Air Force SBIR STTR INNOVATION
TECHNOLOGY WITH DEMONSTRATED RELEVANCE
POWER SCALABILITY NOT AVAILABLE IN COMMERCIAL EQUIPMENT

TOPIC NUMBER:
AF151-070

TOPIC TITLE:
Modular Motor Drive with Programming and Configuration Tools for the Development of Small Aircraft Electric Power and Propulsion Systems

CONTRACT NUMBER:
FA8650-15-M-2604

SBIR COMPANY NAME:
PC Krause and Associates Inc.
West Lafayette, IN

TECHNICAL PROJECT OFFICE:
AFRL Aerospace Systems Directorate
Wright-Patterson AFB, OH

PUBLISHED:
December 2016

PCKA personnel performing electronic speed controller module inspection. (Courtesy photo)

INDIANA COMPANY GIVES LIFT

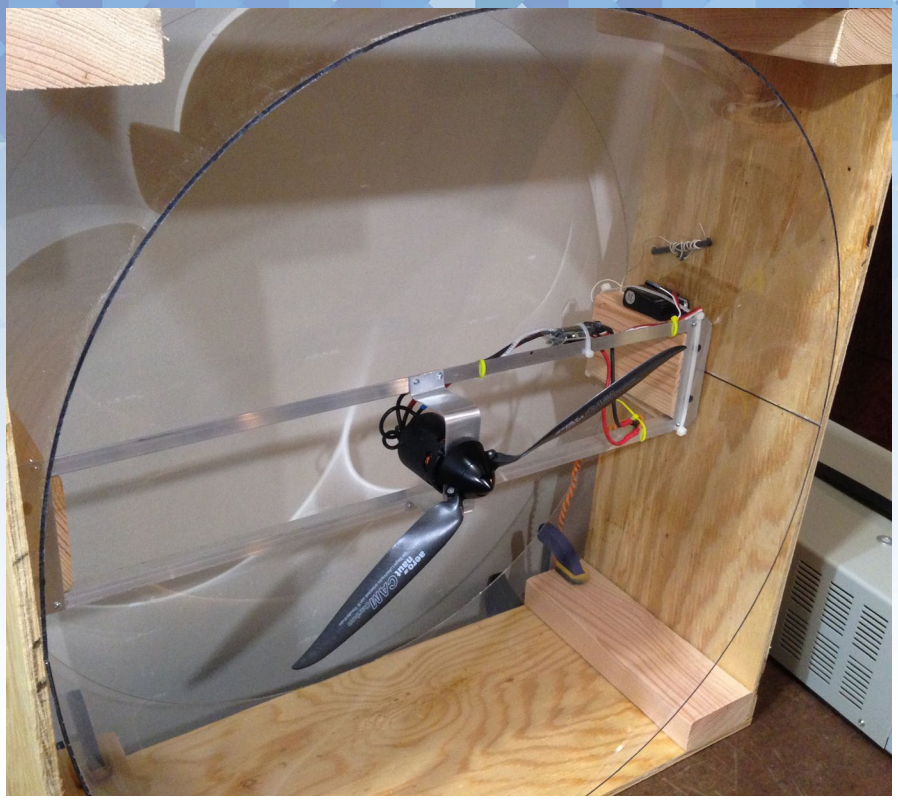
TO AIRCRAFT POWER AND PROPULSION SYSTEMS

Newly improved motor control technology could provide a significant boost to the performance of remotely piloted aircraft.

With support from the Air Force Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) Program, Indiana-based PC Krause and Associates Inc. has developed a system that may be capable of meeting a wide range of small aircraft electrical power and propulsion system needs.

continued >

The company – also known as PCKA – was aiming for its new modular motor drive system to fill the gap between existing commercial equipment and custom solutions at a cost that is viable for most RPA platforms. PCKA touts that its new motor drives offer reduced weight and improved efficiency, compared to current electronic speed controllers, as well as the capability to implement sophisticated control and protection software.



An electronic speed controller module developed by PCKA installed in a test fixture at the company's Indiana headquarters. (Courtesy photo)

BEHIND THE TECHNOLOGY

RPA platform optimization and system integration often require a high degree of customization in both the motor controller software and hardware. However, development programs often lack the appropriate technical expertise and/or funding required to develop a custom solution for each aircraft design. As a result, many platforms use commercial off-the-shelf equipment that is often limited in performance or larger than necessary.

Through its work with RPA developers, the Air Force recognized a need for a fully configurable modular motor control solution that provides power scalability with appropriate reliability, ruggedness and weight/volume optimization not currently available in the marketplace.

Under the Air Force SBIR/STTR Program, PCKA created a modular motor control solution that includes a main control module, a range of peripheral expansion modules and a range of interchangeable power stage modules.

A key feature of the technology is its open hardware and software architecture, which enables users with minimal expertise to meet typical platform needs while providing advanced users the capability to rapidly customize portions of the system to meet sophisticated performance and control objectives. This also allows RPA developers to focus their resources on expanding mission systems and platform capabilities instead of motor controller design and optimization.

EARLY APPEAL

PCKA partnered with multiple RPA developers and the Air Force Research Laboratory's (AFRL) Aerospace Systems Directorate to clearly define what was needed to create a successful modular motor drive ecosystem. This provided the company an opportunity to develop the necessary base software and prototype hardware to demonstrate the advantages of the system to initial customers, which led to the commercial interest even before the next development phase in the SBIR program.

As a result of the early-stage hardware demonstration, PCKA delivered production controllers for Lockheed Martin's Maritime Canister Launch Small Unmanned Air System, an adaptation of the Vector Hawk platform. These first-run controllers have completed system integration and initial flight testing with further development and testing ongoing.

Additionally, PCKA is working with AFRL and Georgia-based Area-I to integrate and flight test PCKA's developed modular motor drive in Area-I's Prototype-Technology Evaluation Research Aircraft platform.

PCKA also has been selected for additional SBIR funding to expand the range of modules available in the modular motor drive ecosystem; refine the base control software to further improve performance and ease of use; and explore advanced control algorithms for both RPA and other applications.