

In the picture: Irish Air Corps integrates live tracking and surveillance data with joint picture

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Key Points

- The Defence Forces of Ireland has expanded its Common Operational Picture to include the air domain
- The Air Corps Operational Picture now includes tracking data for all platforms

In May 2016 the Defence Forces of Ireland (DFI - Óglaigh na hÉireann) completed the process of creating a joint common operational picture (JCOP) with the integration of the Air Corps Operational Picture (ACOP) with the Recognised Maritime Picture (RMP) and the Land Component Picture (LCP). The latter two were integrated in 2014 providing HQ Defence Forces (HQDF) in Dublin a constant up-to-date view of operational activity in those two domains. This solution was achieved using Systematic's SitaWare command-and-control (C2) software suite, with SitaWare Headquarters as the higher level C2 application, SitaWare WebCOP as the web-based COP visualisation and access tool and SitaWare Track Server as the track integration application.

Speaking at the Systematic User Forum in May 2016 in Ljubljana, Slovenia, Commandant Noel Barbour of the Irish Air Corps explained that in the air domain the problem of providing an accurate operational picture was two-fold. Throughout the flights of both fixed- and rotary-wing aircraft there was no reliable tracking data to provide positional information, and there was no real-time access to the maritime track and other situational awareness data provided by the Air Corps CASA (an Airbus Defence and Space legacy company) CN235 maritime patrol aircraft (MPA), which are equipped with the Airbus Defence and Space Fully Integrated Tactical System (FITS) mission system.



The Irish Air Corps has improved the real-time position reporting and surveillance data sharing of its CN235 MPA using Systematic's SitaWare and Track24 tracking, has integrated this into the Air Corps Operational Picture and hence into the Irish Defence Force Joint Common Operational Picture. (Paul Jackson)

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The need for live rotary-wing tracking had been reinforced by aircraft accidents in 2009 and 2012 with subsequent recommendations for such a capability, while the absence of the MPA data was felt particularly by the Irish Navy, which is responsible for patrolling 1 million sq km of ocean, with its principle missions being fishery protection and anti-narcotics operations.

The sighting and census data derived from radar coverage from 10,000 ft is critical to this task; the MPA data feeds into the RMP to augment the existing civilian and warship Automatic Identification System (AIS) locational data, and the Vessel Monitoring System (VMS), which tracks fishing vessels. However, the limitations of reporting and communications meant that sometimes MPA sensor data were integrated up to an hour after a patrol had landed.



The Irish Air Corps will fit the Track24 tracking system to its AW139 aircraft as an interim solution, while the Honeywell Sky Connect Iridium-based system will be the long-term tracking solution. (IHS/Patrick Allen)

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The tracking issue has been overcome with a combination of the acquisition of Honeywell's Sky Connect tracking system and using Track24's positional reporting system, while the MPA data feed has been provided in real time with the introduction of the Mapping Web Service (MWS), bespoke software developed by Systematic. The Air Corps control centre operates blue and white servers. The white server is connected to the internet and receives external unclassified data feeds, while the blue server provides the live ACOP. The MWS acts as an AES 256 encryption bridge and air gap between the two.

The development of the ACOP was divided into two phases. Phase 1 improved the position reporting of the MPA, integrated Sky Connect hardware and software data into the ACOP, and improved the MPA data sharing with the navy in closer to real time, providing sighting and census reports from the aircraft. Phase 2 introduced the MWS, migrated the new MPA reporting system to the service, added the Sky Connect, and developed the Track24 interface.

The Honeywell Sky Connect system provides Iridium-based tracking and worldwide coverage. Eight systems have been acquired by the Air Corps and they will eventually be fitted to all the EC135 and AW139 helicopters. The system provides reports direct to the live ACOP server giving position, altitude, speed, and heading at one minute intervals, although it is intended to improve the latency of reporting.

