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STRATEGIC AIRLIFT CAPABILITY DEVELOPMENT

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Abstract:

In the modern world, strategic airlift – the capability for a fast transport of equipment and personnel by air over long distances to respond to military and humanitarian crises – is in high demand even in a financial environment who remains restrictive.

The Strategic Airlift Capability is a innovation in the field of smart defence ¹ (NATO Concept) and pooling and sharing of defence capabilities ² (EU Concept)-A Unique Model for Cooperation.

Key words: Strategic airlift, transport, capability

Introduction

In the modern world the capability to transport equipment and personnel by air over long distances to respond fast to military and humanitarian crises is in high demand. This happens even in a restrictive financial environment. From this point of view, NATO's airlift capabilities are still an unsolved issue and were some attempts to find solutions. One of those was the development of the Strategic Airlift Capability-SAC.

NATO's European allies spent much of the Cold War era preparing to defend in place, so they have relatively few expeditionary capabilities such as long-range aircraft. Missions to Afghanistan and Africa, as well as the response to the October 2005 earthquake in Pakistan, highlighted NATO's chronic airlift shortage.

In 2006, about 80% from the needed strategic transportation was provided by the United States aircrafts, in specially for the delivery of heavy machinery and helicopters. At that time, upon an analyses it resulted that the best aircrafts were C-17, US production, AN-124, Russian production, and for the future it could be considered the A-400M, European ones.

The multinational initiative for a strategic airlift capability (C-17) was launched by the Assistant Secretary General for Defence Investment, Marshall S. Billingslea who expressed the intention of forming a consortium of several nations who will rent or buy C-17 aircraft type, produced by Boeing company. This initiative should respond to the national needs of the participants as well as for the NATO, UE or UN missions. The principle promoted was that

¹ Smart Defence is a cooperative way of thinking about generating the modern defence capabilities that the Alliance needs for the future. In this renewed culture of cooperation, Allies are encouraged to work together to develop, acquire, operate and maintain military capabilities to undertake the Alliance's essential core tasks agreed in NATO's Strategic Concept. That means harmonising requirements, pooling and sharing capabilities, setting priorities and coordinating efforts better. Source:http://www.nato.int/cps/en/natohq/topics_84268.htm

² The concept refers to initiatives and projects to pool and share more military capabilities among EU Member States. Source: <http://www.eda.europa.eu/what-we-do/eda-priorities/pooling-and-sharing>

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each nation involved in program will have the right to use this capability an amount of flying hours equal with the amount of money contributed at buying/renting expenses. The Letter of Intention was signed by 15 NATO countries: Bulgaria, the Czech Republic, Denmark, Estonia, Hungary, Italy, Latvia, Lithuania, the Netherlands, Norway, Poland, Romania, the Slovak Republic, Slovenia and the United States, as well as NATO Partner country Sweden.

This initiative complements the Strategic Airlift Interim Solution (SALIS) who is providing NATO with strategic airlift capabilities - Strategic Airlift Interim Solution (SALIS), is a multinational consortium of 16 countries, led by Germany, who is chartering Antonov An-124-100 transport aircraft.

The Strategic Airlift Capability, established in September 2008 by signing the Memorandum of Understanding, is an independent and multinational program that provides access to military airlift capability to address the growing needs for strategic and tactical airlift to its 12 partner nations by owning and operating three Boeing C-17 Globemaster III long-range cargo jets. SAC is based at the Hungarian Defence Forces (HDF) Pápa Air Base in Pápa, Western Hungary.

The SAC nations consist of NATO members Hungary, Bulgaria, Estonia, Lithuania, the Netherlands, Norway, Poland, Romania, Slovenia and the United States and NATO Partnership for Peace (PfP) nations Finland and Sweden.

Each participating nation owns a share of the available flight hours of the SAC C-17s that can be used for missions without the prerequisite to consult with the other participants to serve the needs of their national defense, NATO, EU or UN commitments and humanitarian relief efforts.

In respect with the obligations assumed in international treaties and agreements, in specially with NATO and European Union, Romania was glad to be part of Strategic Airlift Capability Programme because had difficulties in ensuring strategic airlift for³:

- deploying, redeploying and contingency rotation in IRAK and Afghanistan,
- transportation of NRF forces,
- transportation of troops and materials in case of collective defence (Art.5 Operations, NATO Treaty),
- transportation of troops and materials for UE tactical troops,
- transportation for multinational military exercises,
- logistics for troops in theatre of operations, etc.

At that time were only limited capabilities for air transportation and suitable most for the tactical level.

After the signing the Memorandum of Understanding, SAC proceeded quickly from an idea into an operational airlift initiative and in November 2012 achieved Full Operational Capability (FOC), being the first operational multinational military airlift initiative in the world and it has quickly proven to be a working solution of responding to the high need of airlift capability in Europe.

1.Strategic Airlift Capability Program

The idea of the shared ownership and operation of C-17 aircraft in Europe was born during the first decade of the new millennium and it was initially labelled as the NATO Strategic Airlift Capability (NSAC).

On 23 September 2008 the 12 nations established the Strategic Airlift Capability by signing the SAC Memorandum of Understanding.

³ <http://www.cdep.ro/proiecte/2011/600/50/5/em655.pdf>

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The objective of the Strategic Airlift Capability Memorandum of Understanding (SAC MOU) is to establish a SAC Program to acquire, manage, support and operate C-17 aircraft and other Assets needed to meet the national requirements of the participants, including those in support of NATO and multinational commitments. The Strategic Airlift Capability has a lifespan of a minimum of 30 years and its member nations have committed to constant development of the program and its capabilities.

Each participating nation owns a share of the available flight hours of the SAC C-17s that can be used for missions without the prerequisite to consult with the other participants to serve the needs of their national defence, NATO, EU or UN commitments and humanitarian relief efforts.

Romania established in the initially phase that 150 Flight Hours are enough for their needs, with the opening to increase the amount accordingly with the future needs. Because the total Flight Hours for the initial participation was only 2755, under the value of 3000 Flight Hours - minimum accepted for the program to Program to exist, all countries had to contribute more. Romania increased the amount with 30 Flight Hours, reaching a total of 180 when signed the Letter of Intention, at 24 July 2006. After that it was established that is a need of 10% from the total amount to be used for training. In this case Romania remained with 162 hours and decided to increase the contribution at 200 hours, remaining with 180 hours for operational use.

