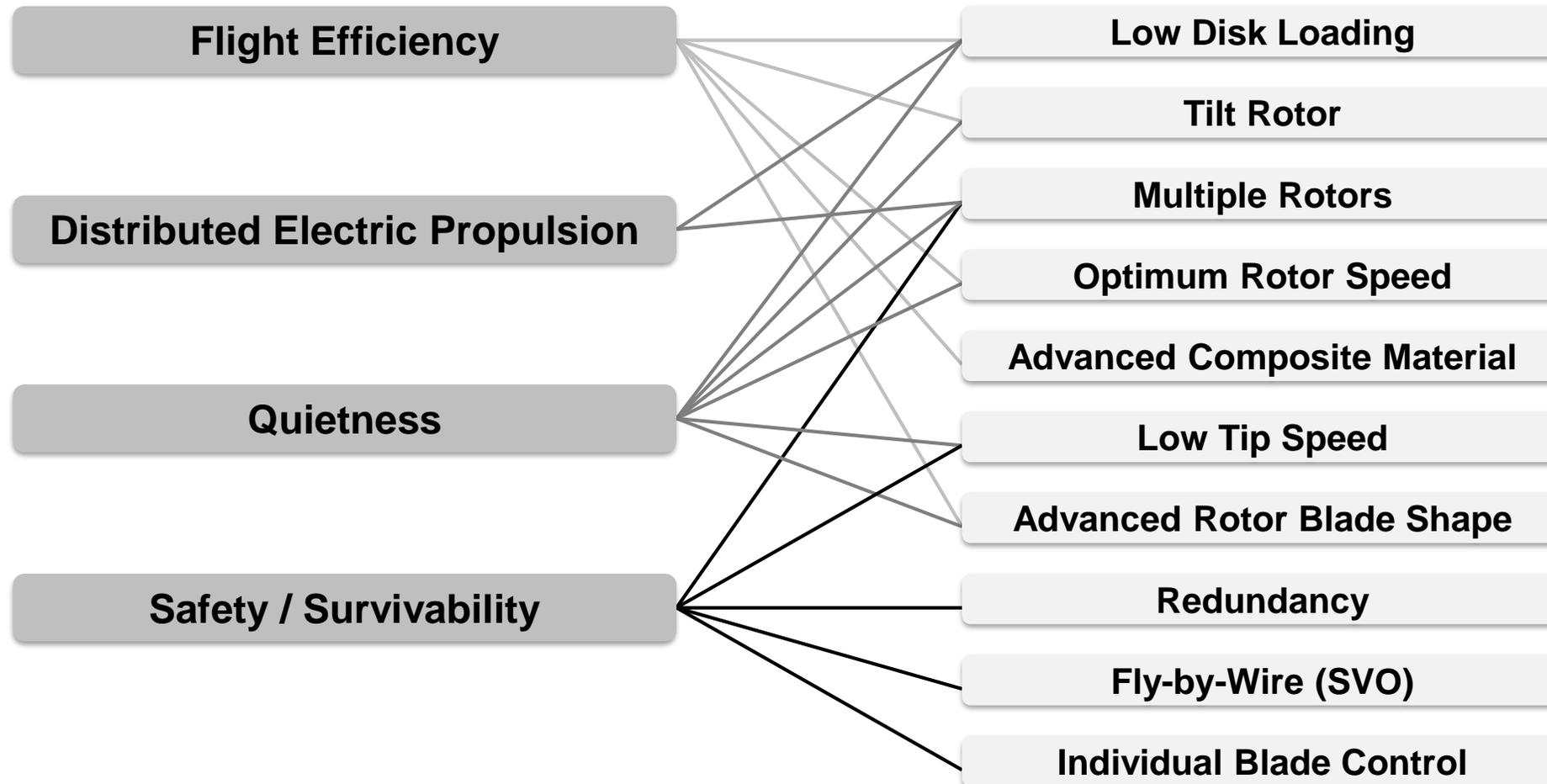


Hanwha–Overair Joint Development

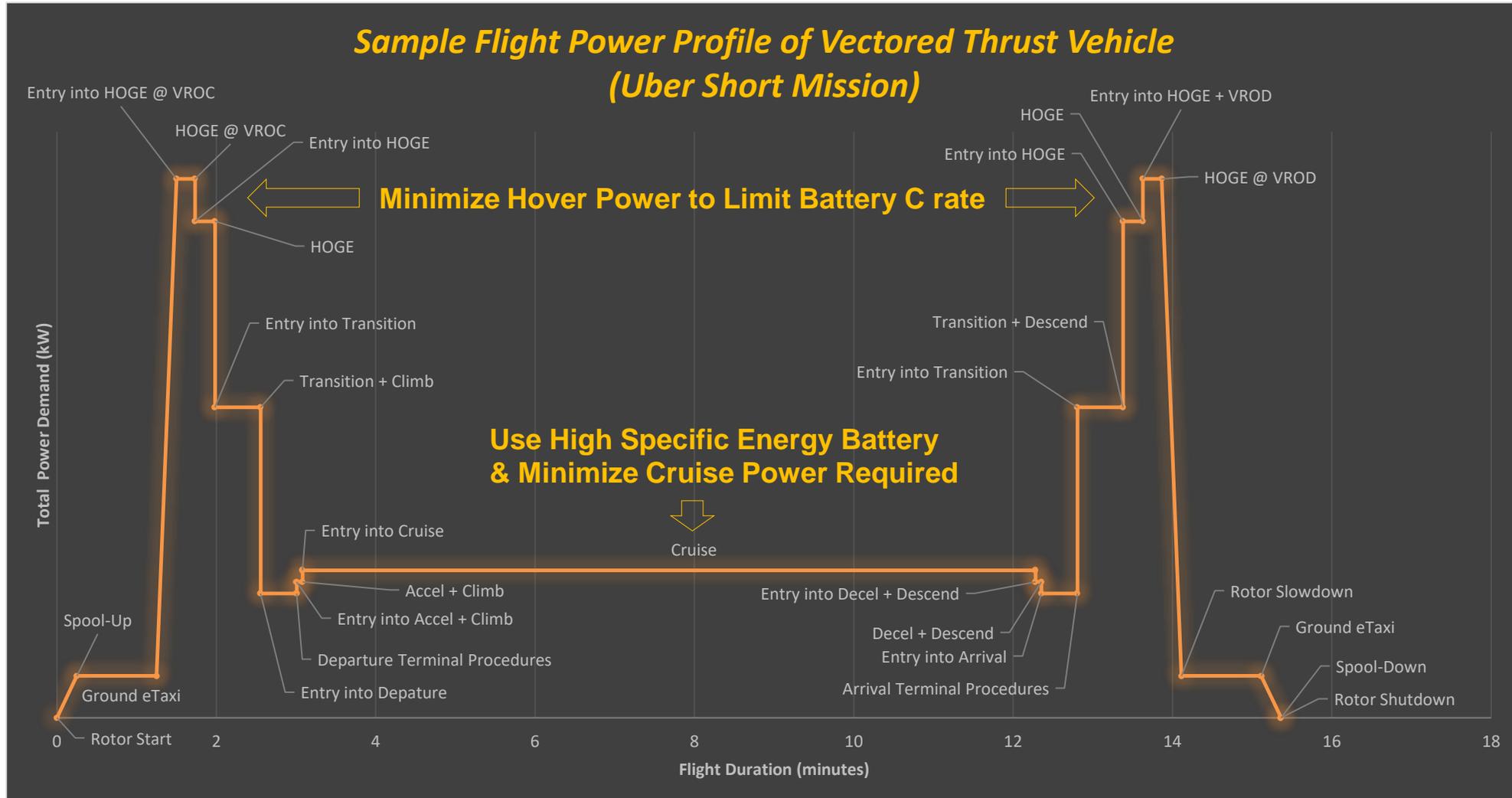
- Payload: 1 pilot + 5 pax (1,100 lb)
- Range: 100+ mile
- Speed: max cruise 200 mph, cruise 150 mph
- Noise: 55 dBA (hover @ 100m), 30 dBA (cruise @ 500m)



