ACCS Insight

News from NATO's Air Command and Control System Programme by ThalesRaytheonSystems

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Jack Harrington, CEO, ThalesRaytheonSystems.

"A major accomplishment for the NATO Alliance"

The ACCS programme has overcome many challenges in its long road to success, and Jack Harrington, CEO of prime contractor ThalesRaytheonSystems, points out that, with almost 95% of the full system now tested, ACCS is in place, viable and a stable platform for growth.

After years of collaborative work, I am delighted to announce that ACCS is here. NATO now has the unprecedented capability to communicate across nations and react to threats in real time. We have passed the first major site test at Glons in Belgium, with all live interfaces and full system redundancy. The interim Ballistic Missile Defence (BMD) capability is now fielded and in operation within NATO. We are moving forward to validation and replication in all sites. This is a major accomplishment for the NATO Alliance," he says.

ACCS is a significant example of NATO's ability to conduct integrated acquisition and operational activities in line with its Smart Defence philosophy. With an integrated air and missile defence system extending protection over 10 million square kilometres of European airspace, "ACCS allows NATO to act in the way it has always intended – as one team," says Harrington.

Just as importantly, the development of the INterim CApability (INCA) for BMD, based on the ACCS architecture and the skillsets of ThalesRaytheonSystems' two parent companies in command and control and data fusion technologies, directly addresses one of the triad of emerging threats that NATO identified as its strategic priorities last year: terrorism, cyber attacks and ballistic missiles.
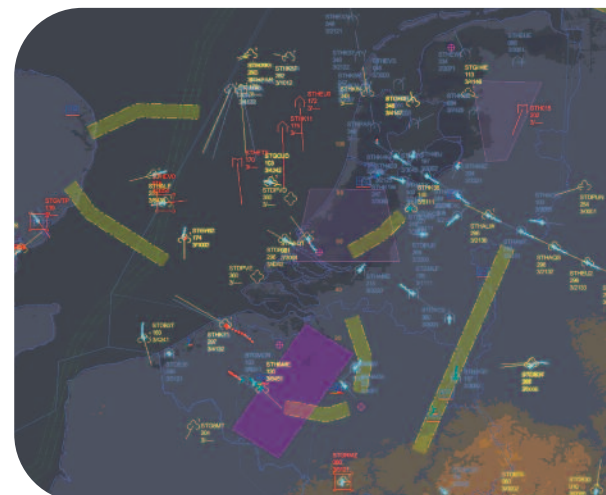
Harrington highlights the fact that this is a success founded on carefully managed partnerships, not only between user and contractor but within the supply chain itself. "As a transatlantic joint venture we are uniquely positioned to build this system for NATO: leveraging the combined heritage and capabilities of our two parent companies. But it's also about the commitment of industry at all levels

> **"ACCS allows NATO to act as it has always intended - as one team."**

over the last twelve years. We have reached out across the entire industrial base to engage a team of over 200 companies in the supply chain from many NATO nations," he says.

The achievements speak for themselves. "The DARS (a mobile facility embodying the ACCS architecture) has been in use for training purposes since 2008, INCA is fielded and operational today in Ramstein and Uedem and we have installed the ACCS system in the four validation nations. As the ST-II tests are achieved we will have a deployed operational system," says Harrington.

He is also bullish regarding the future. Although there are challenges inherent in the precision implementation of the system for different national requirements, "the final 6% is focused at the national level, while we already have early capability in place at Ramstein and are now starting to field ACCS at the additional eleven replication sites," says Harrington. He adds, "work is underway to leverage the investment already made. Tied in with other assets (such as deployed Patriot batteries) ACCS is already making a real difference."

Steve DuMont, VP NATO Business Line, ThalesRaytheonSystems.

ACCS is here – in its initial form – and Steve DuMont, VP NATO Business Line for ThalesRaytheonSystems, reflects on some of the milestones that have been achieved recently and where the programme goes next.

"ACCS is the end result of NATO's grand vision to develop a highly integrated, common AirC2 system, deployed across NATO to allow for the protection and defence of the more than 10 million square kilometres of sovereign NATO airspace while fully embracing the value proposition of 'Smart Defence,' says DuMont, summarising the programme in a single sentence.