After signing the Strategic Airlift Capability Memorandum of Understanding, SAC nations have access to 3,165 annual C-17 flight hours produced by the Heavy Airlift Wing. The hours are divided among nations according to a pre-agreed share.

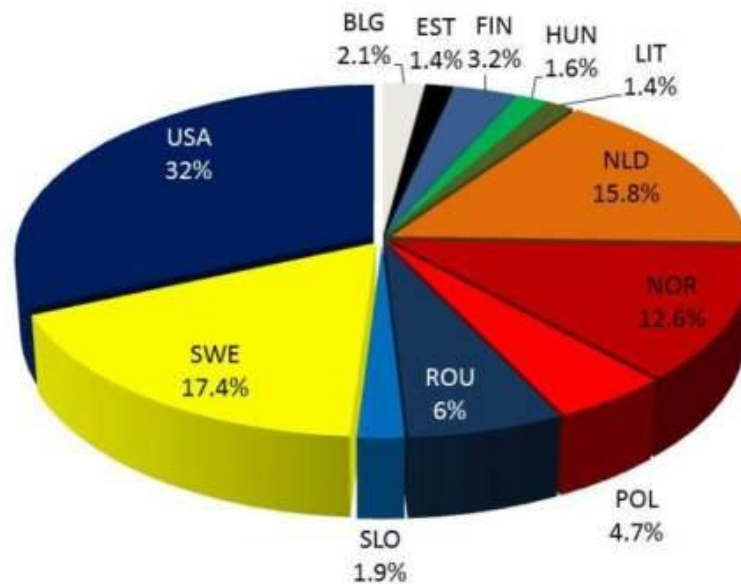


Fig.1 Pre-agreed share of flying hours⁴

COUNTRY	DECLARED FLIGHT HOURS
Hungary	50
Bulgaria	65
Estonia	45

⁴<https://www.sacprogram.org/en/Pages/The%20Strategic%20Airlift%20Capability.aspx>

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Lithuania	45
Netherlands	500
Norway	400
Poland	150
Romania	200
Slovenia	60
United States	1000
Finland	100
Sweden	550
TOTAL	3,165 annual C-17 flight hours

Table 1 National declared flight hours⁵

The cost shares of the program reffers both to aquisition segment and operation segment. The principle used is that each participant will contribute its equitable share of the program cost and will receive an equitable share of the results of the program. Within the operation segment is a distinction between fixed an variable costs and are different are different cost arrangement. Operational fixed costs are directly related to the SAC Program and are shared accordingly with the shared Flight Hours. Operational variable costs (fuel consumed, airport services, etc.) are directly related with a mission performed and will be paid by the participant who used the flight hours.

The Flight Hours are a unit of measure that represents utilization of the C-17 aircraft and represents the basis for SAC MOU cost shares. The Flight Hours charged for a mission include the amount of time the aircraft is in flight, from takeoff to landing, plus 15 minutes added after final landing to account for the total ground operating costs and maintenance requirements.⁶

The governing bodies of the program are the Strategic Airlift Capability Steering Board (SAC SB) and the NATO Airlift Management Programme Board that consists of representatives of the member nations.

The SAC Steering Board, in accordance with the SAC MOU, exercises overall responsibility for the guidance and oversight of the SAC Program. The SAC Steering Board is composed of one permanent or an alternate representative of each SAC Participant and is led by an Chairman who is elected. At the SAC Steering Board meetings, national representatives can be assisted by national experts. All decisions will be taken unanimously, each member having one vote.⁷

The NAM Programme is the legal entity of SAC and an integral part of the NATO Support and Procurement Agency (NSPA) and consists of a Programme Board and a Programme Office.

Heavy Airlift Wing (HAW) is the operational body of the SAC C-17s in the program. The wing is composed with personnel sent by the 12 SAC member nations, being the first operational multinational military airlift unit in the world.

⁵ SAC MOU

⁶ SAC MOU

⁷ SAC MOU

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The SAC MOB (Main Operating Base) was established at Pápa Air Base, situated in Western Hungary and Hungary received a special role in the Strategic Airlift Capability as Host Nation. As a consequence and an obligation to Hungary, the SAC C-17s are registered and flagged in Hungary and also bear the national military aircraft insignia of the nation.

Currently Pápa Air Base provides Strategic Airlift Capability with a variety of services as a part of the program Host Nation Support in the following fields⁸:

- Logistics (Accommodation, Fuel, Catering, Aerial Port functions and Ammo storage)
- Air Side Support (Liquid oxygen, Aircraft lavatory service, De-icing and Airfield maintenance)
- Air Traffic Services (Air Traffic Control, Meteorological service and Air traffic services reporting office),
- Operations (Base entry, Guard and security)
- Emergency Services (Fire rescue, Medical and security)
- Flight Safety

Initially, the first option for the MOB was Ramstein Air Base located in Germany, own by the US Air Force in Europe (USAFE) because of the existing facilities and Pápa Air Base was the alternate solution. In the same time, Romania offer the Mihail Kogalniceanu Air Base to be took in consideration, too.⁹

The technical support related to C-17 aircraft for Strategic Airlift Capability relies on a partnership with the Boeing Company, the manufacturer of the C-17. The Boeing Company, is contracted through the Foreign Military Sales (FMS) program of the United States by the NAM Programme Office. Boeing responsibilities are in the field of maintenance of SAC aircraft and support equipment, engineering and technical support and the management and supply of C-17 spare parts and for this, Boeing Company placed a Field Services Integrated Product Team at the Pápa Air Base.

2.SAC Governance Level

The governance of the Strategic Airlift Capability is organized through two cooperating structures, the **SAC Steering Board** and the **NAM Programme Board**.

The Strategic Airlift Capability (SAC) was established in 2008 following the entry into effect of a Memorandum of Understanding for strategic airlift capability. By signing this MoU, the 12 SAC participants agreed to use NATO for the acquisition, management and sustainment of three C-17 Globemaster III aircraft and other assets, as well as for the support to the operator of the aircraft, the multinational military Heavy Airlift Wing, stationed at Pápa Air Base, Hungary.

