BEZPIECZEŃSTWO NARODOWE

MODERNISATION OF THE POLISH AIR FORCE COMMAND AND CONTROL SYSTEM

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Abstract

This article provides a brief introduction to the achievements of the Polish Air Force (POL AF) in the fields of command and control. The author elaborates on the achievement and approaches for development of the POL AF AIR command and control (C2) system. The activities related to the implementation of the Polish Air Force C2 system modernisation projects and NATO interoperability are thoroughly presented.

Key words: air force, command and control, technology insertion.

Introduction

Since joining the North Atlantic Treaty Organization (NATO) in 1999 and the European Union (EU) in 2004, Poland has been viewed by world leaders as a valuable, strategic member. Since this time, Poland has developed its military capability to fulfill NATO expectations and to cope with contemporary threats.

Current risks are mainly related to: war between states; violence within states, including civil wars, large-scale human rights abuses and genocide; chemical, biological, radiological and nuclear weapons (CBRN); terrorism and transnational organised crime[1].

Following new threats, the concepts of defence of individual states and alliances have changed as well. The necessity to act before a crisis occurs or in its earliest stage has been distinguished. Therefore, there is a need for defensive tasks beyond a country's borders. However, this requires the use of highly manoeuvring forces with large combat abilities, which constitutes the Air Force. In the international environment, the Air Force will be one of the most effective tools in dealing with crises in the near future, regardless of the nature of the conflict (war, other than war or struggle with the effects of natural disasters). The new role, missions and capability requires the transformation of the Polish Air Force (POL AF).

The "Technical Modernisation Plan" signed on December 11 and the "Programme for the Development of the Polish Armed Forces for 2013–2022", approved earlier, launched a new phase of modernisation of the Polish army. The fundamental objective of technical modernisation is development of the operational capabilities of the Polish Armed Forces, including strengthening the national combat potential for carrying out national and allied commitments according to Art. 5 of the Washington Treaty. The programme plans means for developing all the capabilities, including the Air Force command and control system. In today's multi-national, asymmetric defence environment, modern warfare demands broader uses of existing command & control systems, as well as the integration of evolving technologies to connect and employ military capabilities. The days of long decision and preparation time to react to conflict situations are obsolete. Today's forces need robust command &

[1] *A More Secure World: Our Shared Responsibility*, Report of the High-level Panel on Threats, Challenges and Change United Nations 2004, Security Report 12/7/04, p. 2.

control systems to meet these challenges[2]. This is why the POL AF, as a consequence of present and future needs, develops operational capabilities such as deployability and survivability, as well as providing a higher level of automated C2 systems compatibility between different types of NATO units in order to accelerate the decision making process and exchange information quickly.

Therefore, the main aim of this article is to identify the ability to implement a new command and control system in POL AF.

Current Polish Air command and control system

The air command and control architecture provides the frameworks to design, develop, and build a system capable of greatly increasing the effectiveness of air forces. Command and Control of Polish Air Force organisational structure consists of:

• Air Operational Centre (AOC) – is the main centre at which joint air operations are directed, monitored, controlled, executed and coordinated with the other components[3]

• TWO CRC-s (one static, one deployable - DACU and one in the new NATO architecture, ARS[4]); manages all defensive air, offensive air and airspace management activities within its assigned operational area through surveillance, identification, weapons control, positive and procedural airspace control and link management. Moreover, it produces a fully identified air picture, which contributes to the Recognised Air Picture (RAP)[5].

• Two Air Operational and Coordination Centres (AOCC) - will provide permanent Air expertise for, and liaise with, the GRF(L)/Corps Commander on behalf of the designated Combined Air Operations Centre (CAOC) Commander at the tactical level.

