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The Integrated Military Information System of the Ministry of National Defense in the Aviation School Airbase

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Abstract
This article describes the Integrated Military Information System (IMIS), which is being gradually introduced in the Ministry of National Defense. The modern IMIS system is intended to form the foundations of effective management of the Air Force logistics. At present, military units often have to carry out their tasks in a coalition or allied environment and the integrated information system is a key to ensuring a successful outcome of these activities.
This author also focus on airbase tasks on the example of 42 Aviation School Airbase in Radom. The article also describes the implementation effects of IMIS on enhanced functioning of the airbase logistics in this process.

Keywords: information system, logistics support, military logistics, ERP system, safety.

1. Introduction

The military logistical system evolves, in accordance with the adopted development directions, allied requirements, task changes and organizational structures of the Polish Armed Forces. Poland's membership in international organizations is associated with the possibility of conducting operations by the Polish Armed Forces in a multinational or allied (coalition) framework. The armed forces must be, therefore, capable of performing tasks both nationally, and also in cooperation with the armies of other countries within the implementa-

tion of adopted obligations. Technological progress, the informatization of life, knowledge and research advancement give the possibility to support solutions in military logistics (Ogonowski, Bogusz, 2019). For the logistical system of the Republic of Poland, it is related to the need to develop and use the latest solutions in support of the military logistical security. The solution which is aimed at increasing the efficiency of logistical tasks in the military is the implemented Integrated Military Information System of the Ministry of National Defense (IMIS). This includes the information ERP (Enterprise Resource Planning)-type system, covering all aspects of business activities, which allows quick data exchange with co-operants in the entire logistics chain. Today, it is a basic tool for companies, which facilitates business functioning in the changing and competitive market.

The aim of this article is to characterize the integrated military system, which is to improve the functioning of logistics in the Polish Armed Forces, with a particular emphasis on logistical processes occurring in an airbase that is responsible for securing logistics in the process of flight training. Since 2012, IMIS has successively been implemented in AF units around Poland. It covers all the subsystems and areas of functioning of military logistics. The author focuses on solving the following research problem: will the integrated IT system manage to improve the quality and efficiency of support for aviation training implemented in the Polish Armed Forces? It seems that the system brings a new quality into military logistics, enabling an effective implementation of logistical support in the Air Force.

Theoretical research methods, such as analysis and synthesis of information contained in literature and source materials, as well as the inference method were used to develop the article.

2. IMIS Structure

SAP ERP is a software package which, under the basic license contains a full spectrum of solutions, both the trading system (SAP R/3[1] or SAP ECC), where all operations are carried out, and data warehouse, a portal, operating mobile devices (palmtops, radio terminals), integration tools and programming tools (ABAP,[2] JAVA).

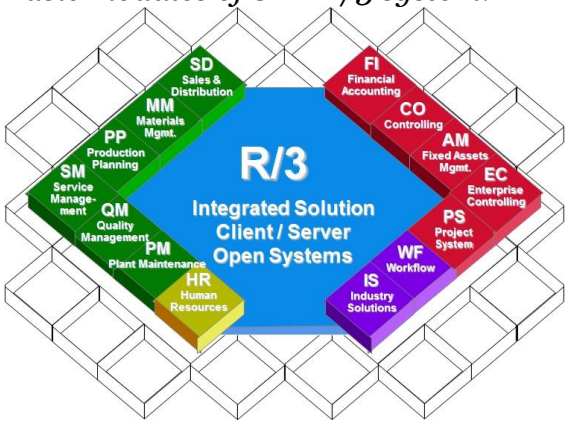
SAP R/3 is made up of independent modules, which communicate with each other, refer to one common database. The system architecture allows a flexible modification of the system. It also implements new modules depending on the needs and the structure of a system which is tailored to the needs of a given organization. In addition, the process can be extended in time. The system's reliance on the ABAP programming language allows a free creation of new applications within the system. In this way, it is possible to achieve any reporting and acquisition of personalized information, depending on the need. Exporting Reports to the MS Office environment gives

[1] The IMIS system is based on the architecture of the SAP R/3 - R. In practice, it denotes conducting operations in real time. The digit 3 stands for the level of system architecture

