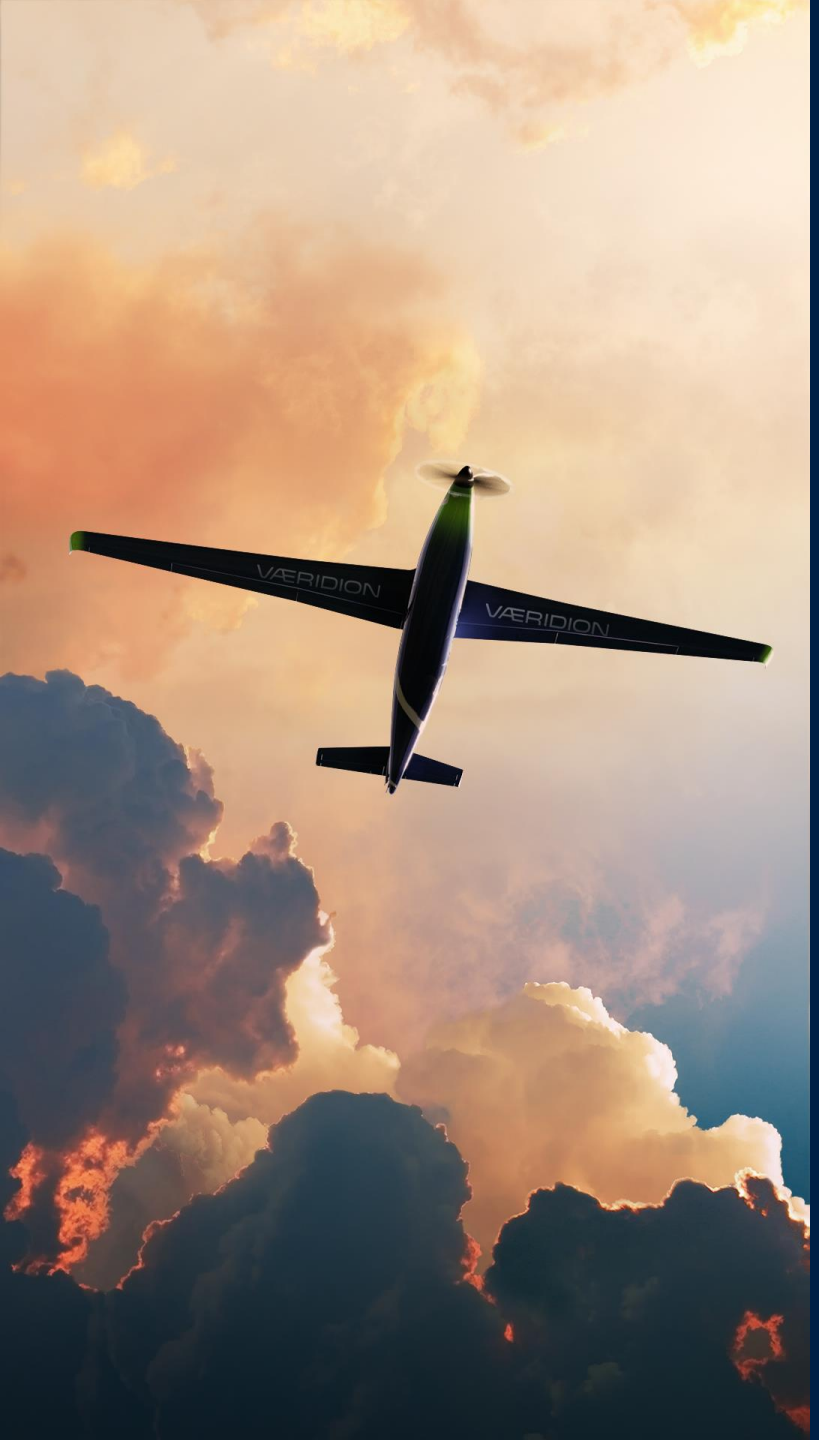

VÆRIDION

GREEN AIR MOBILITY

Challenges and Opportunities of Battery-Electric Flight with the VÆRIDION Microliner

