



# Understanding Starter Generators and Intelligent Power Systems in UAVs

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## **Dr. Nabeel Shirazee, CTO of ePropelled**

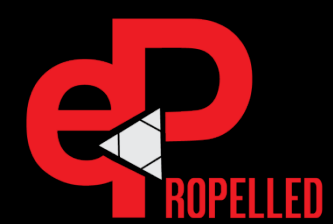
Ph.D. & MSc. in magnetic engineering from Cardiff University, United Kingdom

Chartered Engineer and world respected authority in magnetics engineering

20 years experience in designing innovative electric machines and drives resulting in 15 granted and pending patents

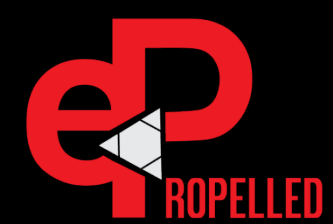
### **Housekeeping:**

- All attendees will be on mute
- Please send questions through chat and we will answer them at the end
- We will be recording this presentation



# Who is ePropelled?

- **20+ years of continued innovation** in the design of electric propulsion systems
- **Many Patented Technologies** delivering breakthrough improvements in Efficiency & Performance
- **We manufacture & assemble our UAV products in USA** to very high quality standards.
- **Working towards** ISO9001 and AS9100D standards in 2021.
- **Headquartered in Lowell, Massachusetts, USA**
- **Other locations include:**
  - Laconia Airport, NH, USA
  - Cardiff, Wales, UK
  - Chennai, India
- **40+ Engineers Worldwide**



# ePropelled's UAV Power Product Line

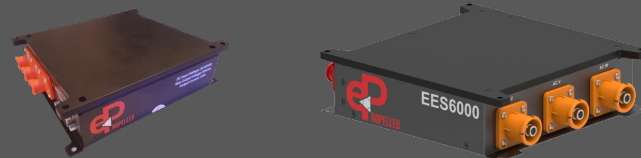
➤ Starter Generators (SG) – 750W to 12 kW



➤ Intelligent Power Systems (iPS) – 750W to 12 kW



➤ Electronic Engine Starters (EES)