[2] ABAP (Advanced Business Application Programming Objects. *Allgemeiner Berichts-Aufbereitungs-Prozessor*, processor of generating reports – a high level programming language created by the company SAP AG. All ABAP programs reside inside the SAP database. They are not stored in separate files, similarly to Java or C ++ languages. In the databases, all ABAP programs exist in two forms: the source code, which can be edited and viewed within the so-called ABAP workbench tools and a generated code of binary representation, comparable to the Java code. Currently, ABAP is the leading language of the SAP R/3 platform software. It can also cooperate with the Java language (e.g. NetWeaver system). Quoted from: edu.gazeta.pl/edu/h/ABAP [accessed on 16.01.2015].

unlimited possibilities of editing and data formatting. The architecture of the SAP R/3 system is composed of the following modules (Fig. 1): AM (Assets Management), CO (Controlling), EC (Enterprise Controlling) FI (Financial Accounting), HR (Human Resources), IM (Investment Management) MM (Materials Management), PM (Plant Maintenance and Service Management), PP (Production Planning), PS (Project System), QM (Quality Management), SD (Sales and Distribution), TR (Treasury), WF (Workflow) .

Figure 1.
Basic modules of SAP R/3 system.



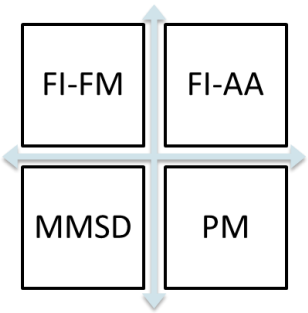
Source: http://www.sapfico.org/sap-fico-module/[accessed on 16.01.2015]

The essence of logistics management is the comprehensive management of operations at the time of the flow of materials and goods from the point of supply to the user of the final product. This is done to minimize the total cost of the distribution of goods, whereas the quality of customer service is maximized. IMIS as an ERP system configures the whole operation of the IT logistic infrastructure of military units. It integrates services, functions and organizational processes. The operations run under a common database, which facilitates effective communication and information sharing. The system is responsible, among others, for the registration and issuing of goods, and the management and movement of goods in a warehouse. The database is constantly updated and contains information on key logistical processes such the warehouse stock, and users' load. The systems are responsible for the optimization of warehouse stock, which significantly reduces storage costs (Klimek, 2012) .

The IMIS is currently used in the Polish Armed Forces. It consists of four core modules, which may be expanded by new modules (Fig. 2):

- MMSD: Materials Management-Sales and Distribution
- FI-FM: Financial Accounting, Funds Management
- FI-AA: Asset Accounting
- PM: Plant Maintenance.

Figure 2.
IMIS modules



The MMSD module (materials management) is the basic module that underlies every logistical service by registering such events as, for example storage intake, internal expenditure or material release receipt. In this module, the majority of internal documents and events related to the registration of purchases are created. This module allows making a full registration of contracts with contractors and monitoring the property issued for use. In the MMSD module, there are property records which are divided into three types of stock: consignment, current stock and war reserve stock.

The MMSD module allows property management, creating internal documents, recording supplier invoices and a full monitoring of supplies. Making

Goods Issue, Liquidation or Materials Received notes is realized on the basis of defined movements in the system. The element that differentiates IMIS from the previously operated IT programmes in logistics is the ability to analyse data entered in the system and reporting on their basis. All reports which are built into the MM module allow indicating property which is stored in warehouses in real time, or automatically, after entering any document that has any effect on the amount of property. The possibility of expanding reports by additional fields, i.e. adding and filtering in combination with the MS Office environment allows an easy and quick preparation of all kinds of reports. This module facilitates managing supplies and operational activities, including offers, sales orders, delivery and accounting clearance. The solution makes it easy to carry out stock-taking, monitoring stocks, and current overseeing of transfers among many warehouses. It also allows updating real-time stock, inventory valuation and availability control (Borucka, 2013) .