Nando van Arnhem - Head of Flight Physics

Delft, 3rd Dec. 2024

2021

Founded in Munich,
Office in Delft since 2023

14

nationalities

6

separate electric
demonstrator programs

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100% Electric Microliner

Battery-wing integration

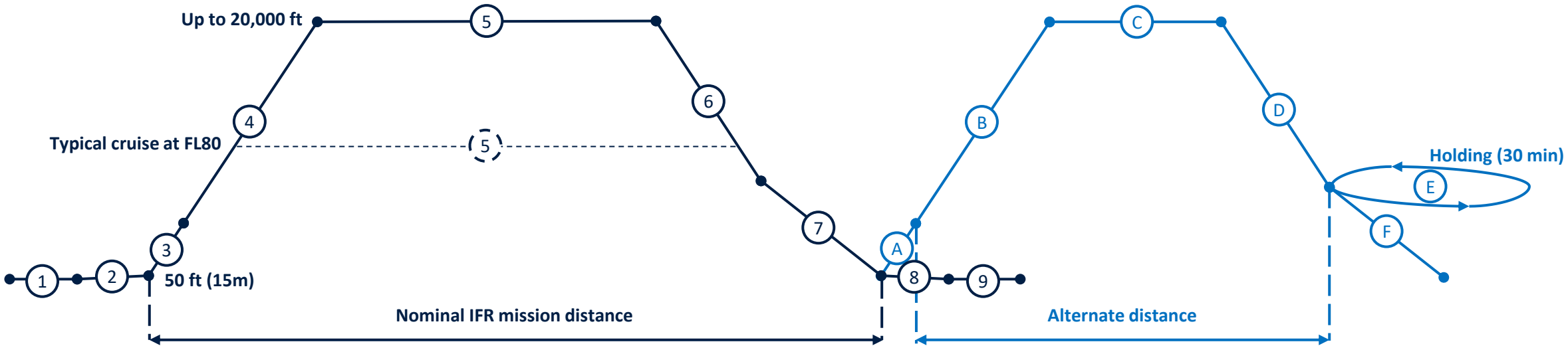
Dual flight-deck supporting single-pilot operations

Single propeller and multi-engine architecture

9-passenger pressurized cabin

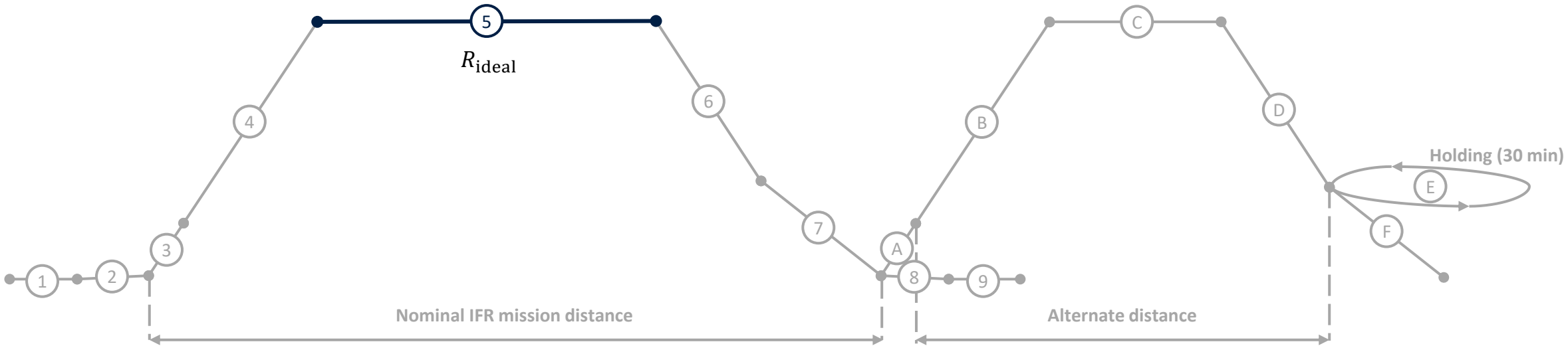
Up to 400km IFR range; Existing regional ICAO 2B airport infrastructure; FIKI operations; eRAM – emission-free Regional Air Mobility

IFR mission profile for commercial flights



1	Taxi out	4	Climb to cruise altitude	7	Approach	A	Initial climb from balked	D	Descent
2	Take off	5	Cruise	8	Landing	B	Climb to alternate cruise altitude	E	Final reserve (30 min)
3	Initial climb	6	Descent	9	Taxi	C	Alternate cruise	F	Approach

