EUROPEAN DEFENCE AGENCY

SESAR

THE MILITARY IN SES / SESAR

Partnering for safe and efficient skies

EUROPEAN DEFENCE AGENCY | SESAR

PARTNERING FOR SAFE AND EFFICIENT SKIES

The military operate in their multiple roles as Air Navigation Service provider, airspace user, airport operator and regulator under State responsibility not only in times of crisis but every day.

365 DAYS

Military air traffic controllers and airports operate 365 days of the year.

State air forces are the biggest fleet operators and airport owners in Europe.

11.000

More than 11,000 military aircraft are stationed in Europe.

Airspace is a finite resource and with up to 100,000 aircraft movements globally per day, up to 50,000 in Europe, there is a need to be efficient. To this end, the European Union launched the Single European Sky (SES) initiative over ten years ago. The aim is to reduce the fragmentation of air navigation services in Europe and to improve the performance of the air traffic management (ATM) system. The military are crucial to this process.

The implications of SES and its technological pillar, the Single European Sky Air Traffic Management Research (SESAR) programme, for the military are considerable. Our Member States have therefore entrusted us to: firstly, connect the military with each other and the European Institutions; develop ways to engage Europe's military in the SES initiative; and lastly, to assist our Member States in accessing EU funding for technological initiatives from the SESAR programme.

The European Defence Agency (EDA) plays a key role in facilitating the coordination of military views, not only those of EDA Member States but of other organisations such as NATO and EUROCONTROL. In order to build adequate expertise, the EDA established the Military Implementation of SESAR Programme (MIOS), known as the "SESAR Cell", in 2014. Recently, EDA together with its States have created an "EDA SES Military Aviation Board" (ESMAB) which provides coordination and cooperation with Member States and international organisations to prevent any adverse impact on national and collective defence capabilities.

For the deployment phase of SESAR, the EDA has signed a cooperative agreement with the SESAR Deployment Manager (SDM). In this phase, the EDA is supporting its Member States and NATO in identifying military projects and preparing bids to obtain EU co-funding for the first time. The deployment projects put forward for funding by the EDA range from ground systems, to air platforms and also studies. A dual use approach to EDA's projects and SESAR in particular is vital. Civil stakeholders can benefit from dual use technology but likewise military can benefit from civilian technology, as is clear in SESAR. We need to seize the opportunity through programmes like SESAR to launch effective and pragmatic cooperative programmes that deliver real results for the military.

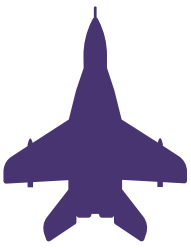
For the military community, early involvement in – and awareness of – envisaged technological solutions is of crucial importance. But how, and to what extent, are the military actually involved in SES and SESAR, from research to deployment? There is after all only one sky, a single resource which must accommodate all stakeholders, both civil and military. This short brochure will give an overview of the military's many roles in the skies of Europe.