The module of sales and distribution supports the sales process by formulating a rapid response to customer inquiries. Therefore, the creation of offers and preparation of sales contracts are conducted in an automated manner. At the time of registering an order, the system takes all necessary steps to realize it, until the moment of preparing a delivery and issuing necessary documents. By integrating the SD module with the MM module, it is possible to control the availability of a given item in the assortment at the time of taking the order (Wieczerzycki, 2012). It allows issuing shipping notes, delivery notes and sales invoices. Defined operations make it possible to prepare, e.g. a hand-over protocol to another military unit or to the Military Property Agency. The invoicing functionality in the system caused a withdrawal of other software (other companies) from the Chief Accounting Division and integrating this process with logistics.

The FI-FM module is used by the Chief Accounting Division, and to a large extent by the Logistics Division. The major components of the module are as follows:

FI-GL: General Ledger Accounting
FI-AP: Accounts Payable
FI-AR: Accounts Receivable

The module aids the management of General Ledger Accounting, journals, budgets, as well as accounts payable with suppliers and recipients. It also allows the execution of all banking activities, including processing of payments made by cash, check and credit card, as well as agreeing on various accounts, financial statements on profits or losses, cash flow, overdue payments and financial commitments. It also allows for updating accounting records when occurring relevant economic events occur.

The primary function of the FI-FM module is to gather financial data in appropriate General Ledger accounts. As a result of the integration with the MMSD module, most records/operations are performed automatically after preparing a document. The FI-FM module serves as a link between the Chief Accounting Division and Logistics. Another feature of the module is to manage a financial plan and a project budget, which allows overseeing the implementation of financial resources. With this solution, there is the possibility of controlling financial resources of particular departments by analyzing of a financial plan. This solution has simplified the acquisition of information about a financial plan of a given service. By means of this module, financial and budgetary reports are prepared. On the basis of records in the accounts of the General Ledger and prepared documents, it is possible to generate financial reports. Every month the system generates Rb-23 (a report on the state of bank accounts of state budgetary units), R-27

(- report on the implementation of budget revenue plan) and R-28 (report on the implementation of a state budget revenue plan) reports, which are submitted to the Ministry of Finance (Regulation of the Minister of Finance, 2014). This solution allows controlling, on a continuous basis, the correctness of documents entered into the Integrated Multi-level Integrated System of the Ministry of National Defence.

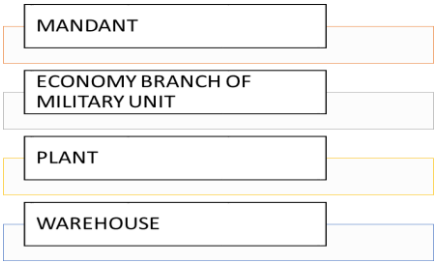
The FI-AA module manages fixed assets of the financial department of the military unit and records the operations connected with these assets. This module is shared by the services and the Chief Accounting Division.

The PM module allows operating using device cards. The PM module contains information on military equipment (ME), possessed by a base, such as a serial number, warranty date, manufacturer, etc. The module is currently being expanded with new features and capabilities.

The organizational levels of logistics in the IMIS system are implemented from SAP R/3, reflecting the essential elements of the organizational structure, i.e. clients, enterprises, plants, warehouses (Figure 3).

Figure 3.

IMIS areas of management in 42 Air Training Base



Clients - an organizational unit in the SAP system, containing a separate set of basic data, set of tables. It represents a group of corporations.

Enterprise - the smallest organizational unit with its own set of accounts. It represents an independent unit, e.g. an enterprise within a capital group. At the enterprise level, the balance sheet and profit and loss account are conducted.

Plant - basic logistic organizational unit of managing materials in the SAP system. In practice, a plant corresponds to one factory, warehouse or location. The plant identifier is unique for the clients.

Warehouse - an organizational unit which is explicitly assigned to only one plant. It is used to store material. At the level of a warehouse, a quantity file is kept.

In the IMIS system, each user is assigned to an appropriate set of roles (Table 1). This allows a precise determination of user competences in different services. The user of the system has access to the data on the basis of executed duties. For example, a person in the Inventory Unit has access to the resources of all the services, while a person from a given service has access exclusively to documents and resources of that service.

Table 1.