• Radar posts (Air Surveillance and Control Systems), assigned to provide constant radar reconnaissance and radar support for the Air Force. As part of NATO's radar reconnaissance network, the Radar Forces provide an air situation picture (RAP – Recognised Air Picture) over Poland and neighbouring territory. The selected Radar Forces units provide radar reconnaissance by constant airspace surveillance to support Air Forces and GBAD Forces combat activities;

• Active units responsible for flying units' activities. They have a decisive impact on the effectiveness of Poland's defence. The Air Force combines fighter squadrons, fighter-bomber squadrons and reconnaissance squadrons equipped with F-16,Mig-29 and Su-22 combat aircraft

and

• Support Units (responsible for organisation and methodical preparedness of the educational process in combat, tactical and flight training of the Air Force personnel. Moreover, the Support Units conduct the entire air defence activities, and participate in structural organisation of the national and allied exercises. The Support units consist of Air Force, Ground Based Air Defence Forces and Radar Forces training elements. Support Units such as: Tactical Air Wings; Airlift Wing; Flight Training Wing; Air Defence Brigades; Radar Brigades and Directly Subordinated Units.

Technical aspect of the Polish Air Force C2 system

The conclusions reached as a result of the missions and tasks of national defence predetermine the requirements towards the Air Force and the necessary resource framework for their realisation. The operational capabilities encompass the potential for accomplishing the Air Force's main mission – to support the security and defence policy of the Republic of Poland. Building and improving these capabilities depend on the following basic requirements: combat readiness, deployment, logistic support, information and, of course, command and control. However, the new missions, tasks and capability needs require technical modernisation, as well as building modern and effective command and control systems.

One of the vital elements in the POLAF C2 system is the Air Sovereignty Operation Centre –

[2] http://www.lockheedmartin.com/us/products/air-defense-C2.html.

[3] K. Załeski, Wybrane problem dowodzenia Siłami Powietrznymi. Aspekt narodowy i sojuszniczy, Zeszyty naukowe WSOP, nr 1(16), Dęblin 2011, s. 31.

[4] ARS consists of: Air Control Centre, Recognised Air Picture Production Centre and Sensor Fusion Post.

[5] B. Grenda, *The Polish Air Component command Headquarters – challenges for future*, Zeszyty Naukowe AON nr 2(87) Warszawa 2012, s. 228.

ASOC, located in the AOC. It enables information exchange of the Recognised Air Picture among the other members of NATO. It contains tracking and correlation functions to create air tracks from plot and track data received from military radars. It establishes a common framework to promote regional cooperation. It is installed in eight European nations.

The ASOC utilises the Link 1 data link to share its RAP with neighboring NATO CAOCs and CRCs. Currently, it does not have Link 16 capability, although it may be added in 2009. It also accepts flight plans. Simulated tracks can be entered. There is an extensive data recording and playback function. The recorded data can also be reduced to a human-readable format. ASOC also has a map editor function for its displays. The ASOC carries out threat evaluation and weapon assessments. Currently, there is no data link capability to exchange digital orders. All mission assignments have to be done by voice communication.

The ASOC uses software that has incorporated the J-Series message processing and supports Link 16 functionality. ASOC connects to the MIDS terminals through CSI as a gateway/router via JREAP C. In the future, the RAP production function will be taken by the CRCs.

Currently, the ASOC system is fed by Radar Posts equipped with Poland's dimension radars (NUR-12 and NUR-11) and additional Radar Posts equipped with radars defined as BACKBONE (NUR-12M). This system covers the entire territory of our country. Radars working in the ASOC system enable the Recognised Air Picture – RAP to be established due to ordered parameters of radiolocation information established in NATO's Integrated Air and Missile Defence System– NATINAMDS[6].

The second POLAF C2 system is the Dunaj national system, which is located in the AOC and all CRCs in Poland. The DUNAJ system is Poland's "automated system for the collection and development of information about an air situation, and support control of active combat units." It is designed to provide faultless functioning inside the NATINAMDS, and faultless collection processing and display of the air situation (creation of Recognised Air Picture (RAP)). During peacetime, DUNAJ provides continuous realisation of the Air Policing function; during conflicts and wars, it provides the means for continuous control of combat units. The DUNAJ system is comprised of two major subsystems: the Weapons Control Subsystem and Surveillance and RAP production subsystem. The command subsystem, which is still under development, will provide the means for automated air defence control of air forces, ground air defence units and EW units. The radar reconnaissance subsystem provides air situation information for the development of the RAP. This subsystem uses the following sources of information: independent radars spread over the sector, radars located on the fixed posts in the Air Defence sector and in adjacent Air Defence sectors, data from IFF systems (included in radar sources) and information from Poland's civilian air traffic control system. The data exchange is realized via Asterix, LINK1 (STANAG 5501) and LINK-11B (STANAG 5511).