Jorge Domecq
Chief Executive, European Defence Agency

ARMED FORCES: THE BIGGEST AIRLINE IN EUROPE

State aircraft fleet* – ECAC

COMBAT AIRCRAFT



3 365

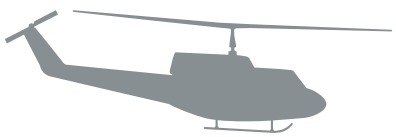
LARGE AIRCRAFT

949

LIGHT AIRCRAFT

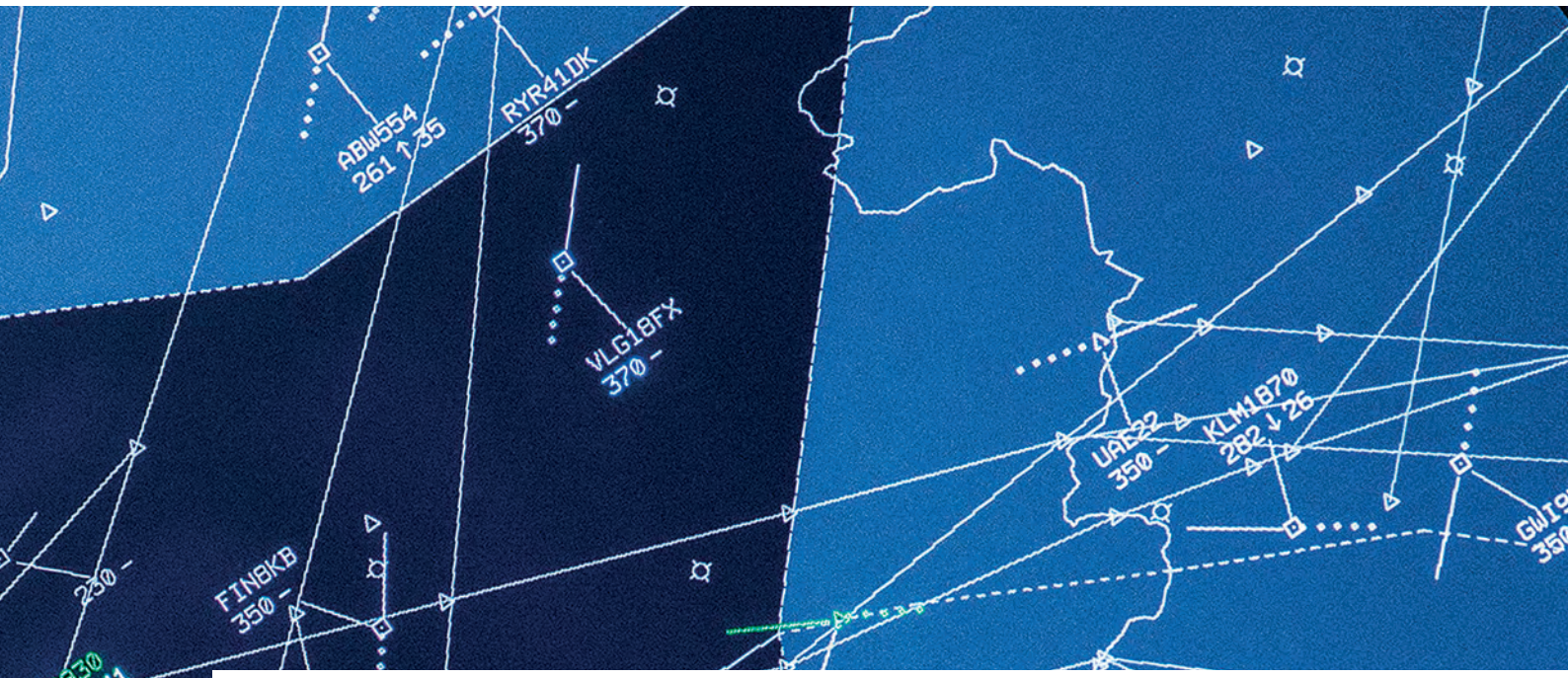
1 390

HELICOPTERS



3 733

*44 ECAC countries including 28 EU Member States



One sky for all

The military recognise and acknowledge the crucial importance of the SES initiative, which aims at achieving improved efficiency, increased capacity, enhanced aviation safety, diminished environmental impact of flights and reduced costs of Air Navigation Services (ANS). The military also understand the economic importance that the skies hold for the civil community.

The military approach is to be "as civil as possible" while remaining "as military as necessary" for its aviation and ATM operations. As an example, a large portion of operations at airports, in TMA and en-route are directly comparable. **However, the purposes of military flight operations are substantially different, sharing the same airspace, at the same time, is therefore not always possible.**

Like their civilian counterparts, the military play many roles in aviation. Military aviation comprises state-owned aircraft engaged in transport, training, security and defence. The military are stakeholders in several different roles and sectors – for example – **as airspace users, airport operators, regulators and service providers.** In establishing the SES initiative the EU Member States committed to ensure that the interests of Member States' military users of airspace are represented in the whole development, decision-making process and implementation of the SES.

In peacetime, the military operate a day to day routine training of air, sea and ground forces. The availability of sufficient airspace and opportunities for military training is fundamental to efficient military intervention. However, the military must **retain freedom of movement** in European airspace to deploy air assets nationally or collectively, within the most dense and complex areas of Europe. Military use of airspace includes anything from training exercises to air policing for national security reasons. Missions often launch with very short notice.

The military and SES/SESAR

Single European Sky (SES)

The SES initiative was launched in 2000 by the European Commission following severe flight delays in Europe in 1999. A High Level Group was established and, building on the recommendations in its report, the Commission drafted a legislative package at the end of 2001. The package was adopted by the European Parliament and Council in March 2004 and entered into force one month later.