The Roles of the IMIS User

Role name	A description of IMIS data, to which the user will have access.
COMMANDER	Supervision over the management of logistical resources.
Chief Accounting Officer	Supervising the work of the Chief Accounting Officer of an airbase
ACCOUNTING EXECUTIVE at Chief Accounting Division - General Ledger Accounting	Management of the General Ledger: orders for booking, accounting of items, periodic accounting
ACCOUNTING EXECUTIVE at Chief Accounting Division - accounts receivables and payables	Registration of documents related to accounts receivables and payables.
ACCOUNTING EXECUTIVE at Chief Accounting Division - BUDGET	Registration of documents relating to the management of an expenditure plan and budget revenues.
HEAD OF SERVICE	Making reports and analyses necessary for management in the area of service.
SERVICE EXECUTIVE - RECORDS	Registration of documents related to economic events in the area of quantity and value register (current assets, fixed assets) within a given service.

SERVICE EXECUTIVE - EXPLOITATION	Registration of operating events related to the Armament Inspectorate, as part of the service.
IMPLEMENTATION ORGANIZER	Person coordinating all implementation projects in a given unit.
BASIC DATA ADMINISTRATOR (Enterprise)	Administration of basic data at the enterprise level e.g.: materials and services, supplier and recipient.
Role name	A description of IMIS data, to which the user will have access.
COMMANDER	Supervision over the management of logistical resources.

Source: the author's own work based on IMIS training materials.

IMIS is a centralized and unified information system, that supports logistical management, financial and human resources (Fig. 4). Its introduction in the whole Ministry of National Defence is to ensure the standardization of activities, exchange and integration of data among all units.

IMIS fulfils functions assigned in the most recent logistics doctrine of IT support systems for the logistics support of the Polish Armed Forces:

1) **information** - providing necessary information logistics and creating databases used in the decision-making processes;

2) **management** - involving the supporting units of logistics planning by optimizing processes in the course of:

a) logistical planning,

b) calculation of needs and acquiring logistical resources,

c) identification, storage and exploitation of the logistical resources,

d) keeping record of logistical resources and economic events,

e) transport monitoring,

f) overseeing and preparation of logistical reports (Doktryna logistyczna Sił Zbrojnych Rzeczypospolitej Polskiej,2014).

3. IMIS in the Aviation School Airbase

Airbases, as organizational units of the Polish Air Force, perform a wide range of complex and responsible tasks, including peacekeeping missions and flight training, with a particular emphasis on preparation for performing tasks in wartime, within the territory of the home country or on deployments abroad either independently or in cooperation with allied forces (Kozuba, Sarnowski, 2017).

Radom is famous for its international AIR SHOWs, which are held every two years on its premises. Apart from good publicity for the city, it is a large logistical undertaking for the military.

The IMIS system is gradually being introduced into units of the Polish Armed Forces. The 42 Air Training Base (42 BLSz) in Radom was first to implement IMIS. The main task of the 42 Air Training Base is to train cadets on the flying course at the Air Force University (LAW), as well as providing logistical and financial support for the financial department of military unit. An efficient logistics support of these undertakings require the use of modern integrated ERP systems (Enterprise Resource Planning). The main objective of the ERP systems is to fully integrate all levels of organizational management. ERP covers all business activities, improves the flow of critical information for its functioning and facilitates an instant response to the changes in demand. The information is updated in real time and is made available at the time of decision making. In the Ministry of Defence, IMIS is such a system, designed on SAP architecture.

Objective of IMIS implementation in units acting as the Military Logistic Centre and in other units that are holders of state budget resources:

1. the integration of autonomous, independent fixed asset inventory re-

sources and services carried out by logistical services and the Chief Accounting Division.

2. gathering information about the possessed material resources at different organizational levels, based on the Uniform Material Index.

3. implementation of the supply chain process together with its effects on accounting, using the IT system.

IMIS is to coordinate projects in managing materials, in the Chief Accounting Division and in all subsystems and functional areas of military logistics.

The basis for launching IMIS is the preparation of the ICT infrastructure based on the MIL-WAN network. It is a prerequisite for disposing technical resources to equip each workstation with system software, performing actions which include: collecting data and recording, storing, displaying, transforming, sharing, transferring it, etc., which ensures data security.