SAC Steering Board

The SAC Steering Board, in accordance with the SAC MOU, exercises overall responsibility for the guidance and oversight of the SAC Program. The SAC Steering Board is composed of one permanent or an alternate representative of each SAC Participant and is led by an Chairman who is elected. At the SAC Steering Board meetings, national representatives can be assisted by national experts. All decisions will be taken unanimously, each member having one vote.

⁸ <https://www.sacprogram.org/en/Pages/HDF%20Papa%20Air%20Base.aspx>

⁹ <http://www.cdep.ro/proiecte/2011/600/50/5/em655.pdf>

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NATO Airlift Management Programme Office

The precursor of the NAM Programme, the NATO Airlift Management Organisation (NAMO) was also established in 2008 by the North Atlantic Council, through the activation of the NAMO Charter. In July 2012, NAMO merged with the NATO Maintenance and Supply Organisation (NAMSOS) and the Central Europe Pipeline Management Organisation (CEPMO) to form the NATO Support and Procurement Organisation (NSPO).

Former NAMO activities in support of SAC were transferred to the NAM Programme, an integral part of NSPO responsible for acquiring, managing and supporting airlift assets and providing financial, logistical, and administrative services for the military force that operates NAM Programme owned aircraft.

The NATO Airlift Management (NAM) Programme Office, an integral part of the NATO Support and Procurement Agency¹⁰ (NSPA), is the acquisition and sustainment authority and manager for the full life cycle of the Strategic Airlift Capability (SAC) C-17 weapon system. It also provides site and administrative support to the Heavy Airlift Wing (HAW) at the HDF Pápa Air Base.

The NAM Programme comprises of the NAM Programme Board with any subordinate committees and the NAM Programme Office. Through the SAC Memorandum of Understanding, the NAM Programme Office is executing the ownership roles and responsibilities for the assigned aircraft and other assets, and performs configuration / sustainment management of the C-17 weapon system. In addition, it contracts on a competitive basis logistics support identified by the Commander of the Heavy Airlift Wing, administers approved operations budgets for the HAW and provides legal, procurement and information technology services for the wing. Personnel and budgets contributed to this military unit correspond to the SAC participating nations' share of flight hours.

The NATO Airlift Management Programme owns and holds the type certificate of the SAC C-17 on behalf of the SAC nations.

The NAM Programme Office is led by the NAM Programme Manager. He will implement NAM Programme-specific decisions taken by the NAM Programme Board.

The NAM Programme Office is organized according to matrix principles within the NSPA. Functional support in the areas of Finance, Procurement, Human Resource, Legal Advice, Security, Internal Audit and Information Technology is provided by functional organizations within the bigger NSPA. As such, these staff members work within functional guidance of these organizations but receive program specific direction and priorities from the Programme Manager.

The leadership positions of the NAM Programme Office consist of the Programme Manager and two Division Managers, the Wing Support Manager and the Weapon Systems Manager, who both act as Assistant Programme Managers.

The symbiotic relationship between NAM and SAC can simply be described as one between a customer (SAC) and a provider (NAM Programme).

¹⁰ The NATO Support and Procurement Agency (NSPA) is a customer-funded agency, operating on a "no profit - no loss" basis. The NSPA is the executive body of the NATO Support and Procurement Organisation (NSPO), of which all 28 NATO nations are members. The NSPA brings together in a single organisation NATO's logistics and procurement support activities, providing integrated multinational support solutions for its stakeholders.

Source: <http://www.nspa.nato.int/en/organization/nspa/nspa.htm>

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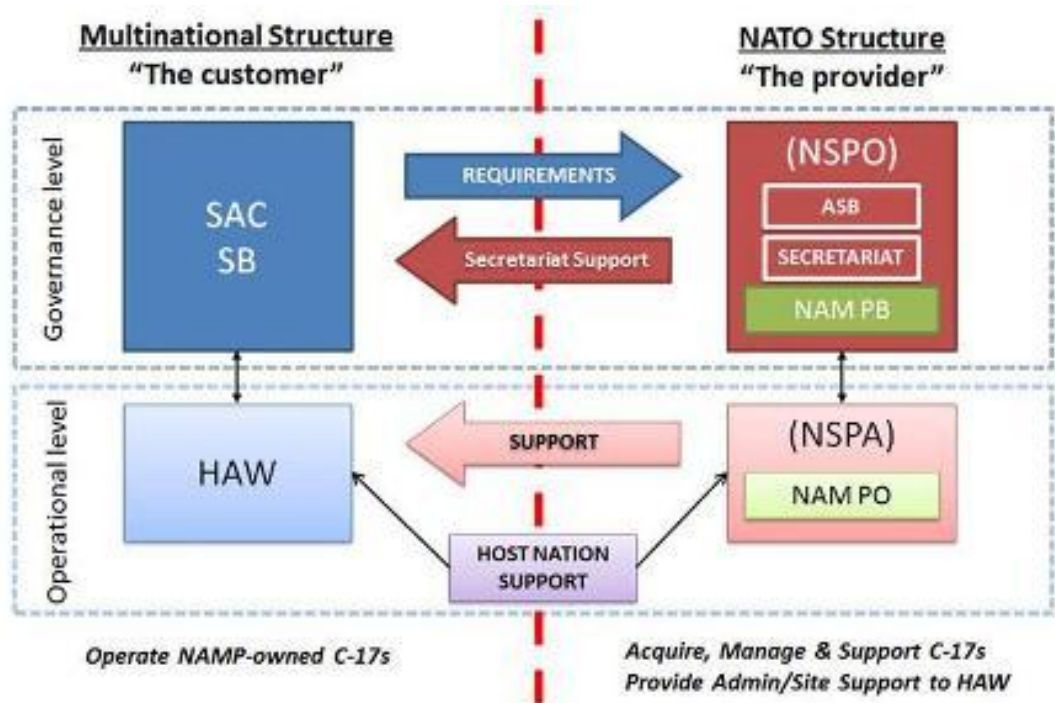


Fig. 2 The relationship between SAC and the NAM Programme described in a diagram¹¹.