The EU's objective is to reform ATM in Europe in order to deal with continued air traffic growth in Europe and to ensure that aviation operates in a safe, cost efficient and environmentally friendly way. To support the legislation, a number of new bodies and projects have been created, including the establishment of the SESAR Joint Undertaking (JU) for research & development, and a SESAR Deployment Manager (SDM) to manage and synchronise deployment. A Network Manager (NM) for the European ATM network has been created, while an independent Performance Review Body (PRB) supports the Commission in the development and management of the SES performance scheme in which Functional Airspace Blocks (FABs) have a key role to play.

The SES initiative has 4 high-level objectives to achieve by 2020:
- A three-fold increase in capacity where needed;
- Improve safety performance by a factor of 10;
- A 10% reduction in the effects flights have on the environment; and
- Reduce the cost of ATM services to airspace users by at least 50%.

SESAR

The SESAR project is the EU's air traffic management infrastructure modernisation programme. SESAR will develop the new generation air traffic management system capable of ensuring the safety and flexibility of air transport.

The main objective of the SESAR programme is to coordinate ATM research and development in the EU and help establish a new generation of ATM infrastructure capable of withstanding the foreseen continued growth of air traffic over the coming decades.

SESAR has entered into its third and final phase – 'deployment' – whereby the concepts and technologies developed through the SESAR JU are introduced into operation across Europe. The European Commission appointed a SESAR Deployment Manager in December 2014.

SESAR HAS THREE PHASES

1. A **Definition phase** (2005-2008), in which the air traffic modernisation plan - the SESAR ATM Master Plan has been developed, establishing the different technological stages, priorities and timetables;

2. A **Development phase** (2008-2013) which developed the basic technologies which will underpin the new generation of systems;

3. A **Deployment phase** (2014-2020 and beyond), which coordinates the large-scale installation of the new systems and the widespread implementation of the related functions.

How does SES/SESAR affect the military?

The SES and the SESAR programme **have been a strong focus** for many aviation stakeholders across the aviation industry over the past years, not least the military.

Member States have exclusive sovereignty in ATM matters relating to military operations and training, however, **military involvement in SES is fundamental.**

It is currently difficult to fly across Europe with a harmonised and efficient military ATM system. The SESAR programme has committed to military activities in cooperation with the defence industry to shape the future of military aviation towards a civil-military performance driven European sky.

The needs of military aviation and ATM support often reach beyond the scope of civil aviation. To work effectively, European airspace management must answer to both military and civil needs with coordinated processes and consultation between civilian and military stakeholders.

To preserve the military requirement of access to all airspace, there is a need to bring the procedures and the performance of ground and airborne military systems used for ATM purposes up to SESAR standards. The deployment phase of SESAR offers an opportunity for the military, similarly to their civil counterparts, to avail of funding to enhance their ATM technology.

Risks of non-involvement of the military in SES/SESAR

Even though not mandatory, non-compliance with SES/SESAR by the military would create risks. Core network performance could be degraded, with negative consequences for States. The military could find it difficult to access certain airspace, which could have an impact on day-to-day training. Most importantly, the military, through non-compliance, might be percieved as a potential danger to civilian traffic.

According to the regulatory and technical evolution of SES, the completion of military missions as well as some public services (e.g. firefighting) will require awareness and reactiveness to this evolution.

Military must be able to operate in non-segregated parts of airspace by:

- using **military systems,** recognised by the EU as providing an equivalent level of performance as the one required for civil aviation;
- following **ad hoc procedures and technical arrangements** with the civil aviation in order to offer a good level of services to military flights in a harmonised way at the European level;
- developing **specific mitigation measures** which need to be accepted by national authorities in order to guarantee a first class level of service to aircraft all across Europe in both General Air Traffic and Operational Air Traffic.

Military need to remain safe in regard to General Air Traffic aircraft by:

- being equipped with SESAR or equivalent military systems;
- developing ground systems (e.g. safety nets) with the aim to mitigate non-conformance of military aircraft with SESAR;
- improving the coordination between civil and military controllers (e.g. collocation of civil and military controllers).

Benefits of military involvement in SES/SESAR

Launching a modernisation programme of military ATM systems is an important opportunity leading to **potential economies of scale.** Dual use systems available for both civilian and military stakeholders can bring down costs for both. Involvement in SESAR can make EU funding available for the military.

Cost savings for the military can be achieved through SES, as for example through Free Routing, comprising fuel and time savings and improving the efficiency of military missions.

Knowledge of and some **harmonisation rules** between the civil and the military bring about benefits to both. Military involvement in the regulatory processes can assist in broader recognition of the uniqueness of military missions.