Design Goal: Fly Longer, Faster, Safe and Quiet with Lower Cost



Maximum Hover and Cruise Efficiency is Required



Butterfly | Optimum Speed Propulsion System

20-foot diameter propellers

Advanced blade design

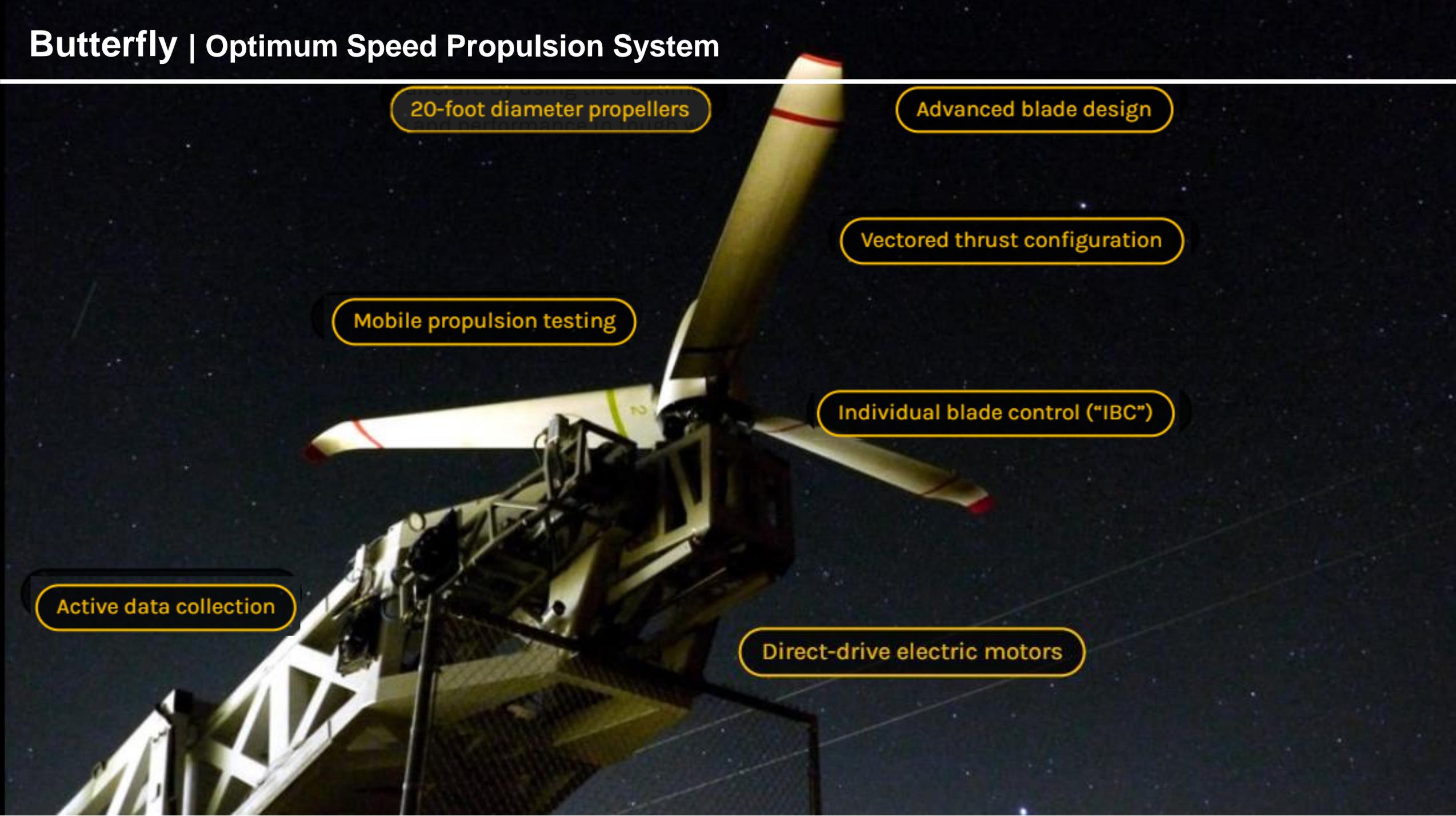
Vectored thrust configuration

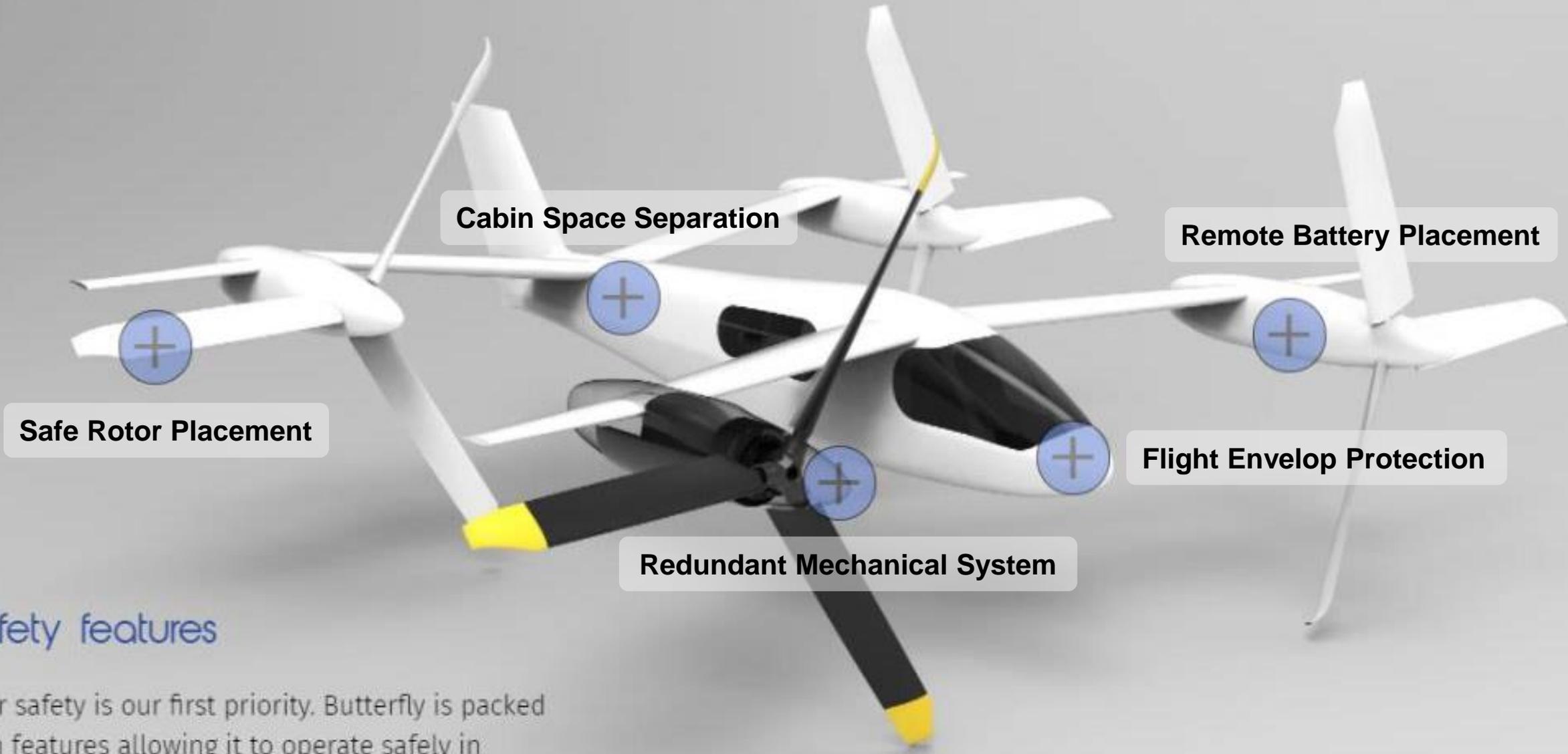
Mobile propulsion testing

Individual blade control ("IBC")

Active data collection

Direct-drive electric motors





Cabin Space Separation

Remote Battery Placement

Safe Rotor Placement

Flight Envelop Protection

Redundant Mechanical System

Safety features

Your safety is our first priority. Butterfly is packed with features allowing it to operate safely in conditions that would keep other vehicles grounded.

Butterfly | Timelines

2021.11

2022.06

2023

2024

2025

2026



Irvine, US (200K ft²)
Victorville, US (20K ft²)

- Joined NASA's AAM National Campaign 2 (preparation for NC-2 flight activities)
- Full-scale electric propulsion system test completed

Unmanned
First Flight

Manned
Flight Test

FAA
Type Certificate

Butterfly
Production



OPPAV Flight Control System Development Project (Apr. 2019 – Dec. 2023)

- FLCC SW(OFP) Design and Implementation
- OPNAV HILS Configuration Setup
- FCS System Integration Test (HILS & RIG)
- OPNAV Ground/Flight Test