The principal benefits to NATO centre on the provision of a highly integrated AirC2 capability that has been tested against a comprehensive and challenging set of requirements, to meet NATO's evolving mission needs. Providing greater operational flexibility and mission effectiveness, the ACCS 'system of systems' is also the foundation for the Alliance's future Integrated Air & Missile Defence (IAMD) capability.

A major accomplishment that came to fruition in March this year was the successful completion of System Test I-2 (STI-2). DuMont points out these included "the most challenging requirements of live system interfaces, system redundancy, 100% of security requirements, and a series of demanding system performance tests that stressed the system at peak load values across the system's operational environment that greatly exceeded any air missions to date."

Lying at the heart of ACCS' unique architecture is the common database, "which enables far greater efficiency in the transition from mission planning to mission execution and rapid re-planning and tasking than do legacy AirC 2 systems," in DuMont's words. As the replication programme extends the fielding of the ACCS Core System across 10 additional NATO nations, the highly adaptable and reconfigurable design will allow the system to meet the nations' specific AirC2 missions and integrate with their unique physical and operational environments.

Building on ACCS as it enters the next phase of its operational rollout, the system will provide core functionality for NATO's IAMD capability development, providing "synchronized situational awareness to NATO operational commanders to enable real-time, accurate decision making based on a common air and space picture, and extending NATO's common system approach to the highly relevant domain of Ballistic Missile Defence - further enhancing the value of ACCS to the NATO operational community," explains DuMont.

As a large, complex programme, the test and validation process has been a long and arduous one – one that the system has passed with flying colours. The next stage is already under way. "ACCS will begin core system operational fielding early next year but several early steps on the path to full operational fielding have already begun, including the acceptance and transition of the Quick Reaction Package Deployable ARS system (DARS/QRP) from its development site in Nieuw Milligen, in the Netherlands to its new operational home at Poggio Renatico, Italy," explains DuMont. Also, the ACCS TMD Interim Capability (ACCS InCa) has been deployed to the NATO Ballistic Missile Defence Operations Centre at Air Command Ramstein, Germany, in support of a real world contingency operation in Turkey.

"Providing greater operational flexibility and mission effectiveness, the ACCS 'system of systems' is also the foundation for the Alliance's future Integrated Air & Missile Defence capability."

ACCS will provide its core architecture as the basis for NATO's Integrated Air & Missile Defence capability. John Bravin, ACCS TMD1 (Theatre Missile Defence 1) Project Manager for the NATO Communications and Information Agency, explains what the vision is and how ACCS is providing the springboard for the continuing development programme.

John Bravin, ACCS TMD1 Project Manager, NATO Communications and Information Agency.

"The need for IAMD was captured in the Capability Package, so this is not really a new requirement. The recent challenges have been to ensure integration in as seamless a manner as possible, to manage different timelines and acceptance milestones and to work with different contractors," he explains, adding that the aim of delivering a single operational, training and maintenance baseline has largely been achieved. "We're there now – ACCS is the baseline and we are now focused on delivering the IAMD focus," he says.

The key development during the ACCS process, according to Bravin, has been to move to a much more flexible layered architecture. This has allowed additional components to be added to the core capability with far greater ease. "We will be adding a missile surveillance capability, which is different due to the ballistic and predictable nature of the target as opposed to the fast moving targets intrinsic to an air surveillance capability," he points out. He adds that, for example, ACCS has a strong emphasis on interoperability through messaging and that by extending existing standards where relevant, an IAMD capability can be evolved without compromising existing air defence capabilities.

"The necessity to get operational capability into the field as soon as possible to facilitate training and concept development in a phased way is one of the lessons we have learned from the ACCS process – and as we move forward with IAMD we are in a much better position all round to take advantage of this," Bravin says.

As the replication phase of ACCS development continues, Bravin believes the development of IAMD capability will benefit from the flexible, layered nature of ACCS. "The key ACCS philosophy is the provision of a core system with adaptation layers for various requirements. These layers are 'wrapped around' the core so, for example, we can readily separate a national adaptation layer (to cater for unique national requirements) around the core," he explains. This will enhance the interoperability of IAMD as it nears completion.