The **new technologies** offered by SESAR can be seen as an opportunity for the military. A key concept in SESAR is the automation of exchanges of information interconnecting the future SESAR SWIM (System Wide Information Management) network with military systems. The military authorities have specific requirements in these domains and a cautious approach to this issue should be adopted. It is vital for the military to develop an understanding of the SESAR intent regarding SWIM and be ultimately able to access the information available and eventually integrate into the SWIM environment. Being part of SWIM will enable military aviation to receive and display the real time activation status of airspace reservations or constraints and all flights following a business or a mission trajectory.

The savings for the military and the network at large by equipping with SESAR technology can be monetised but also valued in terms of **environmental savings.**

Military aircraft fly approximately 170,000 flights across European airspace and through high density TMAs per year. With the planned increases in sizes of TMAs and introduction of extended arrival profiles the pressure on these aircraft to be "as civil as possible" will increase.

European Civil Airspace Users operate approximately a total of 10,000 single aisle, long range and regional aircraft. 20% of the aircraft operating within European airspace are considered to reach a first critical mass within the scope of the PCP (corresponding to 45% of flights operating in Europe*).

In comparison, the military operate approximately 1,000 "transport type" aircraft. Therefore, the military planning assumption is to also target 20% equipage, that is 200 aircraft (corresponding to more than 50% of flights operating in Europe*).

Avionic upgrades of military 'transport-type' aircraft will permit **safe operation** in Free Route Airspace and in high density TMAs without detriment to the Performance and Capacity of ANSPs and airports.

Performance Based Navigation (PBN) capabilities will offer a greater set of routing possibilities that could reduce potential congestion on trunk routes and at busy crossing points. PBN capability helps to reduce route spacing and aircraft separation. Military 'transport-type' aircraft can be handled by Air Traffic Controllers with the same procedures as equipped civilian aircraft, contributing to the reduction of workload.

Using SESAR JU developed metrics, equipage of 200 (or 20% of the total fleet) military transport type aircraft with RNP 1 results in savings shown in the graphic on page 11.

Current challenges

Change comes at a **cost,** and the military in updating its fleet and systems to become SESAR compliant will incur costs. It is hoped that EU funding can help absorb some of these. The military community may also decide which beneficial capabilities and related systems are to be fitted or retrofitted to the aircraft.

* EUROCONTROL Military Statistics 2014

TARGETING A 20% EQUIPAGE RATE FOR MILITARY 'TRANSPORT-TYPE' AIRCRAFT

POTENTIAL MILITARY TIME SAVINGS

- 816 000 minutes per year

POTENTIAL MILITARY CO2 REDUCTIONS

- 123 397 Tonnes of CO2 reduction per year

NETWORK BENEFITS

- Safe operation of military aircraft in Free Route Airspace and in high density TMAs without detriment to the Performance and Capacity of ANSPs and Airports
- Reduce potential congestion on trunk routes and at busy crossing points
- Reduction in controller workload as military 'transport-type' aircraft can be handled by ATCOs with same procedures and workload as equipped civilian aircraft

POTENTIAL MILITARY FUEL SAVINGS

- 39 168 Tonnes of fuel per year
- 32.11 Million € per year

EDA in SES/SESAR

In the recent past, there was a need for greater cooperation between the predominantly civilian SES and SESAR and the military community. Considerable progress has been made, involvement of the military has improved greatly and the European Commission is engaged in a constructive dialogue with both the civil and the military. The defence community is now considered a key partner for the successful implementation of the SESAR programme.

The **EDA was originally given responsibility** at its Steering Board in November 2010 to evaluate the operational risks and financial implications of the Single European Sky for military aviation. This role was further extended in May 2013 with the adoption of an implementing regulation that set the ground for EDA work at the policy level of SESAR. The regulation provided EDA with the task of facilitating the coordination of military views from and in support of Member States and relevant military organisations and to inform military planning mechanisms of the requirements stemming from SESAR deployment.

In order to ensure that this coordination reflects the interests of all military stakeholders, a three-step consultation mechanism closely involving NATO and EUROCONTROL has been established, so that a consolidated position can be provided to the European Commission. In addition, EDA has established the SES/SESAR Military Implementation Forum (SMIF) which includes NATO countries, the European Commission, EUROCONTROL, EASA and the SESAR JU.