Range means optimizing for energy efficiency

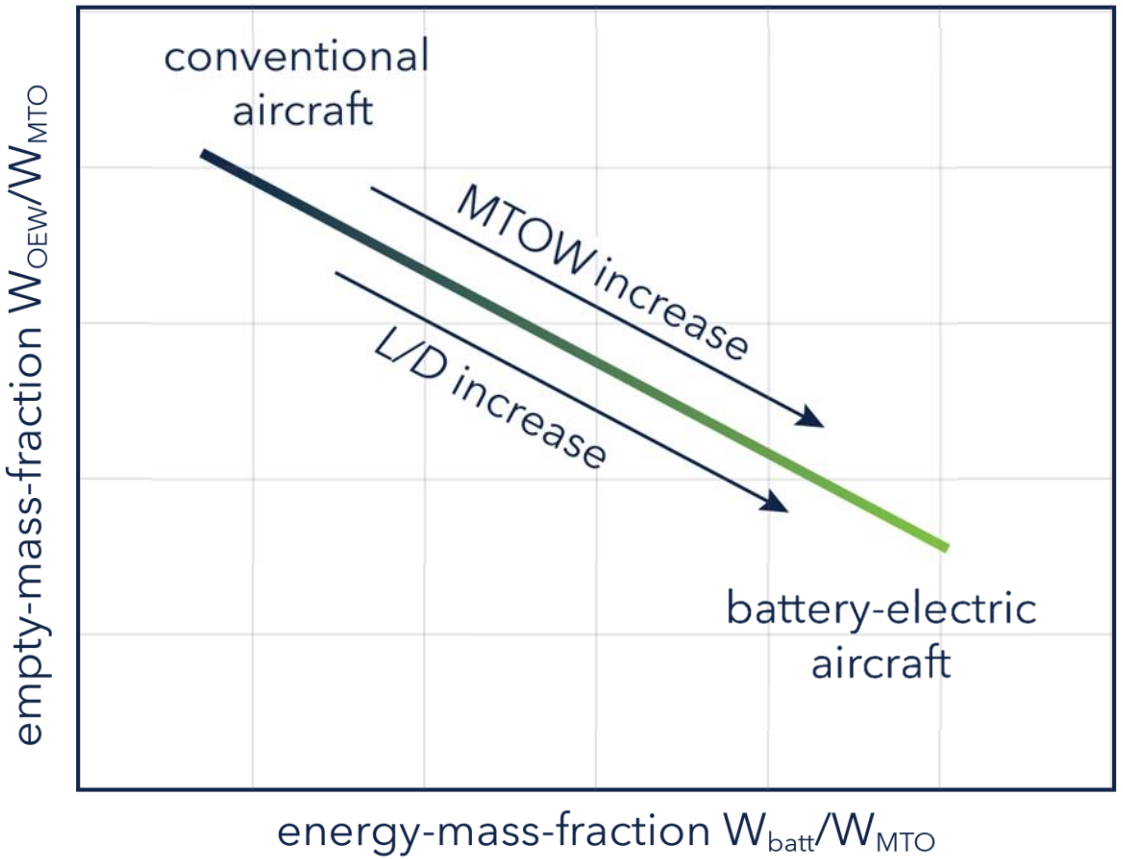


Useable battery energy density — Aerodynamic efficiency — Size of battery

$$R_{\text{ideal}} = \eta_{\text{powertrain}}\eta_{\text{prop}} \frac{e_{\text{batt}}}{g} \frac{L}{D} \frac{W_{\text{batt}}}{W_{\text{payload}} + W_{\text{operating empty}} + W_{\text{batt}}}$$

Electric propulsion system efficiency

Clean sheet design is key



Available end-of-life energy

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Sizing for End-of-Life

Design at end-of-life is crucial;

- aging from charging
- aging from nominal missions
- aging from diversion mission
- lower voltage levels and available power

➢ High level of monitoring is key to maximize range

Energy efficiency

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Wing-Integrated Batteries & Other Systems

SAFETY | PERFORMANCE | COST | TIME | CIRCULARITY

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WING-INTEGRATED BATTERIES (NON-STRUCTURAL)

