A University-Designed UAV Imaging Payload

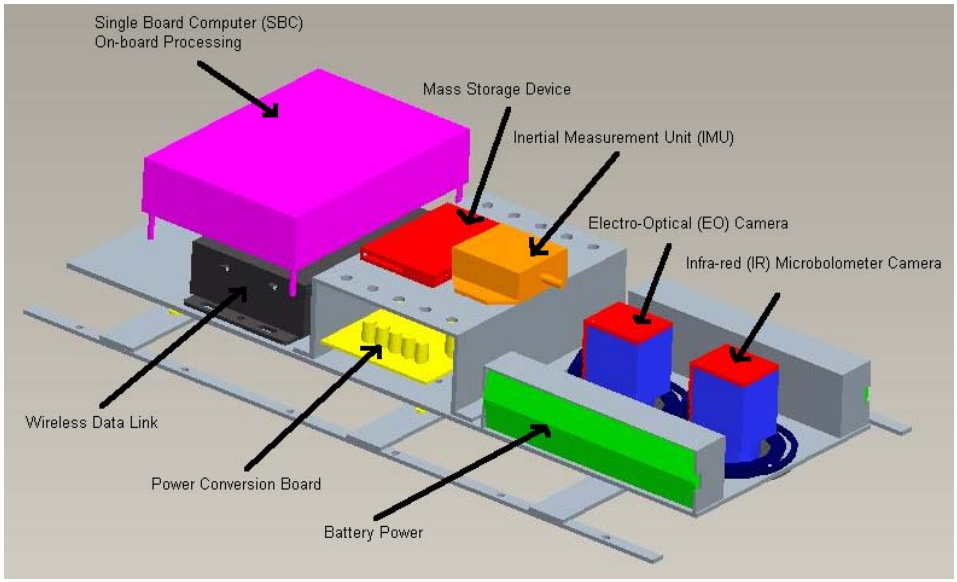
From the Ground Up!

Points of Contact:

Richard R. Schultz, Ph.D.
Associate Professor & Chair
University of North Dakota
Department of Electrical Engineering
Upson Hall II Room 160
243 Centennial Drive Stop 7165
Grand Forks, ND 58202-7165
Office: 701-777-4331
Direct: 701-777-4429
Fax: 701-777-5253
E-Mail: RichardSchultz@mail.und.edu

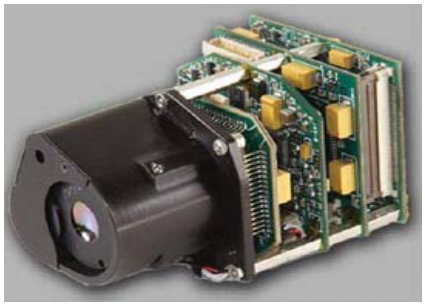
William H. Semke, Ph.D.
Associate Professor
University of North Dakota
Department of Mechanical Engineering
Upson Hall Room 271
243 Centennial Drive Stop 8359
Grand Forks, ND 58202-8359
Office: 701-777-2571
Direct: 701-777-4571
Fax: 701-777-2271
E-mail: WilliamSemke@mail.und.edu

The University of North Dakota (UND) School of Engineering & Mines (SEM) is developing a thermal-optical imaging system to be flown on an experimental Unmanned Aerial Vehicle (UAV) platform designed and built by Lockheed Martin in Eagan, Minnesota. The custom payload and ground control station designs represent a complete end-to-end system, including electro-optical (EO) and thermal infrared (IR) remote sensing capabilities, sensors and receivers to sample payload orientation, onboard data processing, and wireless data streaming in real-time to a mobile ground control station. The custom payload is being developed by UND electrical and mechanical engineering students to perform a broad range of environmental and civilian applications, including firefighting, disaster response, and precision agriculture. A computer-aided drawing (CAD) of the fully-integrated EO/IR imaging payload is shown below.



Fully-Integrated 3-D UAV Imaging Payload System Drawing

The sensing capabilities provided by the thermal-optical imaging system provide data in two key spectral bands, namely visible light (i.e., RGB color) and thermal infrared. The two camera systems offer a complete range of remote sensing capabilities for both daytime and nighttime UAV operations. The infrared camera is an uncooled, microbolometer-based thermal imaging unit, providing state-of-the-art reliability and effectiveness. The image shown below was captured and time-stamped by the IR camera in the School of Engineering & Mines Systems Engineering Design Laboratory.



Uncooled Microbolometer Thermal IR Camera

Image Captured by Thermal IR Camera

Each camera in the thermal-optical imaging system is mounted to a precision pointing system capable of rotating 360º horizontally and 30º vertically. This camera adjustment feature allows each sensor to assume various orientations, enabling such capabilities as continuous pointing on a given target as the UAV loiters in a circle flying overhead.