OPPAV FLCC HW/SW Design



OPPAV FLCC EMC Test



Prepare and presenting Design Audit Review



FLCC HILS Set-up and Test



OPPAV RIG Set-up and Test



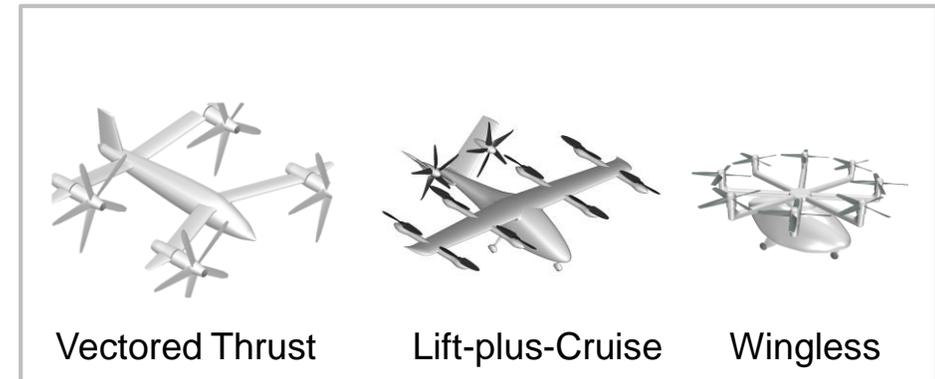
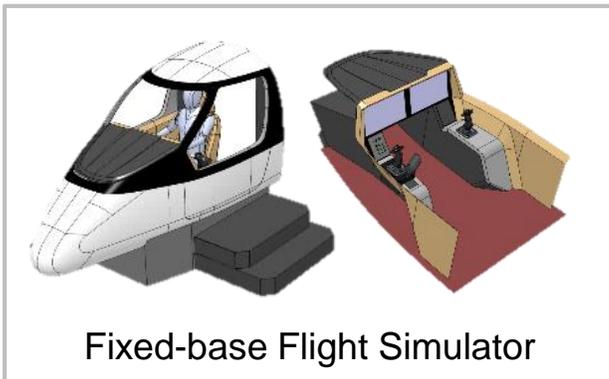
OPPAV Ground/Flight Test



