The Affordable Collision Avoidance Technology for General Aviation and UAV

Every year, around 40 aircraft are involved in a mid-air collision. Half of these are fatal. Most of these accidents happen in good visibility and daylight.

FLARM brings affordable, active and cooperative traffic awareness and collision avoidance technology to manned and unmanned aviation. Over 40,000 manned aircraft and many UAVs are already equipped with FLARM and the number is rapidly increasing.

Research and several accident investigations have shown that despite the VFR-principle of “see and avoid”, it’s often impossible to see the other aircraft. This is not only true when the other aircraft comes from such a direction that the view is obstructed by the own aircraft. The human visual system is not capable of reliably detecting objects on a collision course, since they are on a fixed point on the windshield. Several other physiological and psychological factors further decrease the chance of seeing the other aircraft in time.

**Highlights**

- Leading detect & avoid solution for GA and UAV since over a decade, with over 40,000 aircraft equipped
- Designed for the safety benefit of pilots and small aircraft; not ATC, airliners or military
- Smart trajectory prediction and collision warning algorithms, optionally complemented by autopilot mission data
- Transmit, receive and processing combined in one compact system
- Unique coverage for lower airspace below FL100 outside of airports where ADS-B is nearly nonexistent
- Independent of limitations, interference and marginal innovation on legacy 1090 MHz ATC technologies
- Real-time, low-latency, vehicle to vehicle communication, faster than ADS-B and mobile networks
- Key to any detect & avoid risk mitigation strategy for UAV in lower airspace and BVLOS
- Approved by EASA, recommended by Eurocontrol, CAAs, aeroclubs and insurance companies
- Access to real-time tracking network and remote identification with opt-out privacy
- Integrated 3D fixed obstacle warning system (power lines, aerial lift cables, wind turbines, etc.)
- Complementary technology for SAR

**How does FLARM work?**

FLARM works by calculating and broadcasting its own future flight path to nearby aircraft. At the same time, it receives the future flight path from surrounding traffic. A smart motion prediction algorithm calculates a collision risk for each aircraft based on an integrated risk model. When a collision is imminent, the pilots are alerted with the relative position of the intruder, enabling both to avoid a collision.
Each FLARM system determines its position and altitude with a sensitive GNSS receiver. Based on speed, acceleration, track, turn radius, wind and other parameters, a precise projected flight path is calculated. This flight path, together with additional information such as a unique identifier, is encoded before being broadcast over an encrypted radio channel.

The channel is encrypted to ensure safety, integrity, and privacy. Users can freely configure the level of privacy they require. All FLARM devices are interoperable with each other and share the same communication protocol. The protocol is continually improved as part of an annual innovation update cycle. The frequencies used are in the license-free SRD and ISM bands, meaning that no radio license is required for installation or operation.

The modern PowerFLARM technology has many benefits over Classic FLARM introduced over a decade ago, including superior range on all frequencies globally, higher sensitivity, improved out-of-band filtering and optional antenna diversity. PowerFLARM is fully interoperable with all FLARM systems and comes at an affordable price.

Several FLARM systems also incorporate an ADS-B and transponder receiver. This enables transponder equipped aircraft to be included in the collision prediction algorithm and is especially valuable when flying in high density traffic airspace.

In addition to preventing collisions between aircraft, FLARM can also warn about fixed obstacles. The integrated obstacle collision warning system is kept up-to-date by installing periodic obstacle database updates. The database contains complex and 3d obstacle types, not usually seen in other avionics.

All FLARM devices are based on leading-edge safety technology developed by FLARM Technology in Switzerland. A large variety of FLARM devices are available from different manufacturers for different aircraft types. This also enables the availability of moving map products and other avionics with integrated FLARM, while guaranteeing interoperability and keeping cost low.

FLARM is approved by EASA for fixed installation in certified aircraft. A Minor Change Approval (MCA) is available. EASA supports FLARM as it significantly decreases the risk of a mid-air collision between participating aircraft.

FLARM systems are sold and installed by maintenance organizations and avionics shops. A list of dealers is available under www.flarm.com/buy

A selection of available FLARM devices and displays

www.flarm.com