Lightweight Beacon System for Unmanned Aircraft Systems and Other Aviation Applications

The introduction of small Unmanned Aircraft Systems (UAS) and a growing population of light sport aviation aircraft pose an increasing safety risk to other airspace users. These aircraft and many other small, low-altitude airspace users operate in visual meteorological conditions independently of Federal Aviation Administration (FAA) air traffic separation services. These factors may limit widespread equipage of ADS-B technology. Aircraft operators can self-equip with ADS-B to increase their situational awareness and increase air safety, but this assumes the technology is developed to meet their needs affordably.

The MITRE Innovation Program has produced the Universal Access Transceiver (UAT) Beacon Radio (UBR), which is a small, (e.g., battery-powered) transceiver suitable for a large population of airspace users ranging from small UAS to gliders, balloons, and sky-divers. The UBR’s small size, light weight, and low power consumption enables it to be easily integrated into battery-operated UAS with small payloads, affixed to an aircraft glare shield, or affixed to a sky-diver’s person to alert other airspace users of their presence. When the UBR is coupled with...
a portable graphical display, the pilot/user is able
to see proximate traffic and receive real
time flight information services from the FAA (e.g., weather).

There are many applications of the UBR that expand
on the theme of aircraft situational awareness. A few
are illustrated here. First, high value applications
include national emergency and natural disaster
scenarios where many different government and
civilian organizations come together with air and

land-mobile assets. Portable UAT Beacon Radios
enable the rapid deployment of low-cost surveillance
technology that greatly enhances the situational
awareness of the aircraft operators and the incident
commanders. Furthermore, this technology enables
manned and unmanned aircraft to operate in
controlled airspace safely.

Second, a representative asset tracking application
involves deploying UBRs on large numbers of small
UAS and autonomous vehicles during maneuvering
exercises or test events. The objective is to enable the
range manager or test conductor to easily identify and
locate the movement of these assets independently of
the control links associated with each vehicle.

Third, a search and rescue application may be
employed by organizations like the Civil Air Patrol to
monitor the movement of aircraft and ground teams
to improve search coordination and efficiency.

MITRE/CAASD’s UBR is a prototype built to UAT
standards (DO-282A), but is not FAA certified for
commercial sale or use in the national airspace.
The UBR technology is available for non-exclusive,
royalty-free licensing as a reference design for
commercial interests looking to develop UAT ADS-B
systems.