As the SES moves ahead, EDAs role is evolving too. We are now in the deployment phase of SESAR and EDA has played a **crucial role in support of the Member States,** resulting in 24 projects being submitted to INEA Call 2015 for EU co-funding. For the first time, the military can be beneficiary of financial instruments previously not at reach.

The military community must **strike a delicate balance between the challenges of complying with SES requirements and the military's responsibilities for security and defence.** The bottom line is to ensure that military aircraft, helicopters, radar systems and aerodromes can operate safely and effectively in the SES framework.

THE EDA'S CURRENT PRIORITIES FOR SES AND SESAR ARE

- to improve early awareness of States regarding SES;
- to support States in minimising adverse impact of SES and SESAR;
- to identify and propose possible mitigation actions;
- to support States in obtaining EU co-funding for military projects;
- to support States in identifying a process that will contribute to better involvement in SES regulations from the outset;
- to introduce, in coordination with EUROCONTROL, military requirements in the SESAR Concept of Operations and Research and Innovation activities;
- to ensure coordination with other entities, including the European Commission, EASA, SESAR JU, SESAR Deployment Manager, INEA and multinational organisations NATO and EUROCONTROL.

Key military contributions

SES MODALITIES

The scope of Single European Sky is large and the development and validation of regulations require the appropriate level of involvement from the technical up to the decision-making level. Therefore the SES Modalities propose a **comprehensive approach bringing together available military expertise** in all relevant domains, contributing to the development of military views in the form of Common Military Positions or other types of deliverables as appropriate and their staffing up to the appropriate level in States, before being exported to the EU Institutions.

The SES Modalities are the result of wide consultation with stakeholders and incorporate contributions from Member States, the Commission, EU Military Committee / EU Military Staff and other relevant stakeholders. They take into account the provisions of the "White Paper: Improving Military Coordination Arrangements in Single European Sky" elaborated by the States.

This modus of cooperation is well appreciated by the EDA States and is seen as a key contribution to the SES initiative by the European Commission.

ESMAB

An EDA SES Military Aviation Board (ESMAB) has been created according to the Modalities for Single European Sky approved by the EDA Steering Board on 30 September 2015. The ESMAB will operate on two levels:

- The **ESMAB Executive/Policy level,** meeting at least once every year to address regulatory and policy issues, and to make commitments regarding defence matters in the context of SES, ensuring the necessary national involvement up to the appropriate decision-making level;
- The **ESMAB Management/Expert level,** meeting as required, potentially at short notice, to refine and finalise common military positions and elaborate related supporting documentation/deliverables in due time, as well as to conduct day-to-day monitoring of the consultation process across all areas of SES.

MASTERPLAN

The European ATM Master Plan is the main planning tool to define ATM modernisation priorities and to ensure that the SESAR technology and concept of operation become a reality. The European Air Traffic Management Master Plan Edition 2015 coincides with a proactive participation of the military community, led by EDA. EDA established the "Joint Military Approach" in full cooperation with NATO, EUROCONTROL and the SESAR JU as a way for the military to contribute to this campaign. This has represented a unique opportunity for the military to make a contribution. It has also heralded concrete opportunities offered by the new technologies and procedures which will be deployed in the forthcoming years for the modernisation of the European ATM system.

DEPLOYMENT

In its role of military coordinator for SESAR deployment, EDA supports Member States to identify and prepare bids eligible for EU co-funding. In this context a large number of indications of interest have been received from Member States, NATO and EUROCONTROL. In preparation of the Call for Proposals published by the Innovation & Networks Executive Agency (INEA) for SESAR, around 100 projects were identified in close cooperation with Member States and international organisations. EDA supported Member States in the preparation of their bids. A Memorandum of Understanding formalising the cooperation between EDA and the SESAR Deployment Manager was signed in July 2015. Early 2016 over 20 key military projects were submitted to INEA through the EDA ranging from ground systems, to air platforms and also specific studies. Some examples:

- **Ground Systems:** Airspace Management tools, update of aeronautical data standards or improvements to interoperability and data sharing with civilian counterparts.
- **Air platforms:** Equipping strategic and tactical aircraft, as well as VIP aircraft to support advanced navigation techniques.
- **Studies:** Impact and feasibility studies for ground and air systems.

REMOTELY PILOTED AIRCRAFT SYSTEMS

Remotely Piloted Aircraft Systems (RPAS) have demonstrated their **importance in military operations,** particularly for surveillance and information gathering during the last years.