By working within a carefully developed flexible architecture, by extending existing standards to cover developing requirements and by adopting a spiral development philosophy – in which the principles of spiral development have been applied to an ongoing risk reduction programme – IAMD will deliver an entirely appropriate capability for the recently changed NATO Command Structure, according to Bravin.

The technical capability for IAMD will be delivered during 2015 and the harmonisation required to deliver IAMD to the operational community will take place during 2016, at which time NATO will have a true theatre missile defence capability. "This will be the foundation of future territorial missile defence capability – and ACCS will be a major part of the underlying foundation for that," says Bravin.

Patrice Imbert, Vice President
ACCS Programmes,
ThalesRaytheonSystems.

Patrice Imbert is the Vice President ACCS Programmes for ThalesRaytheonSystems and is thus ideally placed to answer some of the fundamental questions about the current and future status of the programme.

Where does ACCS go next? What is the process for the validation nations now?

After Factory System Tests in 2009 and 2011 established a validated baseline, the System Level Test is also behind us. We now have a new and validated core capability. It works. Site testing now means customisation to meet the specific requirements of each individual nation in an environment as close to the operational one as possible. ACCS will interface with national assets in each country and the process of testing this – ST-II – is something we have been working on for the last three years. The DARS, for example, has already completed ST-II and is now conducting functional testing.

All 11 of the replication sites will participate in ST-II tests and we are now equipping each site with the necessary facilities. This process will continue through mid-2015. But ACCS is not frozen in time, and needs to evolve to adhere to new standards and to integrate new air operation capabilities. Our spiral development programme is improving the definition process, giving us far better capacity to move quickly from prototype development to evaluation and testing.

What capacities and capabilities have you leveraged in reaching the current status?

This 'system of systems' benefits from the expertise and participation of many subcontractors. SELEX is heavily involved radar sensors interfacing and integration, CASSIDIAN provides hardware and Systematic, Indra and several branches of Thales are also contributing. We have 'best of breed' solutions at the cutting edge of technology across many of the complex domains that ACCS touches upon.

There are also specific site contractors managing each of the replication sites. In Poland, for example, it is Bumar, in Greece it is Thales Hellas, Ayesas in

Turkey. There are 15 main contractors from 10 countries and over 200 separate vendors involved in this programme, so it truly is an international collaboration as well as being a complex project.

What are the principal obstacles or challenges you now have to overcome?

Complexity is a challenge: ACCS is all about managing complex systems. We have the expertise to do this and are leveraging the talent and skills we have developed as we move forward.

We also have to shift from the engineering to the user community. At the same time as managing a complex structure, we need to make the system completely transparent to the end user. There is also the requirement to manage synchronisation across NATO. We have 14 nations involved at 20 different sites and many of the users have differing levels of knowledge and understanding. This is a major challenge in complex large-scale project management – but ThalesRaytheonSystems is fully competent in this, with a strong heritage that we are exploiting.

What is involved in providing for flexible manning of ACCS?

We have to ensure alignment of the nations with regard to ACCS, so that every nation can take equal advantage of the opportunities the system offers. So the very comprehensive training programme 'trains the trainers.' Over 200 individuals have now completed over 90% of the training curriculum.

The training academy at Massy has 20 workstations, providing a facility for individual and collective training. We have very specific tools for training, including a sophisticated Integrated Electronic Training Manual. The intention is to train the trainers for each nation first, so they can then train operational crews in all the replication and validation nations.

The operational testing of a large, complex system such as ACCS presents many challenges. Denis Videau, responsible for ACCS testing at ThalesRaytheonSystems, discusses some of these and highlights the way in which collaborative efforts have overcome them.

With STI-2 completed, the task of regulating and validating the existing software has now been finalised. Having already validated the technical requirements in the factory, the next step is to deploy ACCS to the national sites. "We have shown the efficiency of the live interface to demonstrate ACCS at the System Test and Validation Facility (STVF) in Glons and are now ready to deploy the software validation process in Belgium, Germany, France and Italy," says Videau. He adds that each site will now "integrate legacy systems to prove the interoperability of the live interface."

