High Integrity Avionics for UAS Airspace Integration

Matt Cheeseman & Adrian Eves

Callen-Lenz Associates

Autopilot technology

- Developed under AIRSTART as a stepping-stone towards the new generation

The BVLOS technology problem

- Need for avionics that support safety requirements for BVLOS:
  - Reliability & integrity of avionics commensurate with safety target
  - ATM integration technologies commensurate with operating environment
    - Traffic information (e.g. ADS-B)
    - ATC communications (e.g. VHF relay)
  - Detect & avoid technologies integrated in a manner commensurate with CONOPS with appropriate levels of automation
  - Should not be prohibitively expensive

Callen-Lenz Solutions

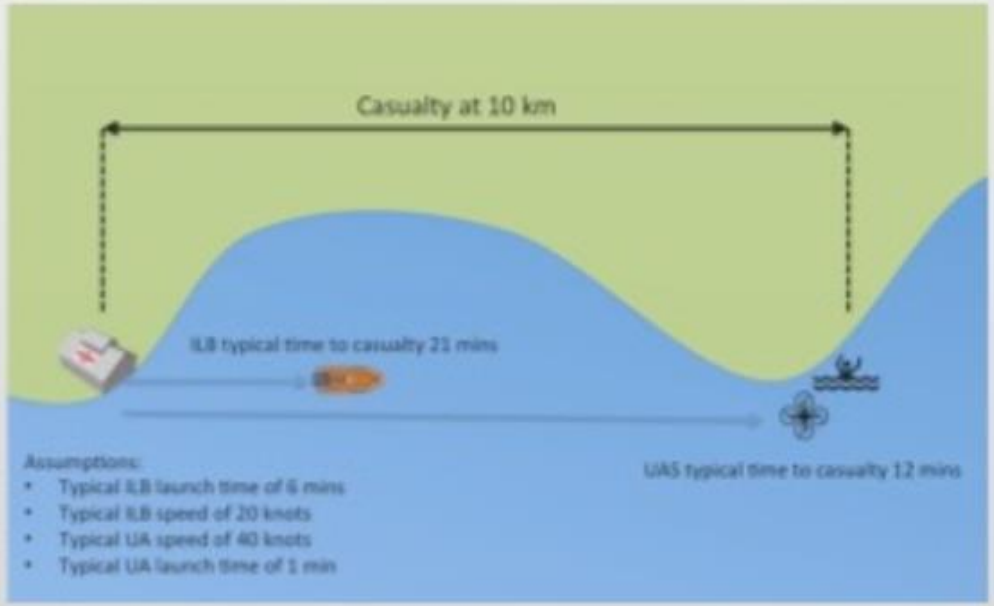
- Dedicated Autopilot Support for Generic 'Detect and Avoid' Technologies
  - Command hierarchy to safely integrate 'avoid' behaviours
  - Configurable 'avoid' functionality (for example during comms failure) to meet regulatory requirements
  - Configurable ground display of 'detect' information, D&A system status and D&A system configuration
- Flexible Communications Fall-Back
  - Seamless use of multi-bearer communications architecture (e.g. direct RF, satellite, cellular, optical high bandwidth)
  - Configurable automated failover for critical and non-critical (mission system) communications

Callen-Lenz Solutions

- Flexible Redundancy
  - Avionics architecture that can be configured to support redundancy appropriate to use case & CONOPS
  - Affordability – redundancy should be commensurate with whole system safety target as configured for desired CONOPS
- Flexible 'Autonomy'
  - Acceptable automated behaviours will vary with environment & CONOPS - should be pilot-configurable (potentially in real time)
  - Traffic avoidance, weather avoidance, no-fly zones, range boundaries, flight envelope protection etc are all valuable but level of automation must be configurable & under control of pilot in a way that is proportionate with CONOPS & regulatory environment

Technology Applications

- Maritime Search And Rescue (SAR)
  - RNLI are a highly relevant end-user of UAS technology
  - Intelligent customer
  - Working closely together
    - Requirements
    - Sensors
    - Vignettes
    - Trials



- Ultimately, extend to other users