SAC sets requirements and the NAM Programme executes those requirements. At the head of each of the two organisations sits a decision-making body, the SAC Steering Board and the NAM Programme Board, respectively. Of necessity the two boards regularly consult with each other. This is facilitated by meeting in combined session, and by sharing the same Secretariat.¹²

The NAM Programme Office is working constantly to develop the support it provides to the Heavy Airlift Wing. A recent improvement of the IT devices used by the wing was the procurement of tablet computers that are used by the aircrews for storing and accessing mission related documents and operational instructions in 2014. For the near future the NAM Programme Office will focus on stabilizing processes within the SAC and NSPA. Also several information technology and infrastructure projects are ongoing. Examples of current developments include the SAC Infrastructure Development Project (IDP) that consists of the construction of the SAC Hangar Complex at Pápa Air Base.

Other current high value and high visibility projects led by the NAM Programme Office include the implementation of a Mission Monitoring & Scheduling System (M2S2) utilized by the Heavy Airlift Wing, a Secure Mobile Communication solution (SMCS), a Portable Flight Planning System (PFPS) and a Business Case Analysis for a C-17 simulator, potentially located at Pápa Air Base.

¹¹ <https://www.sacprogram.org/en/Pages/SAC-Governance.aspx>

¹² <https://www.sacprogram.org/en/Pages/SAC-Governance.aspx>

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3. SAC Operational Level

The **Heavy Airlift Wing (HAW)** is the only multinational C-17 wing in the world and operates the C-17 fleet of the Strategic Airlift Capability for executing the airlift missions requested by the SAC nations.

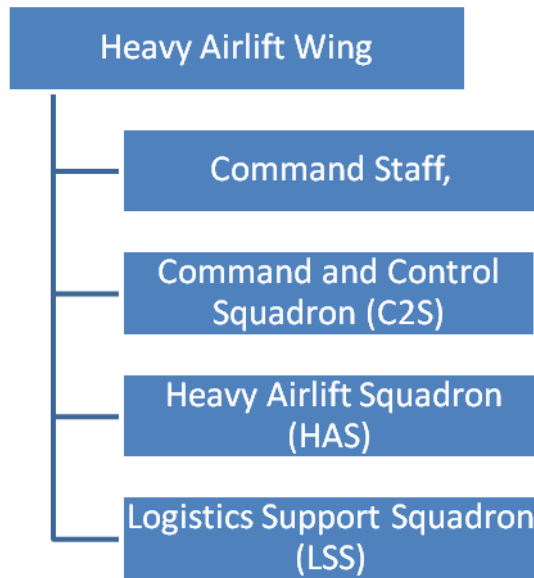


Fig. 3 The consists of the Heavy Airlift Wing¹³

The personnel contributed to the Heavy Airlift Wing correspond to the participating nations' share of flight hours and are hired on temporary or permanent positions. Crewmembers are assigned to different missions, not only those requested by their nation, but a country can withdraw its airmen from a particular mission for national caveats.

The Commander of the Heavy Airlift Wing exercises the authority over mission execution. He is also the final authority in making decisions regarding conflicting requests from the SAC nations. He assesses the mission requests according to the SAC Memorandum of Understanding Mission Priority Classification¹⁴:

1. Employment or deployment of forces in support of NATO, EU or UN military operations
2. Response to actual or anticipated armed conflict or crisis where a SAC nation is involved
3. National emergencies in direct support of a SAC nations' citizens.
4. National support of NATO, EU, or UN operations not covered in #1
5. National support of humanitarian operations
6. Other national requirements

In assessing the mission requests, the Commander of the HAW should first consider emergency need to safeguard life of participants' citizens, and second, the nation with more flight hours.

¹³ <https://www.sacprogram.org/en/Pages/Heavy-Airlift-Wing.aspx>

¹⁴ <https://www.sacprogram.org/en/Pages/Heavy-Airlift-Wing.aspx>

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The leadership positions of the Heavy Airlift Wing are manned by the member nations with the biggest share of flight hours in the SAC program, the United States, Sweden, the Netherlands and Norway.

Heavy Airlift Wing Units

HAW Command Staff is led by the HAW Chief of Command Staff with HAW Quality Manager overseeing the Quality Assurance and Safety sections and consist in functions according with figure below.

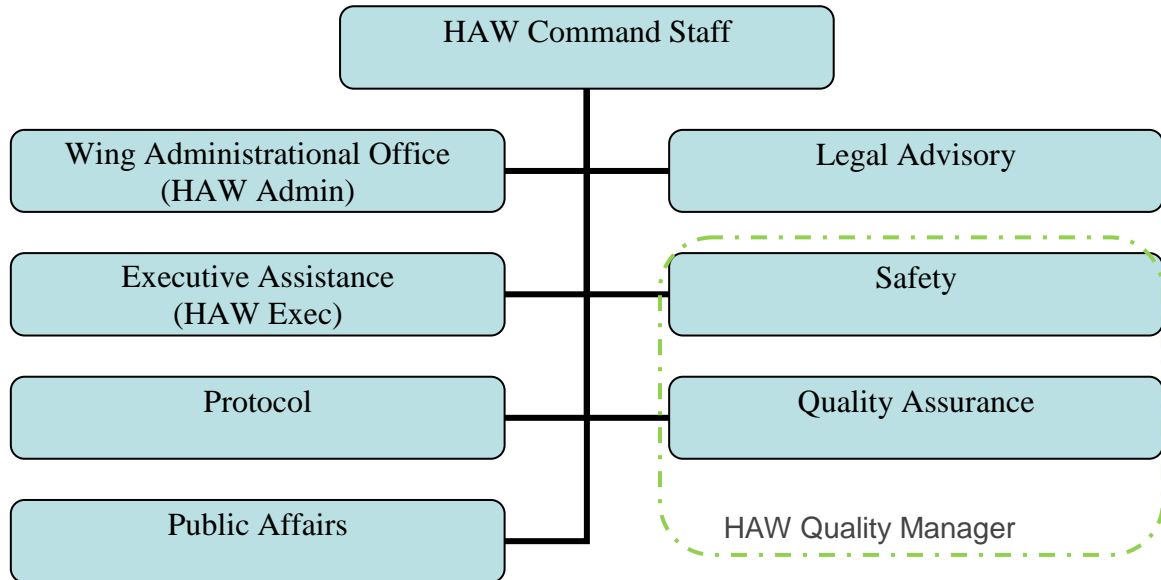


Fig. 4 The consists of the HAW Command Staff¹⁵

The **Heavy Airlift Wing Command and Control Squadron (C2S)** is the focal point for all interaction within the HAW and between wing and the SAC nations regarding their operational airlift requirements.