The problem with the MPA position reporting was that there was no reliable tracking data throughout the flight. Tracking was achieved by Mission Follow Up (MFU) data reporting over high-frequency (HF) radio, providing a regular automated position, speed, bearing, and altitude message to a graphical user interface at the control centre. The data were then manually input into the picture. However, this information was not provided in the early and late stages of a mission as during these periods the radio was used for voice communications and had to be manually switched to data. The requirement was therefore to provide the position reporting throughout the mission and take the human element out of the process so that the ACOP was automatically

updated.

The solution was to use the Track24 system, which was integrated into the aircraft. Track24 is also an Iridium-based system that provides data giving location, speed, bearing, and altitude to a ground station in Arizona, which in turn produces a standard XML feed. This data is fed into the white server and can then be consumed by the MWS which turns it into a C2 track and sends it to the blue server where it is automatically plotted on the ACOP. Track24 is also being used as an interim solution for the AW139 helicopters until the Sky Connect units are fitted.

Reception of Track24 positional data is sensitive to changes in latency, so if no report is received within a set timeframe the system broadcasts an alert and increases the polling frequency to once every 30 seconds.

Surveillance data from the CASA FITS mission system is now provided in a more timely fashion. It is fed into the blue server by email over HF radio via the ground communications centre, which processes the data into an acceptable format and populates the ACOP using SitaWare WebCOP. It is then automatically replicated in the RMP and hence the overall JCOP. Surface tracks at a range of up to 470 km can now be plotted in near-realtime, which is of much greater use to the navy.

The plan for the future is to develop track integration in flight, referred to by Barbour as "SitaWare in the sky". Ideally the Air Corps would like to be able to view the JCOP on board the aircraft with the FITS sensor data replicated directly from on board and with the ground, sea, and air tracks all visible. Ideally this would be achieved through a datalink using a satellite telephone, but Barbour said that there were difficulties getting this certified for use on the aircraft so alternative solutions of a broadband networking radio and 3G/4G LTE communications were now being investigated.

The concept that has been devised uses a laptop on the aircraft hosting SitaWare Frontline, which directly fuses FITS data into the picture and then passes this over a virtual private network to the ground using the SitaWare communications server. This also enables the JCOP to be seen on board the aircraft.

The DFI is in the process of renewing its fixed-wing fleet, replacing its Cessna fixed-wing utility aircraft and the CN235 MPA aircraft. The former is at the request for tender (RfT) stage and the latter will be due in 2019-20. Both platforms will include tracking using Sky Connect or an equivalent, implementation of the SitaWare solution is or will be included in the tender requirements and an airborne network will be needed.

Shortly after the tracking solution had been implemented the DFI staged a major anti-piracy exercise using SitaWare HQ as its C2 solution. It included two surface platforms, three helicopters plus MPA to provide surveillance, all of which were able to be tracked in near-realtime on the JCOP at HQDF together with a rigid-hull inflatable boat containing special forces launched by one of the surface platforms to effect a boarding. The chat facility in SitaWare HQ was used between HQDF, the naval platforms, and the Air Corps HQ to co-ordinate the operation.

