PIPELINE... CONTINUED

prove the detection of hazards with the use of sensors. This would serve to reduce the number of incidents of damage to the pipeline by unauthorized machinery.

- Ability to loiter for longer-term observation. From a security standpoint — perimeters of refineries, chemical plants, etc. — UAS could be used to maintain security for these facilities. In addition, in the event of an incident, either on or offshore, the aircraft could provide real-time data to the emergency manager to make better decisions or assess the extent of the damage.
- Lower cost. With widespread uptake by the industry and surveillance of multiple transportation modes within one corridor, the use of UAS would be more cost effective than today's methods.
- Reduce the cost of repair, cleanup and environmental remediation in the event the pipeline is ruptured.

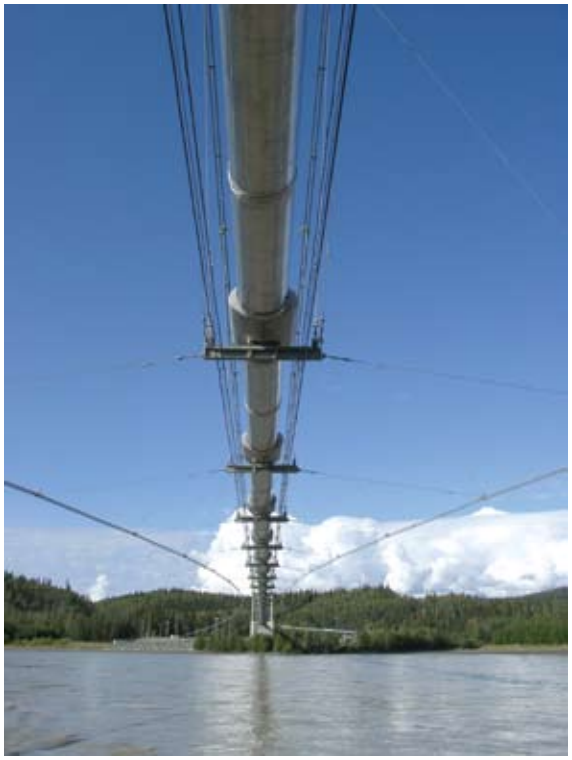
The challenges of using UAS to reap these benefits are many: FAA regulations; absence of sense-and-avoid technology; the need for Certificates of Authorization from the FAA, which as they are currently designed are not feasible for pipeline/corridor surveillance or larger scale marine environments; and surveillance flights, which must be at 500-2,000 feet due to technology limitations and weather.

Remote sensing technology is limited due to altitude, camera/sensor resolution, cost, size, weight, etc. There are technology gaps related to having sufficient computing power on board the aircraft for automated in-flight threat detection with high accuracy, speed and over-the-horizon communications, to name a few.

The public will also challenge UAS operations over concerns about the reliability of the aircraft and privacy concerns, among other issues.

Getting There

To move beyond these challenges, the oil and gas industry needs to improve its level of communication and collaboration with the UAS industry to establish the viability of this approach. Work should start on a small scale, prove the technology and safety and validate that UAS will meet the concept of operations as the oil and gas industry has defined it.



To do this, the industry will need FAA regulations that will allow for a patrol of 20-60 miles of pipeline corridor and will require automated technologies be developed on manned aircraft and then migrated to a UAS as they become more viable. The pipeline industry, through its research organization Pipeline Research Council International, has already begun to address these challenges.

Working with the pipeline government regulator and sponsor, the U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration, and the NASA Ames Research Center, the Right-of-way Automated Monitoring project is conducting research and proof-of-concept tests to close the remote sensing technology gaps.

However, there's a long way to go to achieve a commercially viable, cost-effective UAS solution for pipeline aerial surveillance and the oil and gas industry as a whole.

Gary Shane is a consultant and project manager based in the Chicago area.

The Fire Below: U.S. Forest Service UAS Demo Validates Capabilities

By Jay Willmott

The Virginia Army National Guard's Maneuver Training Center at Fort Pickett, Va., located among the state's lush southern pine forests about 40 miles southwest of the state capitol of Richmond, was the site of another in a series of successful UAS explorations being undertaken by the U.S. Forest Service as it prepares to eventually deploy unmanned technologies for a variety of applications.

Philadelphia-based American Aerospace Advisors Inc. (AAAI) was contracted in 2009 by Forest Service headquarters to carry out the demonstration. AAAI has constructed the Reconnaissance System 16 (RS-16), based on the Arcturus T-16 air vehicle and partnered with 2d3 Inc. to use its TacitView Video Exploitation System for wildfire monitoring use.