➤ EES & Motor Controller

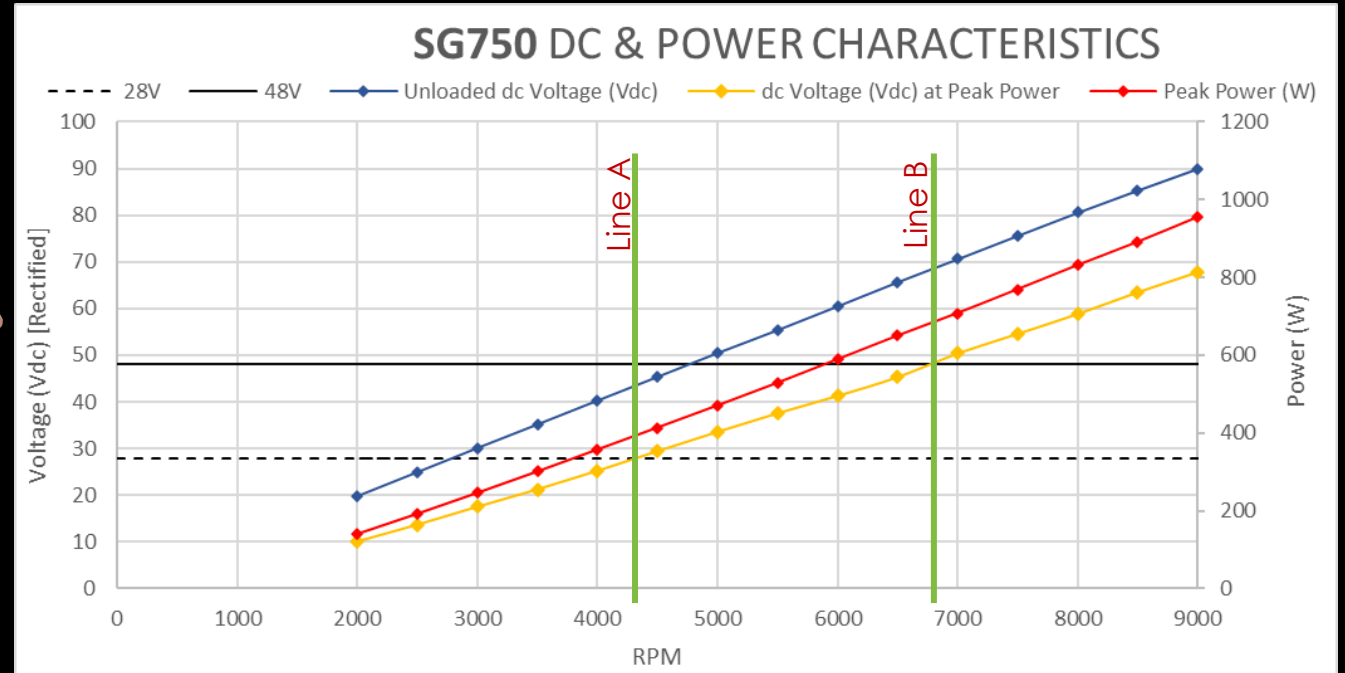


➤ DC-DC Converters



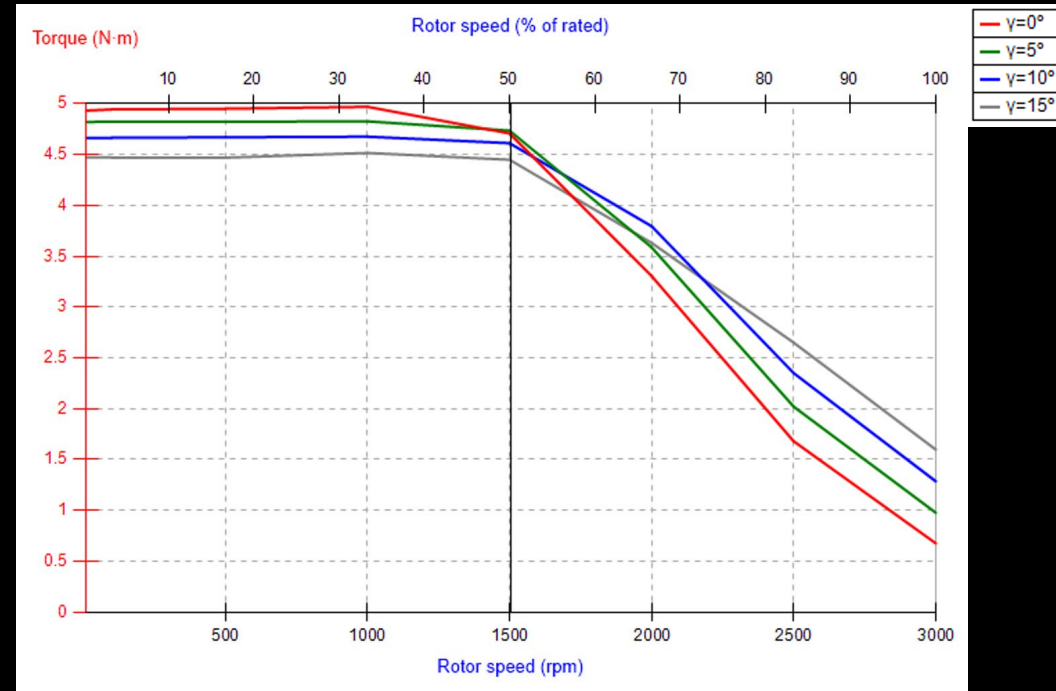
# Starter Generator SG750

## Starter Generators



# Starter Generator SG750

## Starter Generators



# Starter Generators

## Starter Generators Key Features



- Directly driven on engine crankshaft with customizable shaft interface ring
- Bearingless option available
- Active air-cooling rotor and stator hub
- Thermal sensor to measure winding temperature
- Can operate as a propulsion motor

# Intelligent Power Systems

## Intelligent Power Systems Key Features



For iPS750 & iPS1500:

- One primary and two secondary outputs (12V & 5V)
- High efficiencies of up to 94%
- Software and hardware alerts via CAN
- Charges an external onboard battery
- Configure various EES parameters for different IC engines
- Real time data monitoring for all outputs

For iPS3000, iPS6000 and iPS12000:

- one primary output and external EES



## Electronic Engine Starter & Motor Controller

# Electronic Engine Starter & Motor Controller

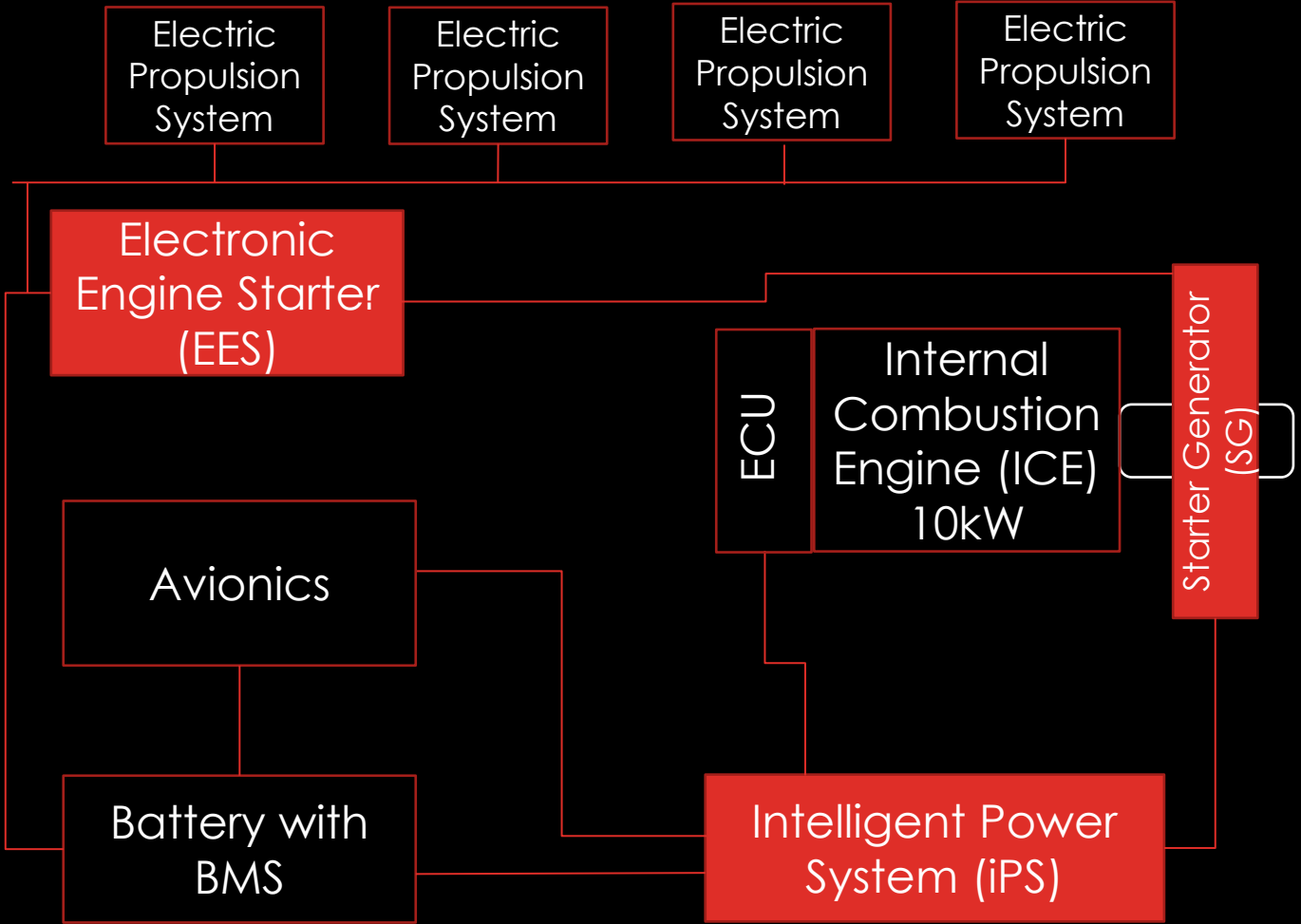


- The EES module will power the starter generator during the internal combustion engine (ICE) start sequence.
- The EESMC will start the ICE and operate the SG as a Propulsion Motor.
- Software and hardware alerts Via CAN
- Data logging via SD card