The challenges in this process are twofold. First is the necessity to ensure system security. "Every component system behaves a little differently, but this is mostly a matter of work volume rather than a technology barrier," he says. The objective has evidently been met, for Videau states that the security audit was passed with flying colours at the end of 2012 and that ACCS security now has the accolade of NATO accreditation.

The second and somewhat larger challenge has been to demonstrate the system is able to meet all performance requirements – some 80 major requirements are involved – while the system is under peak load. "We replicated peak load conditions and proved the system works in a scenario in which there were three times as many sorties as there were in a typical NATO Air Tasking Order during the Gulf War," he says. Not only did this prove the contractual objective had been met, but some 22 individual cases and over 600 separate performance measurements showed "the dimension of the future" for NATO air defence, in Videau's words.

Scenario development involved an extensive definition phase, the development of a robust test case, the management of a large number of simultaneous requirements for information handling and distribution and the insertion of all parameters into a stable and reliable database.

"the dimension of the future…"
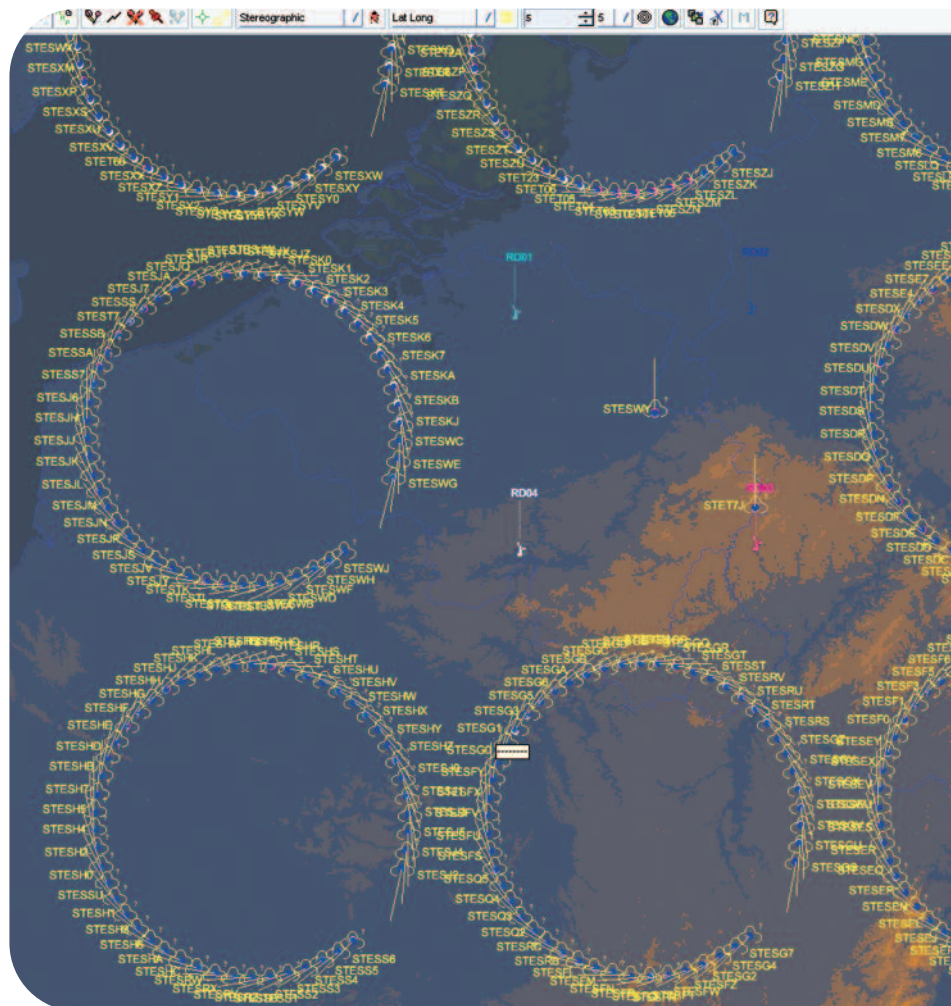
The validation team, consisting of up to 50 people at one point, spent a year on the testing phase of ACCS, the test itself occupying fully eight months. The result, according to Videau, is that ACCS "is built as it was designed, and has been built to work – it is operationally useable."