"The Forest Service envisions three primary missions for this class of UAS. The first is observation of the fire in order to monitor its strength and movement, especially in relation to where our firefighters are deployed and any structures we might need to protect," says Tom Zajkowski, managing supervisor for USFS' Fire Response Team Bravo. Zajkowski was among several Forest Service personnel who witnessed the demonstration.

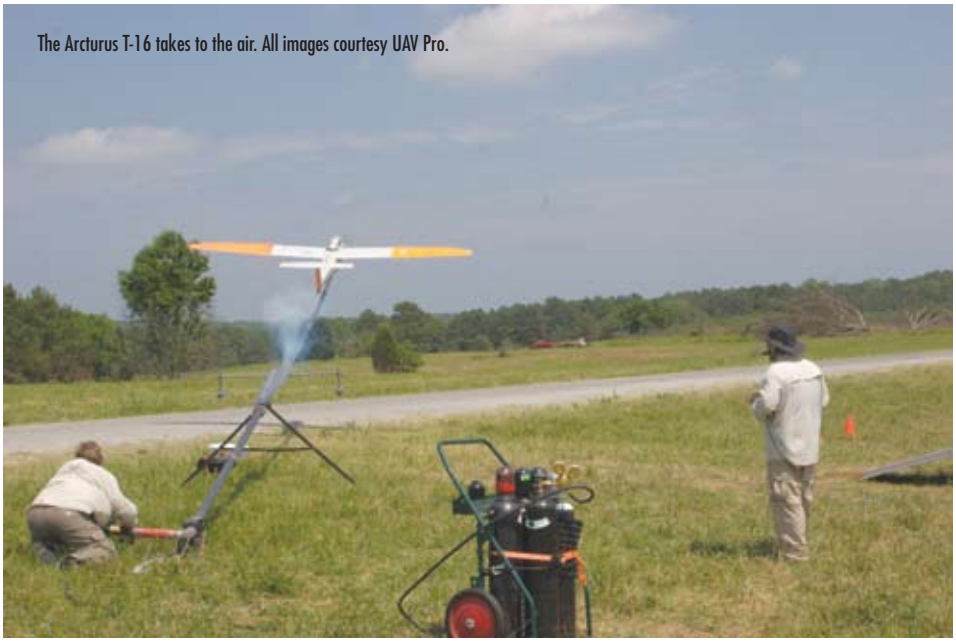
"Then, of similar importance, will be the ability to use the UAS to improve com-

munications among firefighting personnel, who are very often deployed along remote canyons and hillsides, where line-of-sight communications are difficult, if not impossible to attain, and finally, for real-time fire weather measurements, to better predict movement," he continued.

The RS-16 is a self-contained mobile system that includes the aircraft, ground support equipment, payloads and a Mobile Command Center capable of command and control of unmanned aircraft while managing remote sensing operations, including sending out real-time, geo-rectified data.

TacitView ingests imagery and metadata captured from unmanned or manned aircraft and generates that real-time imagery, including annotated images and video clips, mosaics and maps, and geo-coordinates of areas of interest while simultaneously providing the operators with real-time situational awareness and a common operating picture.

June's demonstration successfully showcased the ability of the RS-16 UAS to deploy its EO and IR sensor suites and exploit their imagery in real-time for the wildfire mission, which includes tracking fire perimeters, active fire fronts, fuel fire information and hot spots. In addition to the imaging payloads, an experimental communications relay payload was also successfully demonstrated.



The Arcturus T-16 takes to the air. All images courtesy UAV Pro.

Zajkowski also commented that several of the parameters being tested were the direct results of lessons learned as a result of the Table Top Exercise (TTX) coordinated by AUVSI at the Naval Post Graduate School in Monterey, Calif., in Sept. 2009 (for more on the TTX, see the November 2009 issue of *Unmanned Systems*). The TTX was described as a "game environment" for federal, state and local first responders and local safety officials to "collectively investigate the appliance of unmanned air system capabilities in an emergent public safety application." The success of June's test at Fort Pickett indicates successful implementation of the TTX and the lessons learned through a public-private, government/commercial partnership that reaches beyond dialogue, to real-world testing.

