

# Velocite

Bringing LTE technology to airborne telemetry



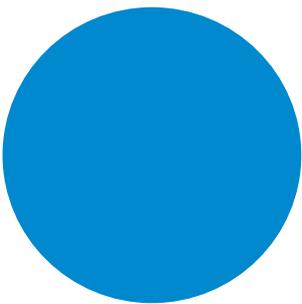
Aeronautical Mobile Telemetry (AMT) provides crucial data communications for performance evaluation and ensures safety during the testing of manned and unmanned aircraft. Current AMT services are provided on high-end, long-range antenna hardware that must be committed to one test exercise at a time. With its Velocite solution, Perspecta Labs harnesses commercial 4G long-term evolution (LTE) cellular technology to well beyond Mach 1 speeds to meet the challenging operational requirements of AMT. Vendor-agnostic and high-bandwidth, Velocite enables multiple simultaneous test missions to be conducted over commercial equipment, saving both time and resources.

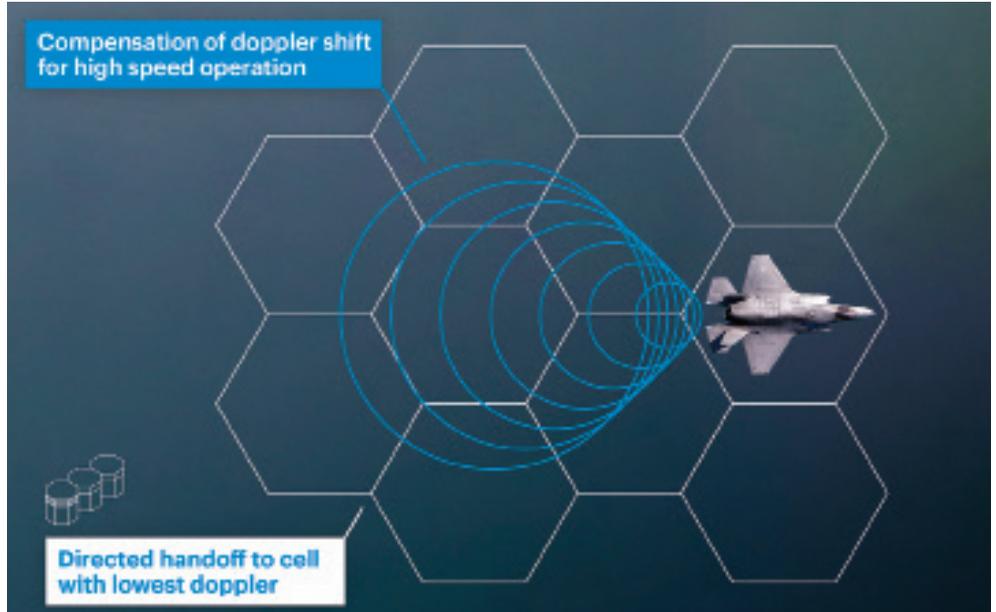
## How it works

Velocite combines an intelligent LTE network design with groundbreaking innovations to reliably deliver high-bandwidth data communications for test aircraft at speeds of 1,000 kph and above. The Velocite network design provides 3D coverage with connection to multiple cells available at most points in the airspace. This provides redundant and reliable coverage, working with diverse LTE equipment for both base station (eNodeB) and user equipment (UE) to deliver a nominal 20 megabytes per second throughput per link over a large part of the covered airspace.

The Velocite Integrated Cellular Network Control capability (ICNC) seamlessly takes control of cell-to-cell handovers and can be implemented without requiring any Layer 2/3 upgrades or modifications to the LTE base stations. ICNC is a sophisticated management component that collects real-time power, location and timing data and utilizes advanced analytics to estimate aircraft trajectory and cell signal quality. The ICNC rapidly and automatically directs handovers to cells with good signal-to-interference-plus-noise ratio (SINR) low Doppler shift. This ensures delivery of uninterrupted data communication at the high speeds used on flight test ranges.

Velocite's transceiver applique provides state-of-the-art Doppler compensation and easily integrates with any standard LTE UE to maintain a robust data link. The applique performs high-speed Doppler estimation and real-time frequency compensation functions to synchronize the test aircraft's LTE transceiver in both radio directions with any desired LTE base station. The applique substantially extends the standard LTE frequency synchronization limit of 350 kph to fighter jetspeed.



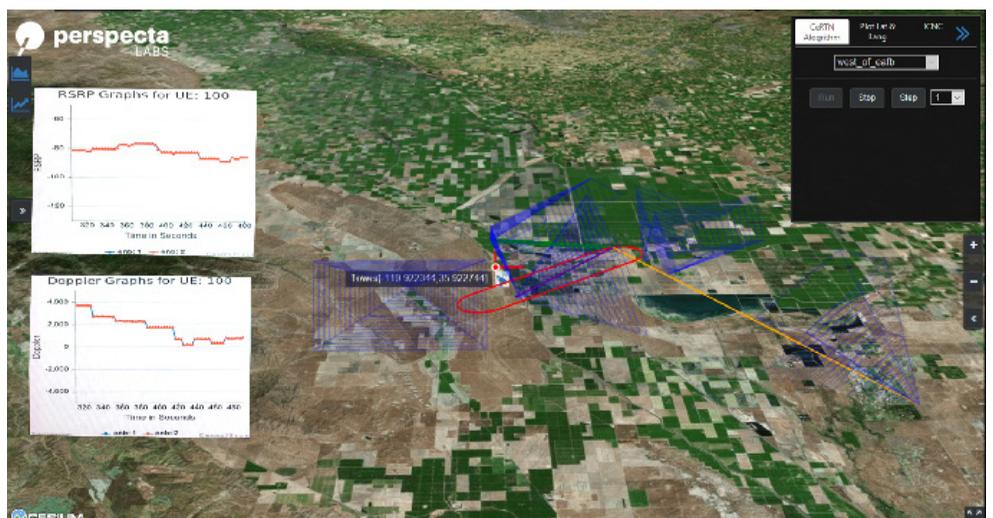


Perspecta Labs' Velocite works with LTE equipment from any manufacturer to choose the optimal cell for minimum Doppler and also compensates for Doppler shift in extremely high speed cases.

#### Value and benefits

- Cost effective and spectrum efficient
- Handles multiple simultaneous tests with almost no spectrum coordination
- Minimal intervention and oversight needed from testing range ground teams
- Dynamic automatic assignment of spectrum resources based on data rate and coverage needs
- Leverages existing commercial equipment
- Operational in all testing range radio frequency bands and at flexible bandwidths, on demand
- Vendor-agnostic solution that can transfer to different vendor platforms to meet custom operational demands

Velocite also includes easy-to-use radio frequency planning tools to support test range operators with 3D coverage analyses and flight trajectory coverage predictions. The ICNC visualization tools are used for supervision of network operation and real-time situational awareness of test status. Velocite components have been integrated with multiple LTE equipment providers' product lines and have been successfully demonstrated in a laboratory environment; field demonstrations are planned for the first half of 2019.



Visualization from Velocite showing the ground network superimposed on geographic background and display of key parameters of interest. This view provides real-time tracking of the location of the test device, the quality of the link and the connectivity details with the ground network.