The introduction of an integrated system enforced keeping quantity and value register in logistics services. Owing to this innovation, organizational and job position changes were introduced both in the services in charge of materials and in the Chief Accounting Division. A major change was the removal of the quantity and value register unit in the Chief Accounting Division and transferring it to the logistics division of individual services (Fig. 5 and 6).

An important, and at the same time, key element of the IMIS system is the integration of logistical and financial records executed through linking material documents from accounting documents. This is a substantial improvement compared to previous solutions. Taking into account the operation of the system, based on its multiple levels, it is possible to execute its full chain of events, i.e. material release receipt (Figure 4).

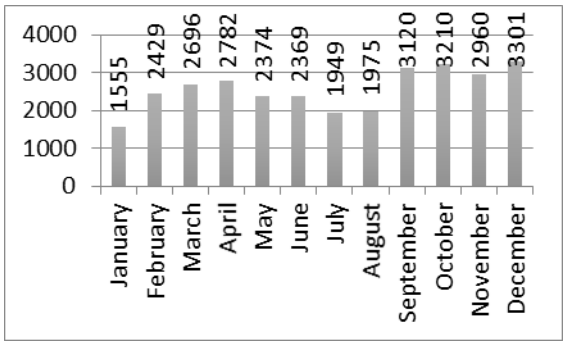
Figure 4.

The scheme of the release of property operations to another military unit in the IMIS system.

The IMIS system offers new standards in reporting and obtaining data information from warehouses. In the 21st century, information allows gaining a winning edge as well as making right decisions. IMIS is a new quality in the field of data processing in real time, regardless of the size of a unit. The number of documents issued by the logistics services at 42 Air Training Base once IMIS became a leading system, proves the amount of daily effort in the logistics division(Bogusz, Ślęzak, 2015) (Fig.5).

Figure 5.

The number of documents made by 42 Aviation School Airbase Logistics in IMIS in particular months of 2014.

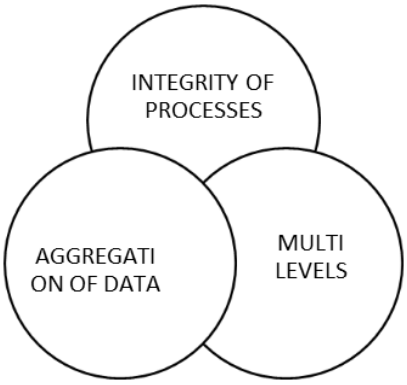


The IMIS system has the characteristics of data integrity, data aggregation and multiple levels (Fig. 6). It ensures effective access, processing and storage of data which are not dispersed in different IT systems. By analyzing the information in an integrated data warehouse, management is much easier. The use of large amounts of data in real time enables an efficient realization of logistical support in the 42 Air Training Base. In

addition, these features allow creating reports and listings, which are freely modified, as needed.

Figure 6.

Qualities of IMIS



4. Conclusions

The timely execution of tasks by military bodies ensures conditions for the proper functioning of the armed forces in times of peace, crisis and war. These tasks also apply to logistical support of air training in air bases. The modernization of the Polish Air Force and the introduction of new aircrafts into school training, led to the necessity of introducing modern integrated information systems in order to ensure aviation logistical support even better. Since January 1st 2014, the 42 Air Training Base has exploited IMIS as a leading system, which has greatly enhanced the performance of logistics tasks in the base and in units which are supplied by the Radom base.

The IT tools used in military logistics were autonomous for individual services, e.g. MAG-MAT, LOGIS, spreadsheets, etc. Often in individual services, original computational programs were devised in order to improve work. The programs did not interact, therefore their capabilities were limited. The introduction of an integrated information system replaced the previous incompatible software in a modular platform that supports individual divisions which are in charge of the airbase material and financial management .

The integrated multi-level system allows the efficient management of the assets of the Ministry of National Defence. It is to ensure an efficient collaboration in the following departments: financial, material, technical, medical, transport, movement of troops and military infrastructure. Once IMIS is used in all military units and institutions, full and uniform access to the existing military financial and logistic resources and army logistics in real time will become reality. It will bring huge savings, and above all, it will significantly improve the functioning of the Polish military - particularly in terms of human resource management, weapons and military equipment.

In the future, two types of modules should be added, training and human resources, in order to fully integrate the data that is key in the functioning of air training bases.

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