However it is clear that RPAS can also offer a wide range of civil applications. At present, the use of RPAS is limited to certain areas of restricted airspace. The reason is that to date no harmonised regulatory framework is in place that allows RPAS to operate in non-segregated airspace. EDA is one of the key stakeholders to enable these operations and has contributed to the main initiatives in this domain such as the roadmap for the integration of civil RPAS into the European Aviation System and the SESAR RPAS Definition Phase, which provided the main inputs to the SESAR 2020 programme.

EDA itself is involved in several research and development projects in the RPAS air traffic insertion area. Some examples are MIDCAS, the European Detect & Avoid project, ERA (Enhanced RPAS Automation), which focuses on different automation, and emergency recovery capabilities or DeSIRE 2, in the domain of satellite communications for RPAS command and control. The EDA Joint Investment Programme on RPAS was launched in November 2013 and eleven Member States are now involved in this activity. This programme provides the forum to generate R&D projects for the development of key technological functions enabling safe integration of RPAS into non-segregated airspace.

In addition, an RPAS Regulatory Framework Working Group was established in EDA in March 2014 with the purpose of developing a harmonised set of airworthiness requirements and common classification and certification processes, in order to ensure that military RPAS can easily integrate into the future European Aviation System. The Agency intends having common military airworthiness and certification requirements for military RPAS by 2018.

STANDARDISATION

The harmonisation of applied defence standards in Europe is a **key enabler for interoperability** of material used by European forces. Moreover it is a prerequisite for a successful cooperation of EDA Member States and their partners in the whole life cycle of defence equipment starting from the development phase, testing and evaluation of material, maintenance, and finally the disposal of equipment.

In 2007 EDA established the European Defence Standards Information System (EDSIS) and in 2011 introduced the European Defence Standards Reference System (EDSTAR) to support the objective of a harmonised standardisation for material. The EDA Material Standardisation Group (MSG) created in 2008 is a well-established network of standardisation managers. The MSG acts as a central gate for all defence standardisation initiatives with a cooperative aspect both for security-defence and pure defence relevant standardisation. In 2015, the MSG, in cooperation with the European Commission, NATO and the three official European Standardisation Organisations - the European Committee for Standardisation (CEN), the European Committee for Electro technical Standardisation (CENELEC) and the European Telecommunication Standardisation Institute (ETSI) and industry, established a coordinated civil-military procedure for defence standardisation in Europe.

AIRWORTHINESS

Within European civil aviation, rules on airworthiness regulations are managed by the European Aviation Safety Agency (EASA).

Member States have their own **national-specific systems to ensure the airworthiness of their military aircraft.** However, until recently, there has been very little coordination between Member States. In November 2008, Defence Ministers entrusted the EDA with the establishment of a Military Airworthiness Authorities (MAWA) Forum and approved the associated military airworthiness roadmap for achieving common harmonisation and certification processes. The MAWA Forum is chaired and supported by the EDA.

The MAWA Forum was tasked to develop a suite of harmonised **European Military Airworthiness Requirements** (EMARs) which are based upon the EASA regulations. The MAWA Forum does not have the authority to impose airworthiness regulations upon countries, who retain their sovereignty for managing military airworthiness. The decision of whether to implement the harmonised EMARs into their national regulations, and the timescales in which this will be done, remains the responsibility of each of the participating Member States.

The EMAR documents form a complete structure and try, as closely as possible, to align with the civil structure. The next step is to encourage Member States in implementing EMARs into national regulation as a step towards mutual recognition.

MILITARY FLIGHTS REPRESENT 25% OF ALL FLIGHTS OPERATING IN EUROPEAN AIRSPACE.

Conclusion

A lot of progress has been achieved since the military statement on SES was made by the EU States in 2004, enabling the military over the last decade to **contribute to the goals set for SES.** In order to safeguard the integrity and security of Member States, the defence community is now heard through a harmonised voice representing: airspace users, Air Navigation Service Providers, airport operators, regulators as well as policy makers.

The military recognise and acknowledge the **crucial importance of the Single European Sky initiative,** which aims at achieving, improved efficiency, increased capacity, enhanced aviation safety, diminished environmental impact of flights and reduced costs of Air Navigation Services. The military also understand the economic relevance of SES.

Military and civil aviation face similar challenges. In addition, military airspace users have very specific needs stemming directly from the different types of missions that are assigned to them by public authorities. They strive to be "as civil as possible" while remaining "as military as necessary".

Partnering for safe and efficient skies.

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