The lessons learned from the last seven years, culminating in the STI-2 testing phase, are several. Videau, who has been enthused and excited throughout that period by meeting and overcoming many obstacles to implementing the ambitious vision that is ACCS, believes these lessons will provide ThalesRaytheonSystems and its extended team with valuable experience for future development. "The necessity to involve operational staffs from the earliest possible stage and to work very closely with them in a transparent manner is a key to future success," he says. He adds that training and education of all team members – in both operational and development communities, is a critical factor. "Everybody needs to speak the same operational language and to have the most intimate possible knowledge of capabilities in order to fully exploit the system's potential," he added.

STI-2 is, without doubt, a major milestone in the ACCS programme. "This marks the end of the development of the software and means we are now firmly established on the road to deliver it to the operational community," Videau concludes.

Denis Videau, responsible for ACCS testing, ThalesRaytheonSystems.

ACCS is in operation! Ken Nesbitt, Operational Advisor for ThalesRaytheonSystems, highlights three instances in which ACCS capabilities are being used and bringing benefit to the customer.

**Ken Nesbitt,
Operational Advisor,
ThalesRaytheonSystems.**

Deployable ACCS capabilities for Surveillance and Control completes Operational Test

A recently completed test and evaluation process on the Deployable ARS (DARS) has proven invaluable, testing DARS hardware and software in a fully operational environment. "In a truly cooperative team effort the DARS test event objectives and scenario were defined and controlled by SHAPE in coordination with the NATO Communications & Information Agency, with DARS military personnel and observers from the Validation Nations manning the operator work positions, with hardware and software supported by a joint team of NCI Agency and DARS support personnel with ThalesRaytheonSystems," says Nesbitt. This represented the first time that the ACCS system has been tested in both full live and simulation environments at an operational unit, under operational conditions, with live sensors, fighters, AWACS, and NATO military personnel on all the DARS work positions.

Using DARS as a test bed for operations and as a means to identify any possible performance issues has been a successful initiative, according to Nesbitt. The DARS unit is now in the process of establishing itself in Poggio Renatico, Italy at the newly formed NATO Deployable Air Command & Control Centre.

Interim Capability for Ballistic Missile Defence is operational

ThalesRaytheonSystems has been a full partner in NATO Ballistic Missile Defence activities for a decade or more, in the initial studies starting in 2003, in prototype development and exercise participation and as a key member of the Active Layered Theatre Ballistic Missile Defence (ALTBMD)Test Bed in The Hague. When the initiative was launched to expand and provide a more robust NATO ALTBMD Interim Capability (INCA), centralised at a newly formed Ballistic Missile Defence Operations Centre at Ramstein, the ACCS prototype was ready for adaptation and installation at the new location.

Today ACCS BMD INCA is a key part of the ALTBMD network connecting tactical units to the command and control structure. The success of ALTBMD INCA in Europe to provide a limited ballistic missile defence framework of weapons, sensors and command and control, is guiding the next phase of NATO BMD development. In a new TMD project, ACCS will address a full set of formalised requirements to evolve the ThalesRaytheonSystems prototype and use the ALTBMD INCA experience to deliver the first operational capability in the next 24 months.

ACCS Early Command and Control suite now available

The Early ACCS Capability (EAC) is an activity designed to provide a demonstration of Combined Air Operations Centre (CAOC) functionality to NATO. Five laptop computers were configured with ACCS software and were networked to simulate a small scale CAOC capability. The laptops provide functionality for the full range of ACCS planning and tasking from the Air Operations Directive and C2 Resource Management, through Airspace Planning, Mission Planning and Current Operations monitoring, which included a simulation scenario for the real-time air picture. The laptops are portable and have been used in several locations to provide demonstrations, hands-on familiarization, and introductory training to NATO operational personnel who will work with ACCS in the future.