FLIGHT CONTROLS & SURFACES

BATTERY THERMAL MANAGEMENT SYSTEM

LIGHTWEIGHT COMPOSITE AIRFRAME

ELECTRICAL SYSTEMS

ICE PROTECTION SYSTEM

VÆRIDION

VÆRIDION Propulsion Battery Development

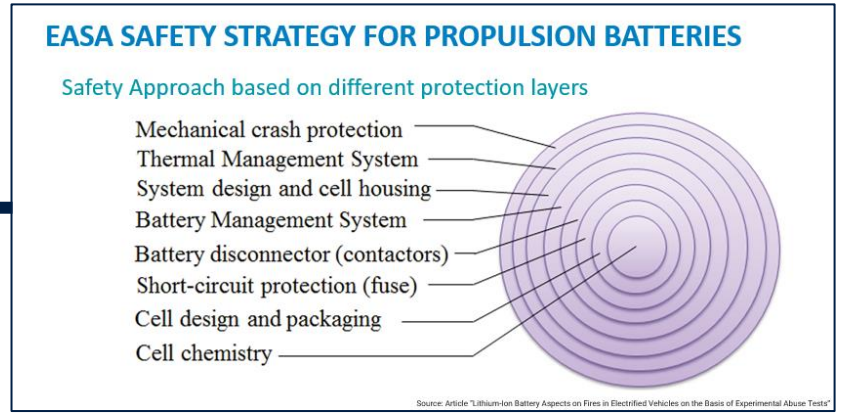
VÆRIDION
R&D

BATTERY CELL MANUFACTURERS

DESIGN
BMS
Electrical
Materials
Mechanical
Thermal

MANUFACTURING

TESTING



Certified
Propulsion
Battery
System

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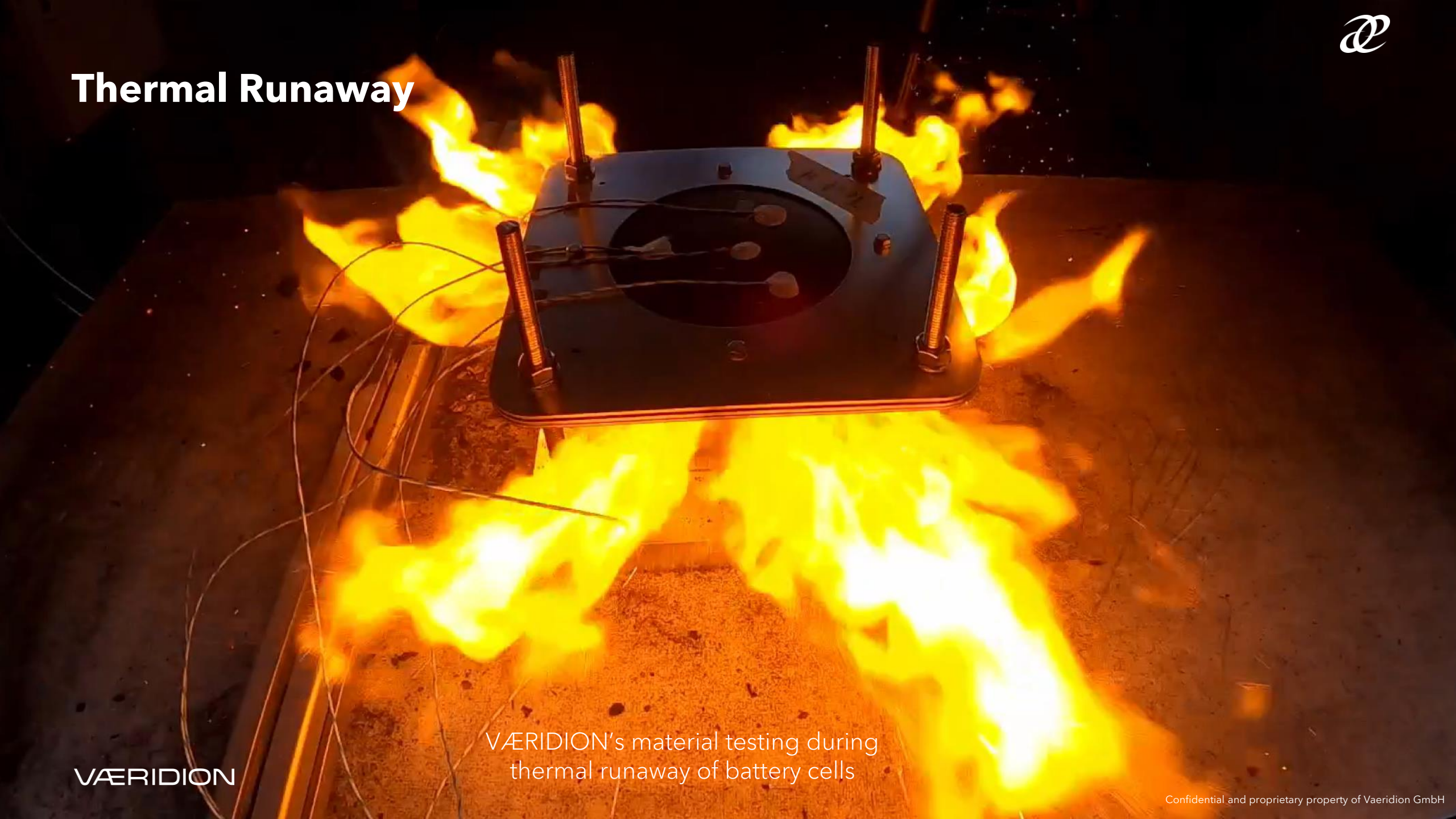
Thermal Runaway



VÆRIDION's material testing during thermal runaway of battery cells

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Thank you