C2S functions are to:

- receive operational requirements for airlift from nations and convert them into actionable mission taskings.
- ensures that the requested missions are executable politically and that the desired payload is transportable by air.
- define the mission priority and helps to set the Required Delivery Date.

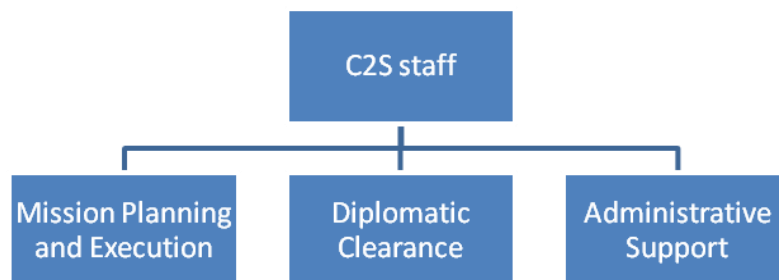


Fig. 5 Command and Control Squadron sections¹⁶

¹⁵ <https://www.sacprogram.org/en/Pages/Heavy-Airlift-Wing.aspx>

¹⁶ <https://www.sacprogram.org/en/Pages/Heavy-Airlift-Wing.aspx>

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Seven of the twelve SAC nations (Hungary, the Netherlands, Norway, Poland, Romania, Slovenia, and Sweden) are represented in the personnel of the C2S.

Heavy Airlift Squadron (HAS)

The Heavy Airlift Squadron (HAS) is the world's first and only multinational C-17 operations squadron.



Fig. 6 The consists of the Heavy Airlift Squadron¹⁷

The HAS use the training, policies and standards of the USAF, the main user of the C-17 and adapted the best practices of C-17 squadrons in the USAF, Royal Canadian Air Force, Royal Australian Air Force and the United Kingdom's Royal Air Force and became the only C-17 Foreign Military Sales (FMS) unit that is trained and capable of performing the entire spectrum of C-17 Airland and Airdrop Mission Capabilities.

The HAS flight crews have a varied background of flying and working with cargo aircraft, fighter jets and helicopters in their national militaries. Apart from the US personnel, none of them have C-17 training before joining the HAW.¹⁸

After C-17 training has been carried out both in the United States and in Pápa, HAS aircrews are capable of reaching a high level of skill in utilizing the various capabilities of the aircraft.

The squadron structure, policies and procedures are designed to operate in support of the Strategic Airlift Capability nations' strategic policies to include combat and humanitarian airlift wherever and whenever they require it.

All HAS crewmembers are proficient in Airland operations that include Night Vision Goggles (NVG) operations, Tactical Arrivals and Departures, Assault Landings and Aeromedical Evacuation (AE) operations.¹⁹

¹⁷ <https://www.sacprogram.org/en/Pages/Heavy-Airlift-Wing.aspx>

¹⁸ <https://www.sacprogram.org/en/Pages/Heavy-Airlift-Wing.aspx>

¹⁹ <https://www.sacprogram.org/en/Pages/Heavy-Airlift-Wing.aspx>

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Additionally, a minimum of 50 percent of the HAS Aircraft Commanders can carry out Air Refueling missions. There are also two aircrews capable of Single Ship Airdrop of Heavy Equipment (HE), Container Delivery System (CDS) pallets and Personnel (PERS) at all times.²⁰

Logistics Support Squadron (LSS)

The Logistics Support Squadron (LSS) is in charge of providing specialists of aircraft maintenance as a part of the crew to perform maintenance at en-route locations, ensures that SAC vehicles are in top condition, ensure parts and support equipment are available to the aircraft maintainers, both at home station as well as en-route, ensures that Aircrew Flight Equipment is maintained for the safety of the aircrew, ensures safe loading and unloading of passengers and cargo at home station, ensures compliance with Dangerous Goods Regulations at all aerial ports where SAC C-17s pick up cargo from and other many support issues such as fuels, ground transportation, customs and other services.

To do all the things mentioned, the LSS Supply works continuously with the Boeing Company, Pápa Air Base and the civilian authorities of Hungary.

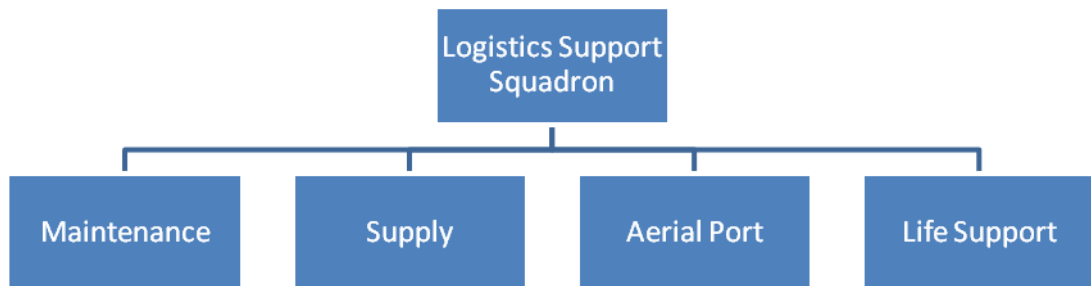


Fig. 7 Logistics Support Squadron sections²¹

Boeing C-17 Globemaster III

The Boeing C-17 Globemaster III is a large military transport aircraft. It was developed for the United States Air Force (USAF) from the 1980s to the early 1990s by McDonnell Douglas. The C-17 carries forward the name of two previous piston-engined military cargo aircraft, the Douglas C-74 Globemaster and the Douglas C-124 Globemaster II. The C-17 commonly performs strategic airlift missions, transporting troops and cargo throughout the world; additional roles include tactical airlift, medical evacuation and airdrop duties. It was designed to replace the Lockheed C-141 Starlifter, and also fulfill some of the duties of the Lockheed C-5 Galaxy, freeing the C-5 fleet for outsize cargo. Boeing, which merged with McDonnell Douglas in the 1990s, continued to manufacture C-17s for export customers following the end of deliveries to the U.S. Air Force. Aside from the United States, the C-17 is in service with the United Kingdom, Australia, Canada, Qatar, United Arab Emirates, NATO Heavy Airlift Wing, India, and Kuwait. The final C-17 was completed at the Long Beach, California plant and flown on 29 November 2015.²²

