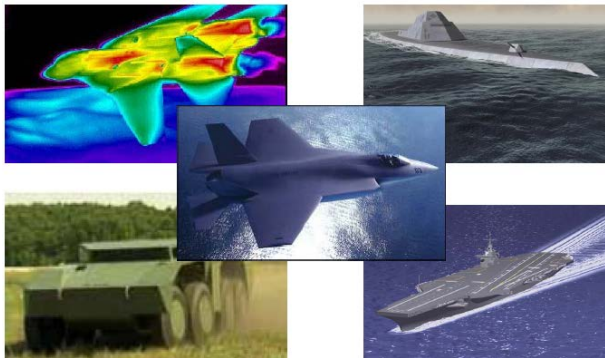




PC Krause and Associates, Inc.

*Engineering, Modeling, and Software
Solutions for Integrated Power, Thermal,
and Propulsion Systems*



*R&D Center and Business Office
4291 W. 96th St.
Indianapolis, IN 46268
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www.pcka.com*

MISSION

Dedicated to the advancement and application of modeling, simulation, analysis, and design techniques and tools for rapid, cost effective development and deployment of integrated power, thermal, and propulsion systems.

APPROACH

Leverage advanced MS&A throughout the technology development cycle to identify optimal solutions, minimize time to functional hardware, identify and mitigate system integration challenges earlier in the development cycle, and better support trade studies of and upgrade plans for fielded systems.

VALUES

For successful technology transition involving integrated systems, PCKA works closely with numerous companies. Therefore, PCKA's paramount objective is developing and maintaining the trust of collaborating organizations while fostering an environment that enables system optimal solutions. Such trust begins with careful handling of intellectual property and development of tools to enable integrated systems analysis while minimizing the need for transfer of proprietary information and extends to the depth of technical advice and knowledge provided by PCKA to integrated system stakeholders.

DIVISIONS

Engineering Services

PCKA's Engineering Services Division develops and transitions state-of-the-art technologies often found only in academic research environments to meet the needs of government and industry programs. PCKA personnel are currently involved in a range of activities related to system integration and subsystem design including the development and demonstration of high-power, high-efficiency, power supplies (both SiC and GaN), high-temperature electro-mechanical actuation and generation systems, electric-machine optimization techniques, prognostics and health-management techniques in aircraft generation systems, high-performance heat exchangers, and advanced motor-control techniques.

Computer Services

The Computer Services Division researches, develops, and deploys tools and simulation technologies necessary to conveniently analyze and optimize integrated power, thermal, and propulsion systems both internally and commercially. Critical analysis software packages with commercial distribution include FastSim with Distributed Heterogeneous Simulation (DHS) Links Technology and ASMG for Simulink.

CUSTOMERS / MARKETS

PCKA supports development and research initiatives for a wide range of government agencies and industry with a strong focus on defense and aerospace applications.

COMPANY PROFILE

PCKA was incorporated in Indiana in 1983 and currently has offices in the Purdue Research Park in West Lafayette, Indiana, Indianapolis, Indiana, and Dayton, Ohio. Today, PCKA is one of the largest high-tech groups in the US dedicated to research and development of dynamic solutions for integrated electromechanical, thermal, and propulsion system challenges. PCKA employs more than 45 professionals including 27 full-time PhD's and has successfully transitioned 20+ Small Business Innovative Research (SBIR) developed technologies.

THE PCKA ADVANTAGE

- Unique expertise across power electronic, electromechanical, thermal, and propulsion systems
- Rapid development / demonstration of advanced technology for challenging applications
- Experienced in navigating IP issues and coordinating multiple stakeholders to analyze complex system dynamics

PCKA

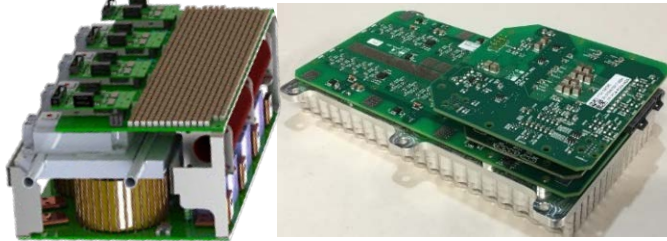
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Call us today at (317) 245-1122
to discuss your power, thermal,
and propulsion challenges!

CORE COMPETENCIES

Power Electronics (Si, SiC, and GaN)

- Magnetic, electrical, and thermal FEA
- Transient simulation capturing control algorithm and switching dynamics
- Design optimization / scaling
- Gate drive design
- CPLD, DSP, FPGA selection and layout
- Sensor selection and signal conditioning
- PCB layout
- Packaging design and integration



Electro-Mechanical Systems

- Motors, generators, starter-generators, electro-mechanical actuators, etc.
- Electromagnetic and thermal 2D/3D FEA
- Lumped-parameter modeling
- Hardware characterization for dynamic modeling
- Integrated thermal, electrical, and mechanical design optimization
- Sensor / sensor-less control algorithm implementation beyond 150 kRPM
- Extreme-temperature machines
 - Below -200°C, above 300 °C

Thermal Management Systems (TMS)

- 2D/3D finite element analysis / CFD
- Air and vapor cycle dynamic analysis
- Phase change cooling solutions
- Integrated TMS dynamic analysis
- TMS dynamic controls development
- Micro-, nano-scale energy transport
- Architecture identification / optimization

Advanced Analysis / Controls

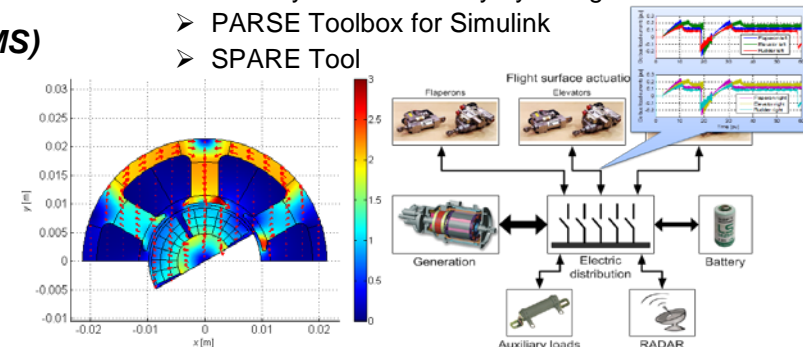
- Analog control design
- CPLD, DSP, FPGA programming
- Analog / digital filter design
- Modulation implementation / analysis
- Advanced control architectures (e.g., sensor signal conditioning / transformation, alternative/multiple control objectives, feed-forward strategies, etc.)
- In-situ and stand-alone diagnostics / prognostics
- Stability analysis
 - Linear, non-linear, hybrid systems
 - Numerical and analytical assessments

System Integration / Optimization

- Multi-environment simulation
- Multi-core, multi-computer, cloud parallelization
- Multi-organization MS&A coordination
- Cross-unit control optimization and tuning
- Integrated system performance evaluation

PCKA Analysis Software Tools

- Automated State Model Generator (ASMG) for Simulink (US Patent 7,353,157)
- Distributed Heterogeneous Simulation (DHS) (US Patent 7,490,029)
- FastSim (with DHS co-simulation technology)
- Distributed Heterogeneous Optimization (DHO)
- TMS Toolbox for Simulink
- ATTMO Toolbox for Simulink
- Stability / Power Quality by Design Tool
- PARSE Toolbox for Simulink
- SPARE Tool



MS&A, prototype, test, and trouble shooting experience from watts to megawatts