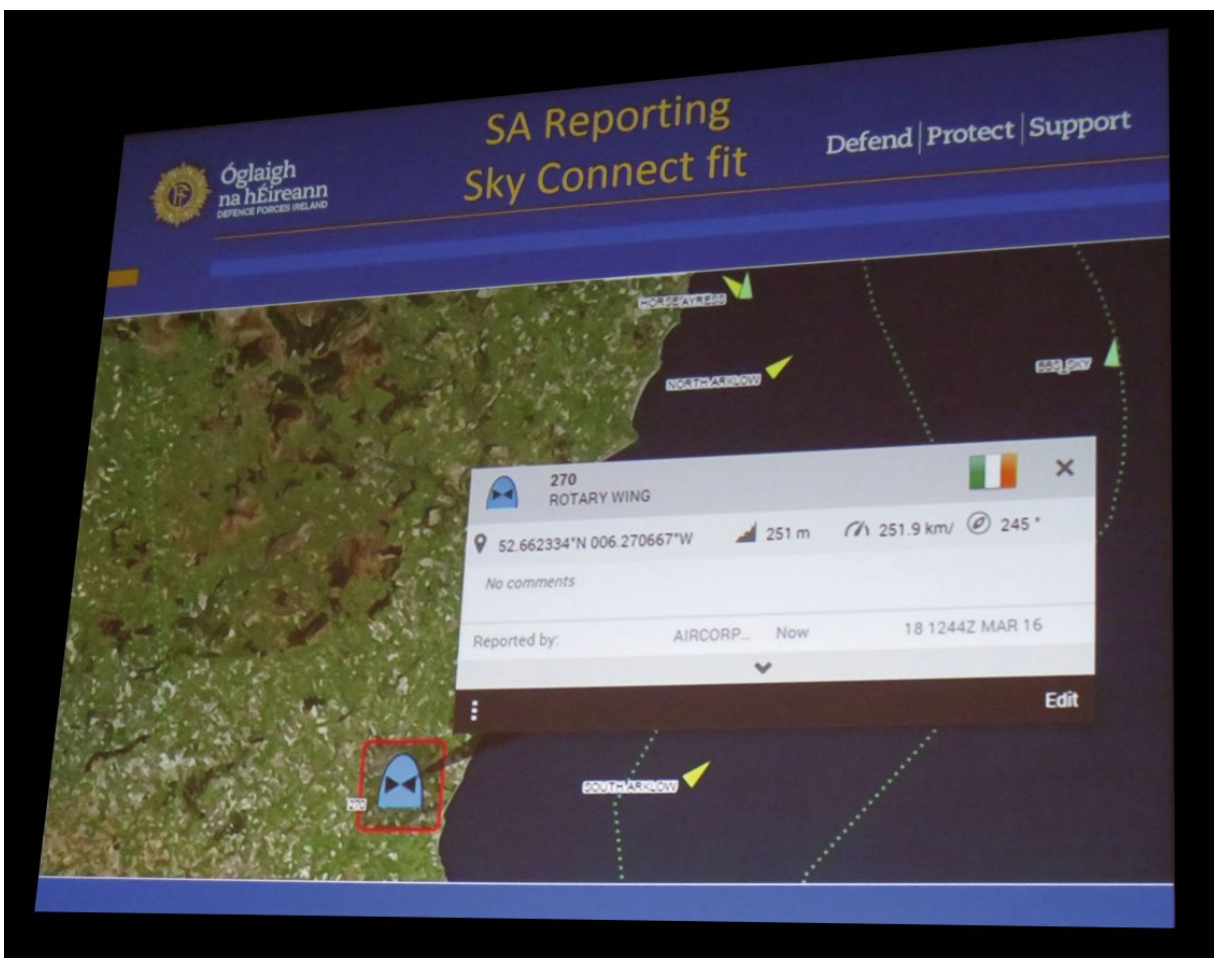
Phase 3 of the ACOP programme will move towards a true Recognized Air Picture (RAP). No air picture is complete without military and civilian radar tracks and the 2015 Republic of Ireland Defence Force White Paper called for the "development of a radar surveillance capability as a priority". A design concept is being developed which will feed the military and civilian radar tracks and the Automatic Dependent Surveillance - Broadcast (ADS-B), which provides similar data for aircraft as AIS does for surface vessels, into the Air Corps white server passed to the blue server

through the SitaWare MWS, used to populate the RAP and hence the JCOP.

The ADS-B receiver hardware will be used with software that produces an Over-the-Horizon-Gold (OTHG) output that can be consumed by the MWS. Barbour noted that in time he expected that it would be possible to remove the MWS air gap and make a direct connection using firewalls. The Air Corps intends to trial this RAP solution in 2016-17.