The three C-17 aircraft operated by the Strategic Airlift Capability Heavy Airlift Wing bear the registrations SAC 01 – 03 and the national insignia of the SAC program host nation Hungary.²³

The C-17 can be operated with a minimum crew of two pilots and one loadmaster. Depending on the demands of individual missions the crew can also be amended with other

²⁰ <https://www.sacprogram.org/en/Pages/Heavy-Airlift-Wing.aspx>

²¹ <https://www.sacprogram.org/en/Pages/Heavy-Airlift-Wing.aspx>

²² https://en.wikipedia.org/wiki/Boeing_C-17_Globemaster_III

²³ <http://www.nspa.nato.int/en/news/news-20141110-4.htm>

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personnel such as the Flying Crew Chief (FCC), a specialist of the maintenance of the technical systems of the aircraft.

The C-17 offers its crew a modern work environment with systems that significantly reduce the workload of operating the complex aircraft. An essential part of them is the cockpit avionics suite that displays flight and systems information on four multi-function active matrix crystal displays and two Head-Up Displays (HUD) that show essential flight information.²⁴



Fig. 8 C-17 Globemaster in different flight configurations²⁵²⁶

Aircraft general characteristics²⁷

- Crew: 3: 2 pilots, 1 loadmaster (five additional personnel required for aeromedical evacuation)
- Capacity:
 - 102 paratroopers or
 - 134 troops with palletized and sidewall seats or
 - 54 troops with sidewall seats (allows 13 cargo pallets) only or
 - 36 litter and 54 ambulatory patients and medical attendants or

²⁴ <https://www.sacprogram.org/en/Pages/Boeing-C-17-Globemaster-III.aspx>

²⁵ https://en.wikipedia.org/wiki/Boeing_C-17_Globemaster_III#Specifications_.28C-17.29

²⁶ Left Up: NATO Strategic Airlift Capability's C-17s in take-off procedure; Right Up: USAF C-17 transporting a Dutch PzH 2000; Left Down: C-17 in an Aeromedical Evacuation configuration; Right Down: paratroopers seated before an airdrop

²⁷ https://en.wikipedia.org/wiki/Boeing_C-17_Globemaster_III#Specifications_.28C-17.29

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- Cargo, such as an M1 Abrams tank, three Strykers, or six M1117 Armored Security Vehicles
- Payload: 170,900 lb (77,519 kg) of cargo distributed at max over 18 463L master pallets or a mix of palletized cargo and vehicles
- Length: 174 ft (53 m)
- Wingspan: 169.8 ft (51.75 m)
- Height: 55.1 ft (16.8 m)
- Wing area: 3,800 ft² (353 m²)
- Empty weight: 282,500 lb (128,100 kg)
- Max. takeoff weight: 585,000 lb (265,350 kg)
- Powerplant: 4 × Pratt & Whitney F117-PW-100 turbofans, 40,440 lbf (180 kN) each
- Fuel capacity: 35,546 U.S. gal (134,556 L)

Performance

- Cruise speed: Mach 0.74 (450 knots, 515 mph, 830 km/h)
- Range: 2,420 nmi^[192] (2,785 mi, 4,482 km) ; 5,610 nmi (10,390 km) with paratroopers
- Service ceiling: 45,000 ft (13,716 m)
- Max. wing loading: 150 lb/ft² (750 kg/m²)
- Minimum thrust/weight: 0.277
- Takeoff run at MTOW: 7,600 ft (2,316 m)^[192]
- Landing distance: 3,500 ft (1,060 m)

4. SAC's Efficiency and Effectiveness

Founded in October 2008, the first tasks of the NAM Programme Office (and its predecessor, NATO Airlift Management Agency NAMA) included carrying out the successful acquisition of the three C-17 aircraft and associated support equipment. The NAM Programme Office also performed the registration and airworthiness certification of the aircraft in parallel with the stand-up of the office itself and provided support to the activation of the HAW and allowing it to start executing SAC missions.

The Heavy Airlift Wing reached Full Operational Capability in November 2012. During year 2013 the SAC C-17 fleet reached another significant milestone by meeting the 3,165 annual flying hour target set by the SAC member nations. Simultaneously several key infrastructure projects at Pápa Air Base were concluded and a range of new and revised governmental and commercial agreements or contracts in support of the SAC were finalized.

	Missions	Sorties	Flight Hours	Passengers	Cargo (in metric tons)	Cargo (in pounds)
2009	50	180	650.9	863	948	2,090,213
2010	144	665	2,665.0	5,295	5,327	11,744,452
2011	200	725	2,938.4	12,830	10,536	23,228,822
2012	231	733	2,928.0	16,484	9,286	20,471,845
2013	253	861	3,165.0	13,114	11,429	25,195,569
2014	251	842	2,892.0	10,334	9,462	20,860,577

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2015	293	939	2,818.9	16,759	7,223	15,923,290
TOTAL	1,422	4,945	18,058.2	75,679	54,211	119,514,768

Table 2 Heavy Airlift Wing Mission Performance 2009 – 2015²⁸

	Nr. Of PAX	Cargo	FLIGHT HOURS(H)	SORTIES	T/H	T/S	H/S
2009	863	948	650	180	1,591231	5,746111	3,611111
2010	5295	5327	2665	665	2,197561	8,806767	4,007519
2011	1283	10536	2938	725	3,629782	14,70938	4,052414
2012	16484	9286	2928	733	3,734426	14,91733	3,994543
2013	13114	11429	3165	861	4,025403	14,79721	3,675958
2014	10334	9462	2892	842	3,629115	12,46485	3,434679
2015	16759	7223	2818	939	3,157878	9,476997	3,001065