The Initial objective was a few weeks of hands-on at Ramstein. However, the laptops have since also been used in other demonstrations and familiarizations, notably with the DARS Nieuw Milligen crew to explain the CAOC level functions that are needed by operators in execution of the DARS daily mission. The porting of ACCS CAOC capability onto laptops has also served as a de-risking step in a process to bring full ACCS software functionality into the PC laptop environment. Porting to a lighter PC-based architecture is nearing completion and will bring a new flexibility to the future development and deployment of ACCS assets for NATO AirC2 purposes.

Although ThalesRaytheonSystems is the prime contractor for ACCS, such a large scale, complex programme depends heavily on the excellence of the partner companies in the programme's supply chain. Lorenzo Mariani, Managing Director for the Land & Naval Systems Division of SELEX ES, based in Rome, highlights the success of the collaborative process from the viewpoint of a major contributor to ACCS.

Lorenzo Mariani, Managing Director for the Land & Naval Systems Division of SELEX ES.

"We have been involved from the very beginning of the ACCS programme in two major areas. In the first, we provide some of the most complex technology elements for the core system, in the area of sensor fusion and integration of existing and new sensors. In the second, we are also heavily involved in the replication process across all ACCS sites, for several of which we act as the site manager and systems integrator," says Mariani.

SELEX ES is the newly created inheritor of all the defence electronics legacy capability of Finmeccanica – the former companies SELEX Systemi Integrati, ELSAG and Galileo having been brought together in a single entity. Radar, sensors and system integration capabilities form a large part of the new company's expertise, which it is leveraging aggressively for the ACCS requirement. "This has been the core SELEX mission for decades, and we have successfully implemented this mission for our NATO and export customers. We continue to do this with our involvement in ACCS," Mariani points out.

Mariani highlights the tangible benefits accruing to SELEX – and to Italy – from its participation in ACCS. "First, ACCS makes possible a very expensive system and capability that would otherwise be beyond the reach of many nations. Without ACCS, we would never have this sort of capability, either at an industrial or a national level. Second, the issue and benefits of standardisation should not be underestimated. ACCS has allowed us to be part of 'the club' and a part of the design authority for an important capability. Third, the work we do here generates an industrial and technological synergy that allows us to further develop key capabilities to the future benefit of the programme and for our own export strategies as well," he says.

The heritage of experience and knowledge that SELEX brings to ACCS has had a beneficial effect, Mariani believes. "Our depth of experience has enabled us to address the complex integration of a wide variety of sensors in a relatively short period of time. We believe our partners – and our customer – will agree that the results have shown a very good performance, not only from the point of view of the sensible use of technology but also from an equally important perspective – the intelligent use of funds," he says.

The experience SELEX has had with sensor and data fusion projects for nations with as diverse requirements as Italy, Norway, Spain, Turkey, Germany and Poland – among others – has enabled the company's contribution to ACCS to enhance the integration of vast amounts of data from multiple sources into a single, cohesive picture for the operational community. "ACCS is a very good example of collaboration throughout Europe. It shows that large scale initiatives have a long life and can make a real contribution to European defence. We sincerely hope that the level of collaboration might further increase in the following phases of the programme, such as ACCS TMD1, for the anti-ballistic missile capabilities of the system," Mariani concludes.

Enzo Montalti, Programme Director, AirC2 for the NATO Communications and Information Agency (NCIA).

Enzo Montalti is the Programme Director, AirC2 for the NATO Communications and Information Agency (NCIA). In this position he is very well placed to provide an epilogue for this issue of *ACCS Insight*. He highlights some of the important features and future challenges for ACCS.

"ACCS means a lot to NATO. It brings together all our legacy funtionalities for AirC2 and integrates capabilities for our air policing and for out of area operations," Montalti says.

He points to both the proven architecture and the modularity of the system as contributions to enabling continuous updates of information from a wide range of sensors for the operational community. "ACCS will introduce a new concept of operations that is much simpler and more effective for the operator at the workstation and we believe this will fully satisfy our needs for decades to come," he says, adding that there is sufficient flexibility in the core system for this level of confidence.