The next one is the SAMOC-PRZELOT System (Air COI-Level of interoperability 3). It is dedicated system for of the tactical level (air defence brigade). It is a command and control system which provides both capability to command and control legacy post-Soviet SAM launchers (2K11 Krug/SA-4 Ganef, or S-125 Neva/SA-3 Goa etc.) and interoperability with NATO systems. The data exchange is achieved via ADatP-3 (STANAG 5500) and LINK-11B (STANAG 5511).

The last and newest system in POLAF is CSI (CRC System Interface). CSI (CRC System Interface, previously known as CRC SAM Interface) is a real-time buffer system that allows C2 units to exchange data with other C2 units via standard data links. CSI enables:

- control of the active units and assets (battle management);
- integration of different systems which can exchange information in different NATO standards;

[6] NATINAMDS is a system of systems comprised of four functional areas: A common 'Battle Management Command Control Communications and Intelligence' (BMC3I) structure to support Surveillance', 'Active Air and Missile Defence' (Active AMD) and 'Passive Air and Missile Defence' (Passive AMD) [ ]. All four functional areas contribute to the Defensive Counter Air (DCA) [ ] operations area of Counter-Air and provide the basis for the protection of Alliance populations, territory and forces and the projection of AMD firepower. Source: *MC Concept for the NATO Integrated Air and Missile Defence System (NATINAMDS),* International Military Staff, NATO April 2015, p. 7.

• use of tactical data link systems between CRCs and active units.

CSI can exchange data via the ATDL-1, Link 1, Link 11B, NASAMS, MBDL, JREAP C, and Link 16 data links. CSI is not just a data forwarder between these links; it also performs track correlation/decorrelation functions, provides SAM control, man-machine interface, automatic/manual link registration, filtering, recording reduction of data, and fire unit/BBF mapping.

CSI can be used as a standalone buffer with any CRC host system or it can be integrated with MASE to form a C2 system that produces a Common Operational Picture (COP) of air, surface, and ground tracks. The ICC network enables exchange of formalised command and report documents and additionally performs some functions connected with force commanding. At present, this system is implemented in AOC, CRC's, AOCC's and Tactical Air Bases.

Finally, this system is planned to be implemented in all and air and SAM units in Poland. In addition, POLAF plans to implement an element of ICC software in our national NR network (MIL-WAN) for training purposes. POLAF has implemented Identification Friend or Foe (IFF) Mark XII standard and has already planned to implement Mark XIIA capability defined in STANAG 4193.

The Identification Friend or Foe (IFF) programme is also worth mentioning. We started the IFF programme in the early 1990s and our SAMs systems, radars and post-Soviet aircraft were equipped with interrogators and transponders made by Polish industry. New military platforms have IFF installations made by our allies and Polish industry as well. Interoperability of our IFF devices has been checked many times during international exercises. Currently, two R&D (research and development) programmes are ongoing, in order to obtain Mark XIIA capabilities: in the air (transponder) and on the ground (interrogator).

Future prospective of the Polish Air C2 system

The commanding system shall be based upon advanced IT and communication technologies, including broadband systems for data transmission, computer systems and software. Besides, networks of physically isolated, though uniform in the informational aspect, banks of information and electronic systems for imaging operational situations shall form an important part of the commanding system. The above elements, which will be integrated into one system, shall form the technical basis of a common information environment covering all commanding posts on the strategic, operational and tactical levels of command. Modern technologies which support the decision-making process shall enable the high efficiency and acceleration of the process of taking decisions, issuing orders, setting tasks and on-going monitoring of the operation course[7].