Table. 3²⁹

	T/H	H/S
2009	1,59	3,61
2010	2,19	4,00
2011	3,62	4,05
2012	3,73	3,99
2013	4,02	3,67
2014	3,62	3,43
2015	3,15	3,00

Table. 4

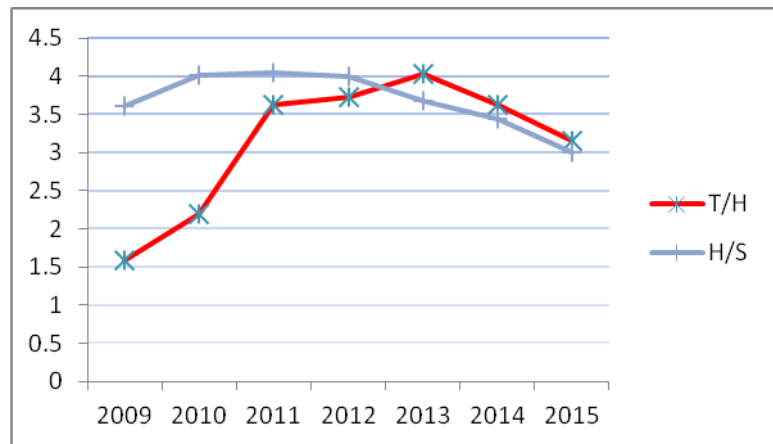


Fig.3

	T/S
2009	5,74
2010	8,80
2011	14,70
2012	14,91
2013	14,79
2014	12,46
2015	9,47

Table. 5

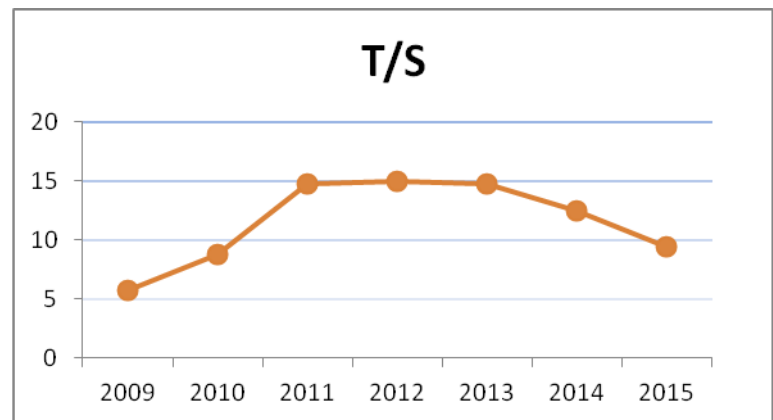


Fig.4

²⁸ <https://www.sacprogram.org/en/Pages/Heavy-Airlift-Wing.aspx>

²⁹ Assumption: 1 pax weight 100kg

T: total weight carried/year by SAC aircrafts

H: Flight Hours

S: Sorties

T=nr. of pax *100kg/1000 + tones of cargo

STRATEGIC AIRLIFT CAPABILITY DEVELOPMENT

At the air travel industry level efficiency is addressed to capital productivity and is measured in two ways³⁰:

- the simplest measure is the average aggregate load factor of the airline. This can be taken to measure the approximate capital productivity of the airline. Aggregate load factor are defined as the percentage share of seats occupied per year in total aircraft seat capacity on route served by the carrier.
- a more adequate method is to evaluate efficiency by analyzing and comparing the outputs of the decision unit to its inputs. Each output and each input is assigned a weight and the ratio of weighted outputs to weighted inputs yields a global measure of efficiency in given environmental conditions. Outputs include total passengers transported and total passengerkilometers. Inputs include total personnel, capacity, fleet, fuel and average stage length.

Usually, efficiency can be expressed in terms of³¹:

- distance per vehicle per unit fuel volume e.g. km/L or miles per gallon (US or imperial)
- distance per vehicle per unit fuel mass e.g. km/kg)^[31]
- volume of fuel (or total energy) consumed per unit distance per vehicle e.g. L/100 km or MJ/100 km
- volume of fuel (or total energy) consumed per unit distance per passenger e.g. L/(100 passenger·km)
- volume of fuel (or total energy) consumed per unit distance per unit mass of cargo transported e.g. L/100 kg·km or MJ/t·km.
- electricity used per unit distance e.g. kW·h/100 km or miles per gallon equivalent (mpg-e)

In our case study, the method chosen is to analyze the total weight transported / year of use and the flight length expressed in Flight Hours. I chose those units of measure starting from the basics of transportation: carrying people and goods and from the definition of the strategic airlift³².

In order to do this, first I found the total weight transported/year making an assumption: 1pax=100kg and I used the formula: $T = nr. \text{ of pax} * 100\text{kg} / 1000 + \text{tones of cargo}$, where T represents: total weight carried/year by SAC aircrafts.

Second thing was to find out the average value of the weight per Flight Hour and per sortie.

The third element was to find out the average duration of flight in terms of Flight Hours/Sorties.

Based on the official information (Table 2) the results are included in Table 3 and Table 4.

Those informations give us an image about how the transportation of people&goods evolve in the time frame 2009 to 2015, and we can see that it was a natural increase of the total weight and the duration of flight in the first years, had a period of staging between of two years and starting 2013 started to decrease and the efficiency of SAC to be affected.

In business, such a thing will be followed by a strategy review due to poor management or inefficient practices.

In military is not necessary true and we have to consider other factors too. In our case a cause was the retreat of troops from Afghanistan and as a result a lower need for cargo and troops employ and deploy, which is an external factor. If we take a look at the military presence in Afghanistan, the major conflict in the analyzed frame time, we will see that the

³⁰ http://ilot.edu.pl/prace_ilot/public/PDF/spis_zeszytow/205_2010/07.%20Baron%20A..pdf

³¹ https://en.wikipedia.org/wiki/Energy_efficiency_in_transportation

³² https://en.wikipedia.org/wiki/Airlift#Strategic_airlift

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graph with the military presence is very similar with the graphs who presents weight/sortie and weight/Flight Hours.

Another effect of retreating troops from Afghanistan was the reducing of the time of flight in terms of Flight Time/sortie because the need of transportation for long distance was reduced too.