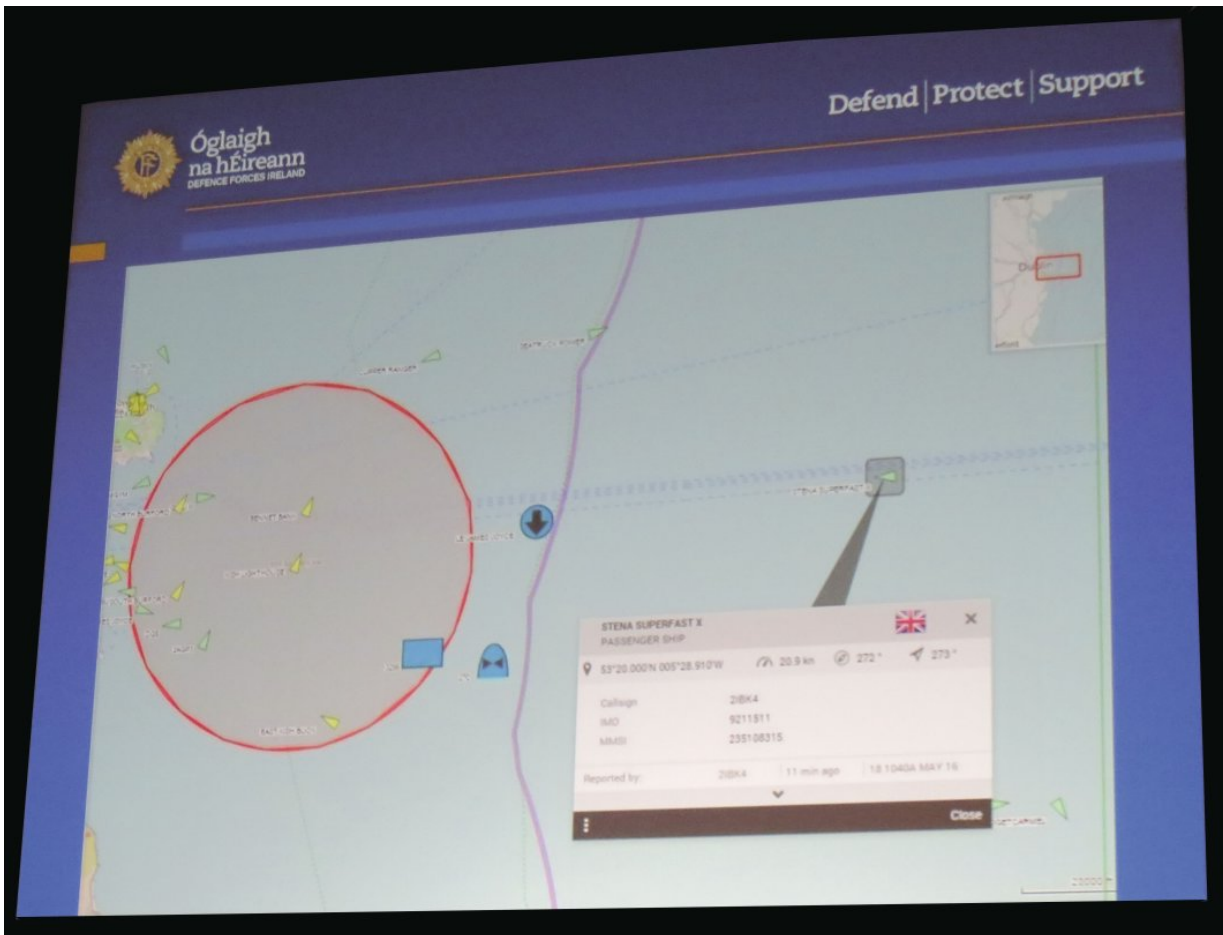
COMMENT

The development of tracking solutions for the Air Corps platforms and the integration of the ACOP into the JCOP using SitaWare means that the DFI now has a joint picture which has real utility in supporting its demanding surveillance and protection tasks, with the prospect of further improvements. It is an example of how the innovative use of limited resources and some lateral thinking can provide an adequate solution to a capability gap.



The track of IR270, the first Irish Air Corps EC135 helicopter fitted with the Honeywell Sky Connect tracking system, shown on a screenshot of the DFI Joint Common Operational Picture. (Giles Ebbutt/DFI)

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A screenshot from the DFI Joint Common Operational Picture during Exercise 'Poseidon' in May 2016, showing maritime AIS tracks with a hijacked ship highlighted and the tracks of the Irish Navy vessel LE James Joyce (the black arrow in a blue circle) and an Air Corps EC135. (Giles Ebbutt/DFI)

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