Poland recognises the importance of its role in supporting EU and coalition partnerships and has established a Foreign Military Sales (FMS) case with the United States. The FMS case is managed by the United States Navy International Programs Office (NIPO) under the Poland Letter of Offer and Acceptance PL-P-LAM Amendment 1of 18 March 2009 Phase I contract. This first phase will assess the current Command and Control, Communications, Computer Intelligence Surveillance and Reconnaissance (C4ISR) capabilities ("As-Is") and provide recommendations for acquiring and integrating future capabilities ("To-Be") to modernise military and civilian infrastructures to meet Polish Air Force (POL AF) requirements. The Phase I Assessment was focused on operational environments in support of the Joint Task Force (JTF), Joint Fires and Air Defence. The products developed under the Phase I C4ISR assessment will be used to align future investment decisions, analysis of Alternatives (AoA) and engineering efforts for modernisation of the POL AF systems and platforms. The POL AF C4ISR Assessment establishes a baseline to evaluate proposed systems solutions and develop implementation approaches compatible with current and future force infrastructure. This baseline will also be used in future phases to test and validate field systems. Future phases of this assessment will provide complimentary engineering and integration support.

The existing gaps in POL AF capabilities reduce the effectiveness of Poland's participation in joint or coalition operations at home and abroad. Today's demanding requirement for timely information exchange between headquarters, units

[7] Vision of the Polish Armed Forces 2030, Ministry of National Defence, Warsaw 2008**,** s. 31.

and platforms dictate the use of secure digital media and networks to execute the functions of Battle Management (BM) and Command and Control (C2). The secure and timely exchange of information supports common tactical and operational pictures, threat warnings, command orders, and battlespace de-confliction and provides Situational Awareness (SA), enhances self-defence and reduces the risk of fratricide. Additionally, network centric enabled forces can receive the required SA from Intelligence, Surveillance, and Reconnaissance (ISR) assets that is scalable to perform their mission. The interoperability requirements cannot be met with a single "golden" system. The interoperability solution set should include multiple independent systems that can be interconnected and must be interoperable in order to satisfy multiple joint and coalition requirements.

The primary goal for the POL AF C4ISR Assessment Programme is to define a structural solution set that identifies potential systems that will allow the Polish Air Force to operate jointly with the other services of the Polish Armed Forces, other Polish Agencies, and be interoperable with the U.S and NATO. The products developed under the POL AF C4ISR Assessment will provide the policy makers, programme managers, services and industry a viable requirements document to support the expansion of current and future interoperable capabilities. The POL AF C4ISR Assessment identifies overarching requirements, reveals potential capability gaps and proposes solutions for development and integration. The POL AF C4ISR Assessment CONOPS supports investment decisions by:

- Providing a vehicle to integrate decisions made throughout the POL AF C4ISR Assessment programme.
- Depicting the operational requirements POL AF C4ISR Assessment capability will support.
- Defining external technical and procedural requirements.
- Providing data and rationale for programmatic decisions by POL AF.
- Providing the basis for changes to Doctrine, Organisation, Training, Leadership, Materiel, Personnel, and Facilities (DOTMLPF) development and personnel manning requirements.

The CONOPS (Volume I) and Joint Services Architecture (Volume II) together support future engineering efforts by:

- Depicting the operational context and technologies for verification of the functional concepts in support of POL AF C4ISR Assessment test and evaluation processes.
- Depicting the POL AF C4ISR Assessment capabilities alignment with other integrated structures and functional capabilities.

The initial emphasis provides for the generation and distribution of a real-time Common Tactical Picture (CTP) among all major Command and Control (C2) centres and platforms. The CTP is the primary mechanism through which commanders can access tactical and operational data using a map-based user interface. The CTP integrates sensor-derived and other tactical information from the multi-Tactical Data Links (TDLs) and intelligence networks to provide commanders with near real-time location of friendly, neutral and enemy air, maritime and ground forces, and amplifying information on those forces. This increases SA and enables combat identification, allowing the commander to exercise effective C2 for battle execution. At the operational level, shared information from the tactical level is fused with non-real-time data such as the status of resources and battle orders and plans, allowing the commander to exercise effective C2 for force operations. The CTP provides the current depiction of the battlespace for an operation within a combatant commander's Area of Responsibility (AOR). C2 systems should be reliable, survivable, flexible, interoperable, timely, and secure. Historically, Polish C2 systems lacked interoperability because each service built its systems and sensors to different performance specifications.