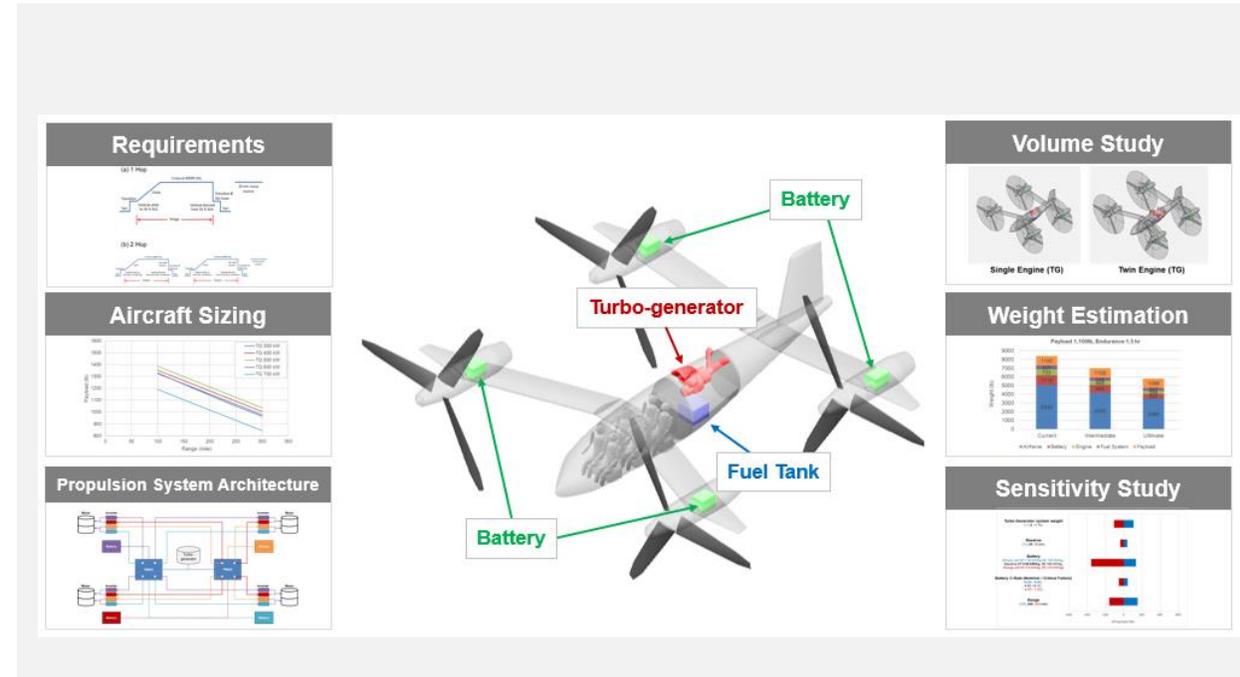
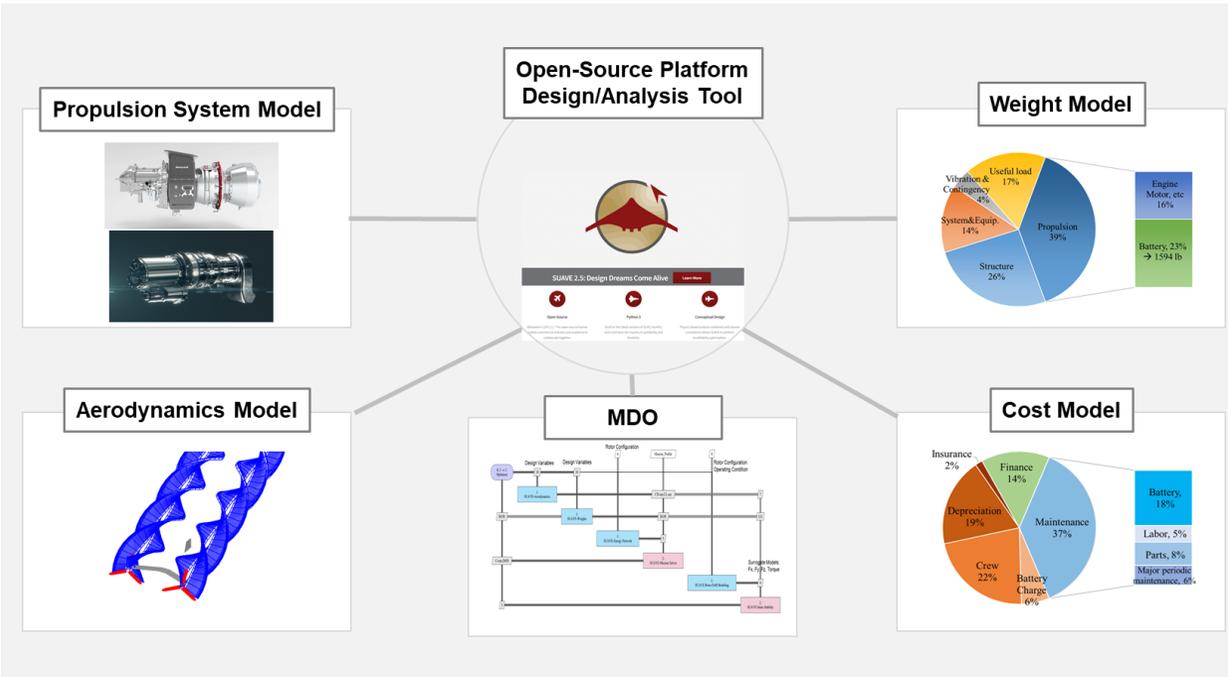
eVTOL Flight Simulator Development Project (Apr. 2022 – Dec. 2025)

- Fixed-base and motion-platform flight training devices for three different types of eVTOL vehicle (Vectored Thrust, Lift-plus-Cruise, and Wingless Multicopter)
- eVTOL Vehicle Design & AeroDB Generation
- Flight Control Law & SVO
- Flying & Handling Quality Assessment
- Pilot Training Program

UAM Virtual Integrated Operation Platform Project



Advanced Research on Hybrid-Electric VTOL Aircraft



Leading Systems
Amber UAV



Karem Aircraft
US Army Joint Multi Role
(design contract)



Karem Aircraft
Butterfly Gen 2 subscale vehicle
flight test



Karem Aircraft
36ft variable speed propeller test



1980

1990

2000

2010

2020



Frontier Systems
A160 Hummingbird
(broke endurance and altitude records)



Karem Aircraft
US Army Joint Heavy Lift (JHL)
(design contract)



Karem Aircraft
Butterfly Gen 1 subscale vehicle
flight test



Karem Aircraft
US Army FARA
(design contract)



Overair
Butterfly