History

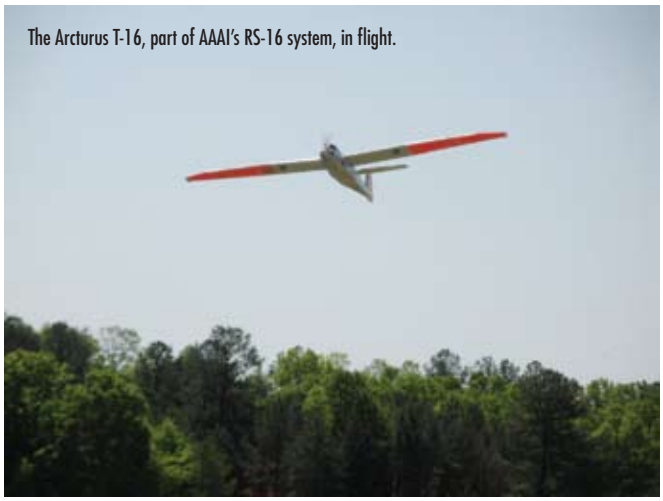
The initial test of the RS-16 system was performed in February 2010 at the U.S. Army's Dugway Proving Ground in northern Utah. The follow-on June test was originally slated to occur at Fort Hunter Liggett in central California, but was relocated to Virginia's southern tier when

FOREST SERVICE... CONTINUED

the West Coast location was deemed "too wet" to support controlled burns needed to allow evaluation of the aircraft's onboard infrared sensors. Fort Pickett's 42,000 acre expanse was selected for its availability, close proximity to both the UAS vendor team and U.S. Forest Service Headquarters personnel and because the base permitted the Forest Service access to its restricted operating zone (R-6602) following an arduous system readiness review process that eventually resulted in permissions from base airspace, frequency and range operations authorities. In addition to providing airspace and ranges suitable to perform the demonstration, the Fort Pickett Fire Department assisted with preparation and management of the critical controlled burn sites.

An increasing amount of UAS training activities are being permitted at Fort Pickett on a "non-interference basis" as a means of complementing other ongoing training activities there. Base management is cognizant of the increasing role of UAS and has so far been able to strike a balance between traditional ongoing training activities, such as fixed and rotary winged manned aircraft, mechanized, artillery and infantry activities, while at the same time recognizing a need to incorporate current and emergent unmanned technologies that are increasingly a part of modern warfighting.

"It's an integration challenge for the base" said Jay Willmott, former president of UAV Pro, which is based at Fort Pickett and coordinated the approval process, "because there are only so many ranges and only so much restricted airspace here and much of it is scheduled months, if not years, in advance. We're hoping additional federal and state resources might be made available to assist Fort Pickett with managing the extra workload of approving and integrating unmanned systems into their already busy training schedule."


The Arcturus T-16, part of AAAI's RS-16 system, in flight.

AAAI is integrating the lessons learned from this and previous projects with the Forest Service to increase the performance of the RS-16 system. AAAI plans to add aircraft of various types, integrate higher resolution imagers, increase the performance of its communications relay payload and expand its RS-16 fleet. In addition, working with partner 2d3, AAAI is developing enhanced TacitView video exploitation tools specifically designed for wildfire applications.

The Forest Service has a long history of using aviation assets to support its vital mission, and not solely for fire fighting applications. The service sees potential uses in surveying lands previously scorched by fire to determine likelihood of mudslide activity. UAS can also potentially be used to re-seed areas after a fire and monitor the emergence of non-native invasive species. However, these potential missions, like the others, are still slow in being realized.

"We are still waiting on a more benevolent set of FAA guidelines which will allow us to support wildfire monitoring beyond line of sight from the ground observer's position," said Everett Hinkley, program manager for the USFS's National Remote Sensing program, one of the attendees at the demonstration. "We have a demonstrated need for this capability and with operational use we will be able to maintain air safety while improving the fire community's ability to save lives, property and resources."

Well-planned and responsibly conducted demonstrations such as the U.S. Forest Service's efforts at Fort Pickett could help give regulatory authorities a baseline for determining which agencies should be allowed to operate UAS in the National Airspace System and under what circumstances.

Jay Willmott is president of AUVSI's D.C. Capitol Chapter.

Into the Air in Australia: Regulatory Framework for UAS Takes Shape Down Under

By Reece Clothier

More than a decade ago the Civil Aviation Safety Authority (CASA) undertook the proactive step of defining regulations for the operation of unmanned aircraft systems (UAS) in Australian airspace. The result, which is captured in Civil Aviation Safety Regulation 1998 (CASR) Part 101 Subpart F, is still viewed today as world-leading in its approach toward the regulation of this unique and growing sector of the Australian aviation industry.

When defining Part 101, CASA recognised the unique aspects of the Australian airspace environment, UAS operations and their potential applications. The regulation facilitates the operation of small UAS (defined as fixed-wing aircraft with a maximum takeoff weight of less than 150 kilograms, or 330 pounds, and 100