## Different Modes of Power Systems in UAVs

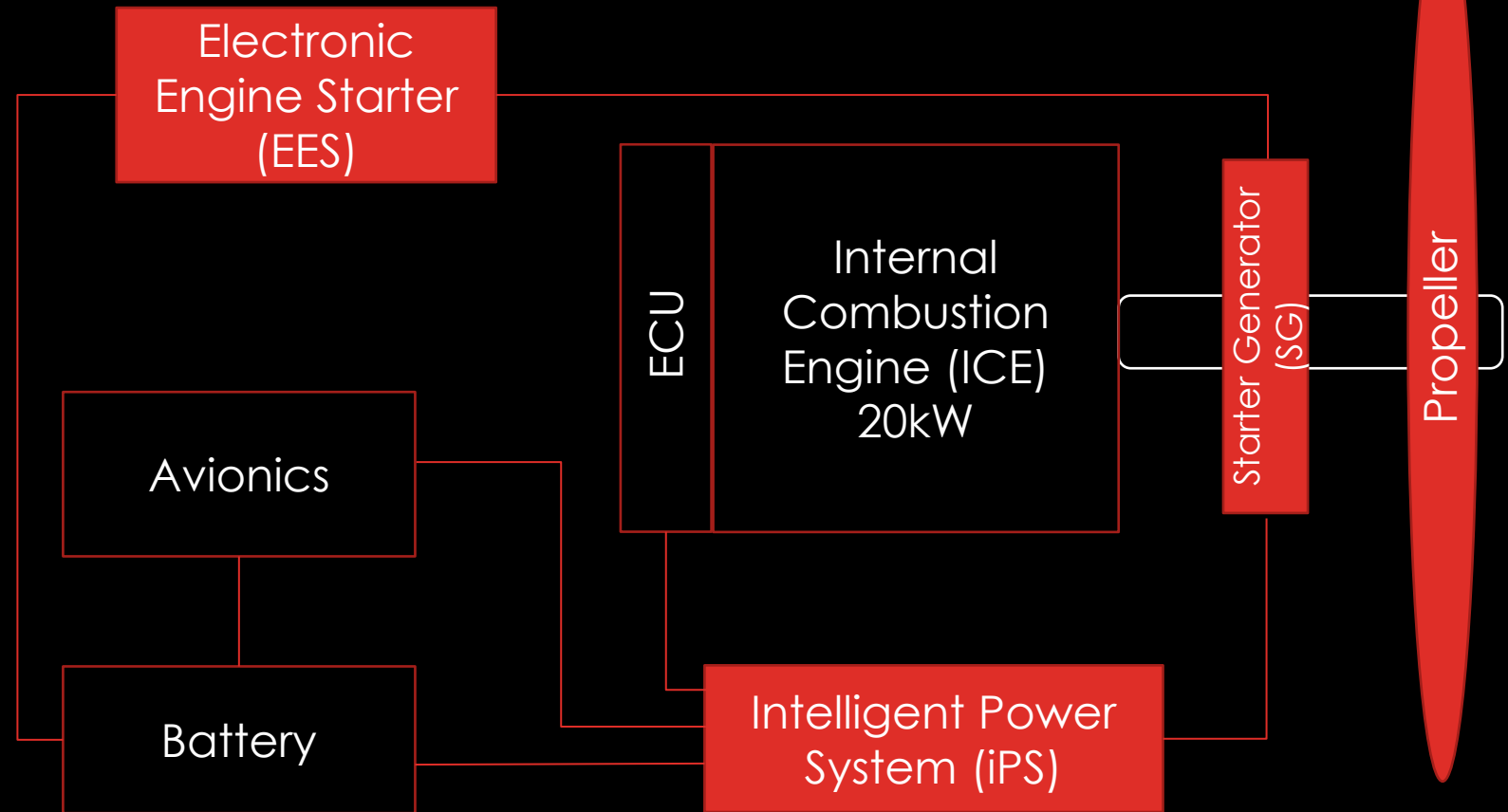
- **Mode1-** Solely for producing electricity onboard.  
Power Unit for Range Extension (PURE™)
- **Mode2-** Starting the ICE & Power Generation.  
Starter Generator in series with the ICE and propeller.
- **Mode3-** Mode2 Plus Power Assist.  
Starter Generator as Propulsion Motor in assisting ICE during take off and landing or in stealth mode.  
Mode3 is much more efficient than mode2.