The concept of joint combat operations absolutely requires the exchange of tactical information between participants on a real-time or near-real-time basis using TDLs to develop a CTP. In the conduct of joint operations, lack of a CTP results in several obstacles for warfighting commanders:

When defending against a coordinated attack, duplicative or overlapping fire is likely to result. Some targets will be "overkilled" while others will escape unharmed.

There is limited ability to prioritise targets, which on the battlefield represent varying threat levels as the dynamics of the battle play out.

Warfighting commanders of different services must rely on voice communications to coordinate

engagements as targets transit from one service's AOR to another's. This is especially true in the littoral, where AOR among Army, Navy, or Air Force assets could overlap.

The potential for fratricide is increased, as friendly unit information may not be exchanged among services at all, or in a timely manner.

In contrast, the exchange of real-time tactical information between C2 systems, weapon systems, and intelligence systems provides mutual support, allows coordinated action, and prevents interference between interoperable forces for the efficient and effective application of military force. This concept is applicable at all echelons of military action, whether single service, joint, or combined operations.

The Polish C4ISR Programme is aimed at improving inter-service communications, as well as resolving long-standing problems in intra-service C2. The Link 16 MIDS terminal, as a primary focus of the Polish Programme, is the cornerstone of an infrastructure that allows near real-time exchange of tactical information across C2 platforms without regard to branch of service. These improvements allow the development of a fully integrated CTP.

The exchange of data supports such joint operations involving the following functions, such as Joint Air Defence, and Joint Fires, which will be discussed in detail in this volume.

Summary

In recent years, the Polish Armed Forces have been very active in modernisation of its forces to meet NATO and EU mission requirements. Poland's participation in Middle East operations with the U.S. Navy, NATO and EU programmes have provided and continue to provide enhanced capabilities enabling increased participation in coalition and multinational exercise and operations. The Polish Air Force could supply up to 48 F-16s and a Depoyable Control and Reporting Centre (DCRC) as part of the NATO Response Force (NRF), designed to be a force projection and conflict response force around the world. However, the short fall of interoperable C4ISR systems hinders increased participation from the Air Force components. To increase the ability for the POL AF to operate more effectively in a Joint and coalition environment, there needs to be a structured careful procurement of secure network enabled communications capabilities that are interoperable with all the Polish Forces, as well as other partner nations.

The primary goal for the POL AF C4ISR Assessment Programme is to define a structural solution set that identifies potential systems that will allow the Polish Air Force to operate jointly with the other services of the Polish Armed Forces, other Polish Agencies, and be interoperable with the U.S and NATO.

The POL AF C4ISR Phase One Assessment is structured to provide the reader with an analysis of current multinational interoperability gaps and present possible solutions for these gaps.

All Interoperability requirements cannot be completely satisfied by one system. The POL AF C4ISR Phase One Assessment presents a "Family of Systems" solution, independent systems that can be arranged to interconnect in various ways to provide interoperable capabilities.

The POL AF C4ISR Assessment products are presented in three volumes:

Volume I – *POL AF C4ISR Phase One Assessment: Concept of Operations (CONOPS).* Describes the operational environment that the POL AF C4ISR Assessment programme must support.

Volume II – *POL AF C4ISR Phase One Assessment: Joint Services Architecture*. Describes the high-level system level architecture required to support interoperability in the context of Volume I CONOPS.

Volume III – *POL AF C4ISR Phase One Assessment: Plan of Actions and Milestones, and Capabilities Implementation Road Map*. Describes the schedule and activities for POL AF C4ISR Assessment Phase II.

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