James K. Sokolowski, Ph.D. 1992

Graduating in 1992 with specialties in spectral imaging (aka hyperspectral imaging) and numerical modeling, Jim completed two postdocs, one at Universite Laval and the other at the Space Telescope Science Institute. In 1995, Jim became Program Manager for Lockheed Martin and acted as both program manager and principal scientist for the Small Spacecraft Technology Initiative (SSTI) - a NASA attempt to streamline its spacecraft design, build, launch, and operations processes. Jim built all ground segment systems for SSTI's two spacecraft - Lewis and Clark - creating the worlds first web-based imagery tasking, processing, and dissemination system, as well as complete data processing and product generation systems for all spaceborne hyperspectral, high-resolution multispectral, and other mission instrument data. Jim also successfully integrated an extremely diverse SSTI user community composed of U.S. intelligence and military agencies, academic users and institutions, as well as a broad spectrum of commercial users. Jim completed this work, originally scheduled for a two-year build cycle, in just over one year, and was nominated for NASA's Technical Innovation of the Year award in 1997.

In 1997, Jim left Lockheed-Martin and NASA to form his company, Remote Measurement Services, LLC (RMS), which has been engaged in a wide array of scientific, technical, software and systems engineering work since. In the late 90s, RMS was instrumental in pioneering the use of airborne hyperspectral instruments to revolutionize the survey methods commercial mining companies use to discover rare earth minerals, gold, and diamonds. RMS supported many airborne campaigns, collecting petabytes of imagery data over vast areas of Central and South America, Africa, and Asia creating highly automated data handling regimes that are now an integral part of virtually every mining company's exploration arsenal. RMS' hyperspectral techniques have allowed increases in spatial surveying resolution by more than on order of magnitude, and sped total surveying time from many months to a few weeks.

Integral to these mining successes was that RMS was the first to use non-linear spectral transformations to mitigate the impacts of low signal to noise ratios, atmospheric distortions, and other real-world hyperspectral artefacts creating a tool suite RMS calls its Natural Vector Transforms (NVTs). RMS has used NVTs to support government and private foresters, the U.S. intelligence and defense communities, the Department of Homeland Security, and a host of other clientele. Only now, more than a decade later, have the U.S. intelligence community and the Department of Defense begun to explore the utility of similar non-linear spectral transforms.

In forestry, RMS was able to use airborne hyperspectral imagery, in conjunction with high-resolution panchromatic and engineering-grade Lidar data to increase the typical accuracy of tree species identifications from 60-70% to consistently higher than 90% and in many cases approaching 100%. With these accuracies, RMS is also able to detect the subtle declines in forest health due to infestations such as Hemlock Woolly Adelgid, the Emerald Ash Borer, and Mountain Pine Beetle, which are becoming much more insidious due to global warming conditions and regularly cooler winter temperatures. RMS is currently pioneering the use of airborne hyperspectral imagery in protecting the nation's forests and its timber industry against these debilitating pests.

Following the 9/11 terrorist attacks and the beginning of the wars in Afghanistan and Iraq, RMS supported the U.S. intelligence community by engaging in a Top Secret study of the use of various spectral technologies for defeating our adversary's use of Camouflage, Concealment, and Deception (CC&D) techniques. Jim is a recognized community CC&D expert and has used a version of RMS' NVTs to allow real-time detection of enemy camouflage and concealed targets on the modern battlefield. Jim also redefined the laboratory techniques used by our various intelligence agencies to characterize camouflage, which have allowed continued improvement in our ability to detect them.

The results of this study were reported directly to George Tenet (the Director of the CIA) and his staff at his Langley, Virginia headquarters.

Because of RMS' expertise in airborne surveying, software and systems engineering, as well as hyperspectral and general imaging science, Jim acted as a Subject Matter Expert (SME) in support of the U.S. Army in its design, build, test, and operation of a classified Secret airborne Intelligence, Surveillance, and Reconnaissance (ISR) aircraft. Jim was the only mission SME in charge of two of the aircraft's sensor systems and supported its stateside design, build, integration, and test. All aircraft instruments enabled real-time target detections and Jim's instruments required more airborne computing power than any other airborne instrument to this date. In late 2010, Jim completed a six-month tour of duty in Iraq flying daily missions on board this aircraft in support of U.S. and coalition forces by detecting Improvised Explosive Devices (IEDs) and Explosively Formed Penetrators (EFPs) before they could harm our troops. Conditions in Iraq were harsh, minimum 72-hour workweeks, and terrorist attacks against our operating base and the aircraft in flight. This mission was extremely successful, saving untold numbers of service men and women's lives and even allowing the capture of terrorist forces as they were detected burying IEDs and EFPs, while none of the plane's air or ground crews were injured by direct enemy action.

Presently, Jim and RMS are contracted under three projects. The first is a hyperspectral-based, multi-camera system to detect trace explosives found on people, their belongings, or other objects (e.g. vehicles). Jim is responsible for the scientific, technical, and engineering design of this system and is currently commissioning the build of its hardware, while managing all aspects of its software engineering and system integration. We anticipate this system will be sold to any variety of corporation, institute, or government agency requiring pre-screening of people and their possessions prior to admittance into sensitive facilities. Second, RMS is combining aspects of radio interferometry, synthetic aperture radar and nuclear magnetic resonance imaging, and seismic interferometry to create a novel subsurface imaging modality using extremely low-frequency electromagnetic energy. This methodology promises a dramatic increase in subsurface resolution and target sensitivity and is beginning field trials in support of the monitoring of subsurface fracking operations in the U.S. and Canada. We expect in time, this technique will allow sufficient subsurface fidelity to assist in oil and gas exploration efforts as well. Lastly, RMS is studying the feasibility of spaceborne radar and electro-optical imagery to monitor the environmental integrity of Carbon Capture and Sequestration (CCS) processes in North America. This project is currently completing the technical calibration of all spacecraft signatures and will soon result in a software tool to aid environmental engineers to ensure the safe operation of these facilities and the mature stewardship of their operating environment.