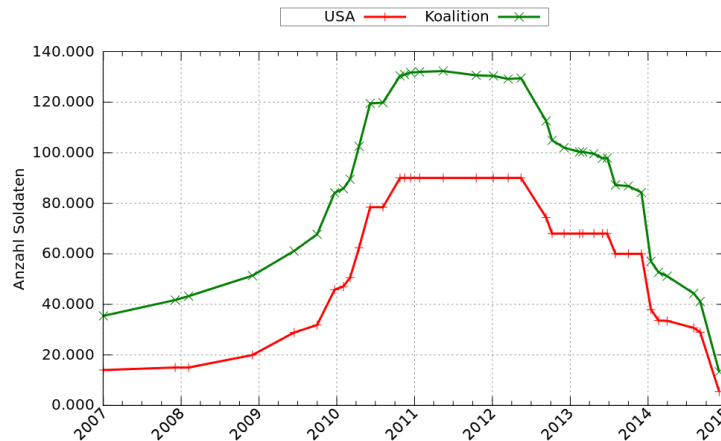


Fig.5 Afghanistan Troop Strength³³

Naturally, a question is rising from this: Is still needed this capability? The answer is „Yes” because the goal established for SAC is to meet the national requirements of the participants, including those in support of NATO and multinational commitments. The most important, in my opinion, are: employment or deployment of forces in support of NATO, EU or UN military operations and the transportation of troops and materials in case of collective defence (Art.5 Operations, NATO Treaty).

In terms of effectiveness, SAC organizations work constantly to optimize the use of the versatile C-17 platform to respond to the airlift needs of the 12 member nations in the best way possible. Currently the Strategic Airlift Capability pursues several information technology and infrastructure projects that serve this target. Current high value and high visibility projects include the SAC Infrastructure Development Project (IDP) at Pápa Air Base, the implementation of a Mission Monitoring & Scheduling System (M2S2) utilized by the Heavy Airlift Wing, a Secure Mobile Communication solution (SMCS), a Portable Flight Planning System (PFPS) and a Business Case Analysis for a C-17 simulator, potentially located at Pápa Air Base.³⁴

Currently the Heavy Airlift Squadron (HAS) is the only C-17 Foreign Military Sales (FMS) unit that is trained and capable of performing the entire spectrum of C-17 Airlift and Airdrop Mission Capabilities. All HAS crewmembers are proficient in Airlift operations that include Night Vision Goggles (NVG) operations, Tactical Arrivals and Departures, Assault Landings and Aeromedical Evacuation (AE) operations. Additionally, a minimum of 50 percent of the HAS Aircraft Commanders can carry out Air Refueling missions. There are also two aircrews capable of Single Ship Airdrop of Heavy Equipment (HE), Container Delivery System (CDS) pallets and Personnel (PERS) at all times.³⁵

³³ https://commons.wikimedia.org/wiki/File:Afghanistan_Troop_Strength.svg

³⁴ <https://www.sacprogram.org/en/Pages/SAC-Future-Developments.aspx>

³⁵ <https://www.sacprogram.org/en/Pages/Heavy-Airlift-Wing.aspx#has>

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According with the Efficiency and Effectiveness Matrix, taking in consideration SACs high effectiveness and the balance between high-low efficiency, we can place SAC in the Thrive and Survival areas, depending on the international military warfare context.

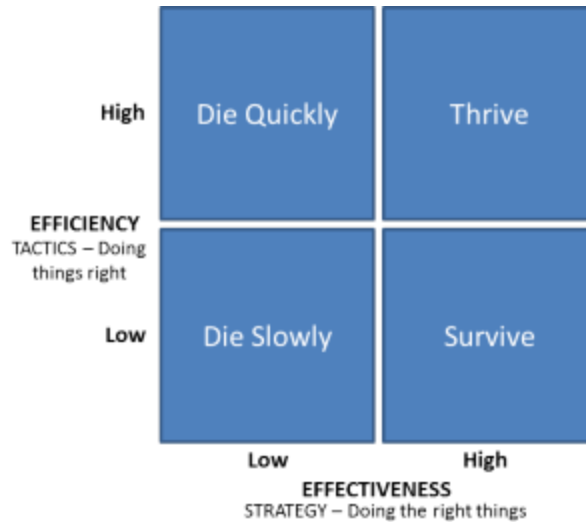


Fig. 6 Efficiency-vs-Effectiveness Matrix³⁶

Conclusion

Strategic Airlift Capability was born from the need to transportation goods and persons very fast at long distances, especially in support of military actions across the world. Small countries not have the capacity to develop by itself a program in order to achieve this capability because is very expensive and the cost per flight hour is very expensive obtaining a non-effectiveness program. This cost includes not only the aircraft, countries need to consider all the aspects related with a new aircraft: qualified personnel, proper infrastructure, related assets and permanent maintenance. In real life we can observe that even bigger countries have the same unsolved issue.

In a multinational initiative all those costs will be shared and the needs will be covered at least partially if not in total.

SAC initiative represents a unique model for cooperation and this “model” can be use as a starting point in research and development phase of creating new capabilities inside NATO and EU.

In such type of cooperation, all partners will use their best efforts to maintain and to further develop the cooperation in order to adjust constantly the program to their common needs. If we share the same values and we have the same goals, why not to share the recourses to achieve our goals? It is a way more economic to do things. We need to be aware that the strength of such cooperation (the link between same goals and sharing resources) is in the same time the main weakness. For this the cooperation needs to be flexible and to allow to enter or to sign out from the program. SAC program is constantly developing, increasing its strength and gives room for new partners.

Regarding missions, it is easy to see that SAC is oriented to satisfy the national needs but the accent in the prioritizing process of the missions is to support NATO, EU or UN military operations and national emergencies in direct support of a SAC nations' citizens.

³⁶ <https://growthandprofit.me/2013/02/25/efficiency-vs-effectiveness/>

STRATEGIC AIRLIFT CAPABILITY DEVELOPMENT

The developing of the SAC was very fast, from 12 September 2006, when the Letter of Intention was signed, to 12 October 2009, when the third and last of the three SAC C-17 aircraft was delivered and Full Operational Capability was reached it took only three years. That means is a strong cooperation between SAC nations.

The surviability of SAC is ensured and granted by the high efectiveness level and the constant impruvenent orientation of the participans. The efficiency is very sensitive at the changes in the military context and SAC needs to adapt. This is a matter of the participants in how they choose to use the allocated flyght hours and can appear differences between nations actions in how to use in an efficient way this capability.

Another result of the paper is that a model used in analizing a business can conclude to wrong results if applied as it is to military enviroment because the goals are different: cost effectiveness vs. mission effectiveness.

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