He also points out that the system has reached a level of maturity, and that "with one very important test milestone now behind us, we now hope to complete testing of the system in its entirety by the end of this year."

The road to the current level of maturity has been a long and complex one – but one that has been successfully navigated by supplier and user sides of the community alike. "The successful operational test of the DARS has been especially important, and it is very gratifying that it exceeded user expectations," he says.

The modular and flexible nature of the ACCS core system is an important feature, Montalti believes, to ensure the accommodation of new requirements in the future and to help form the backbone for NATO's missile defence capabilities. He does not believe that the issues already on the horizon – such as the routine integration of unmanned aerial systems into military flight operations – will present any challenges that cannot be overcome.

"A lot has been achieved and there is a lot more still to come in ACCS, which is the most significant NATO Common Funded programme for the last 20 years," he concludes.
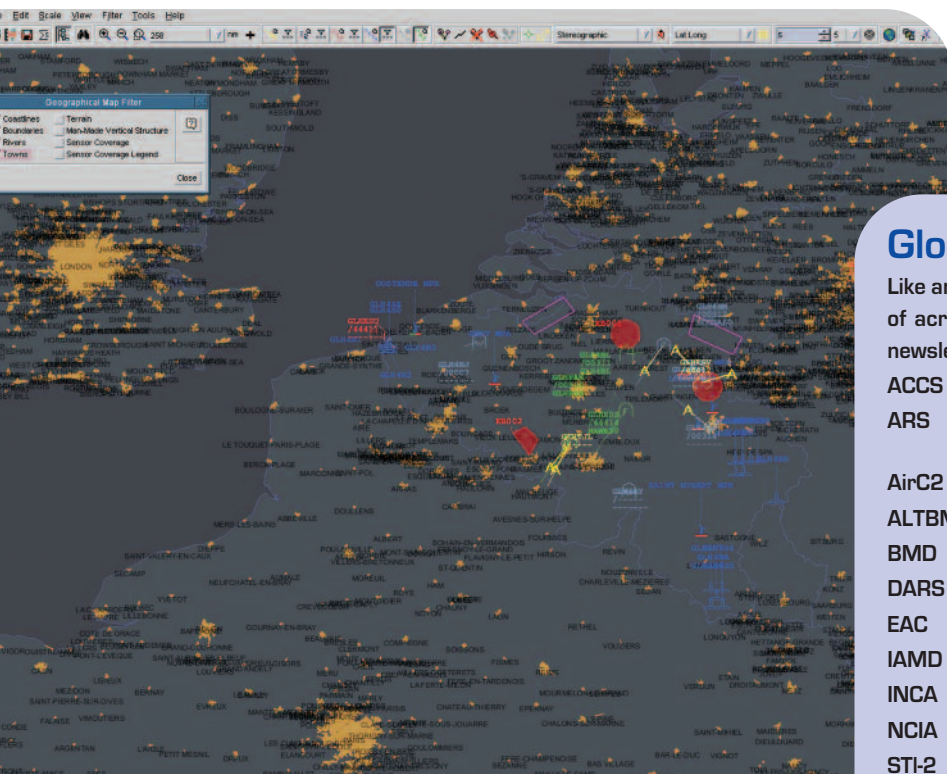
Glossary

Like any major programme, ACCS generates its own language of acronyms and abbreviations. The main ones used in this newsletter are listed here to assist the reader.

ACCS	Air Command and Control System
ARS	Air Control Centre, Recognised Air Picture Production Centre and Sensor Fusion Post
AirC2	Air Command & Control
ALTBMD	Active Layered Theatre Ballistic Missile Defence
BMD	Ballistic Missile Defence
DARS	Deployable ARS
EAC	Early ACCS Capability
IAMD	Integrated Air & Missile Defence
INCA	Interim Capability
NCIA	NATO Communications and Information Agency
STI-2	System Test I part 2
STVF	System Test & Validation Facility
TMD	Theatre Missile Defence

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