# Mode 1



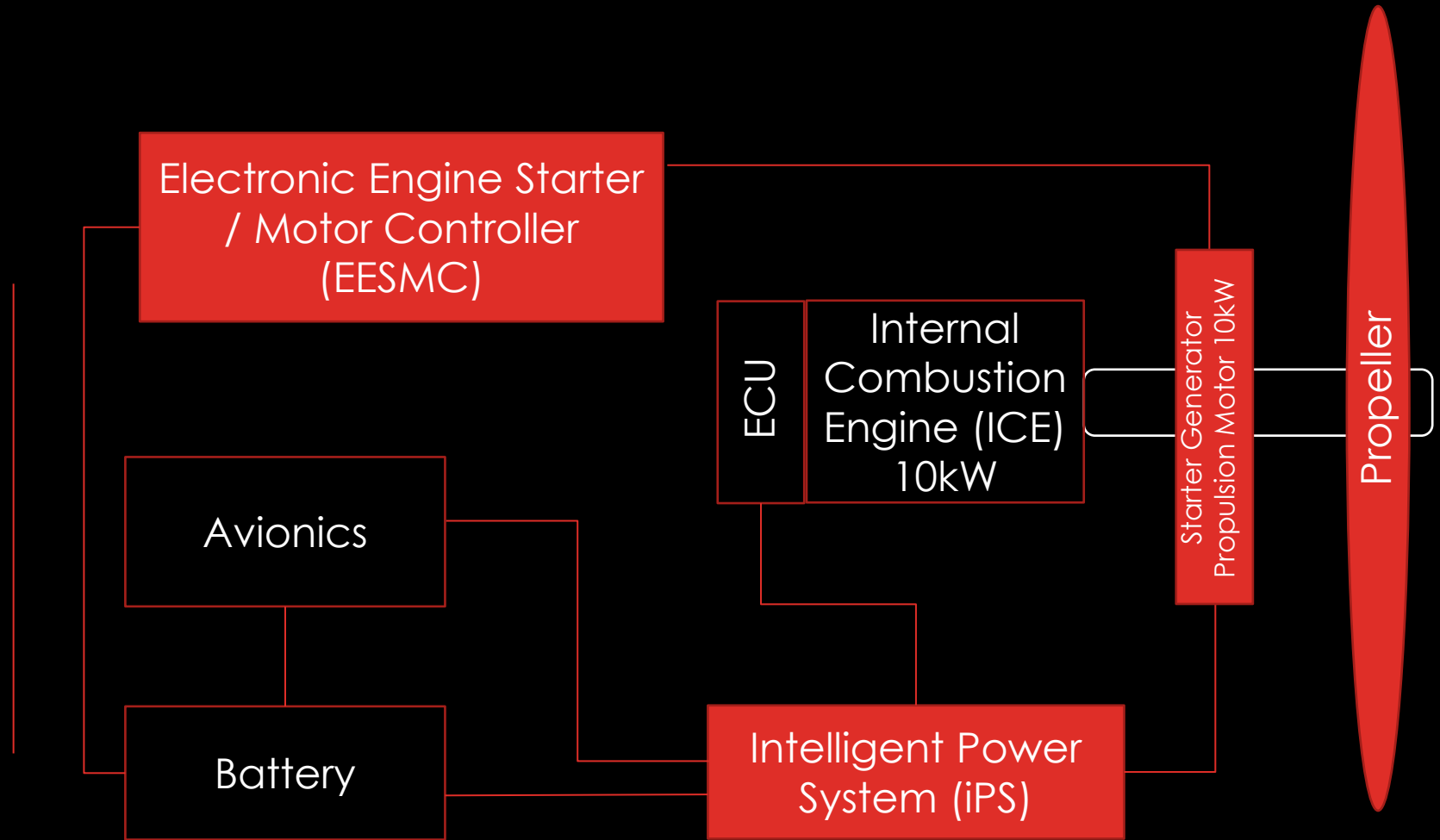
Power Unit for Range Extension (PURE™)

# Mode 2



Starter Generator in series with the ICE and propeller.

# Mode 3



Starter Generator as Propulsion Motor in assisting ICE during take off and landing or in stealth mode.

## Conclusion

- **All of our products are** light, powerful, efficient, smart and reliable
- **It will help the UAV and aircraft manufacturers** succeed in designing better and more reliable UAVs and aircrafts.
- **Questions?**



Dr. Nabeel Shirazee

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For more detailed information on our products, visit our website:

[www.ePropelled.com](http://www.ePropelled.com)

THANK YOU