SEARCH AND RESCUE SERVICE IN THE AERONAUTICAL SECURITY SYSTEM

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K e y w o r d s: aeronautical security system, SAR organization, rescue system

1 INTRODUCTION

The contemporary world's period of turbulent chance and the emergence of new doctrines and strategies necessitated by the political situation as well as, above all, the rise of the new threat of terrorism in aviation have made the issue of air rescue, together with the question of flight safety the subject of numerous deliberations and analyses. It has also made this one of the key elements of the world's air safety system. The necessity therefore arises to integrate the forces and resources set aside by individual states within a global search and rescue system adequate to the new challenges.

Since joining NATO, one of the armed forces' top priorities has been to achieve the capacity to collaborate with the Alliance's forces in aiding air survivors and participate in search and rescue operations of air crews who have found themselves in enemy territory. An awareness of the conditions of using aircraft in military and other operations (stabilisation efforts, humanitarian campaigns) as well as of the threats involved is the point of departure for formulating the principles and procedures of aiding people in danger.

This article deals with how the Search and Rescue (SAR) service is organised in Poland – a service that has undergone thorough modernisation in recent years. The modernisation has resulted from the necessity of adapting the SAFR service to the new political and economic conditions in which Poland has found itself. The main factors necessitating changes in the air search and rescue realm were: the ratification and implementation of normative NATO documents pertaining to SAR and CSAR (Combat SAR) as well as the entry into force of new aviation legislation.

2 LEGAL BASES OF SAR FUNCTIONING IN POLAND

Poland's search and rescue service functions along the lines set down in the Convention on International Civil Aviation popularly referred to as the Chicago Convention. It is the source of international law regulating international air navigation. Successive annexes[1] to the Chicago Convention have adapted its provisions to contemporary conditions.

The Chicago Convention (art. 25) obligates every contracting states – subject to the control of their authorities – to extend assistance to the extent they deem possible in practice to endangered aircraft on their territory. It also obligates the states to permit aircraft owners or the state authorities registering the aircraft to provide such aid resources as circumstances require.

Detailed regulations on air search and rescue are contained in Annexe No. 12 to the above-mentioned convention. That document together with Manual ICAO Doc. 9731 – AN/958[1] spells out the principles regulating search and rescue services on an international scale.

Annexe No. 12 is the basis on which the NATO Standardisation Agency develops the standardisation agreements accepted and implemented by the armed forces of the North Atlantic Treaty Organisation. It should be stressed that during the development of STANAG[2] 3552 the basic terminology contained in Annexe 12 and complementary documents (manuals) was accepted and adapted to military requirements.

An international document of particular significance is ICAO – Doc 9731 – AMSAR – International Aeronautical and Maritime Search and Rescue Manual. It comprises three volumes: Vol. I. Organisation and management; Vol. II. Search and rescue coordination; Vol. III. Mobile forces and resources contains a detailed description of the procedures used in aeronautical and maritime rescue operations. A specific feature of this document is that it relates to rescue efforts conducted on land using aircraft and ground transport as well as to search and rescue activities at see using aircraft and seagoing vessels of various types. The manual helps determine their needs in the realm of air search and rescue and fulfil their commitments arising out of the provisions of the Chicago Convention. Those commitments in the form of relevant regulations for air and sea search and rescue services are contained in Annexe 12 as SARPs – Standards and Recommended Practices ICAO.

The International Aeronautical and Maritime Search and Rescue Manual contains instructions introducing a uniform approach to the organisation and conduct of aeronautical and maritime SAR. It encourages Contracting States to make use of the manual to develop and upgrade their domestic search and rescue services.

In NATO, the organisation and functioning of the search and rescue system are specified by STANAG 3552 (search and rescue). The solutions presented there are in accordance with the stipulations of Annexe 12 and partially also of STANAG 7030 (Combat Search and

1 On the basis of the Government statement of 20th August 2003 Poland is bound by 18 annexes to the Convention. Their text has been published in the Official Journal of the Civil Aviation Office.

2 NATO *Standardisation Agreement.*

Rescue). That holds true first and foremost for the accepted terminology, signals used in rescue operations and general procedures.

The principles regulating the organisation of airport rescue and the responsibility of airport management to maintain rescue and fire-extinguishing services are contained in Annexe 14 to the International Civil Aviation Convention. Airports, Vol. I – Airport design and use.

The question of searching for and recovering personnel missing in the course of combat operations is new in Poland and known only to a narrow circle of specialists. It should be emphasised that that searching for survivors and rescuing live in items and peace and war are closely related. Peacetime SAR resources will also be used in times of war with only the procedures changing.

3 SAR ORGANISATIONS

The organisational principles and tasks of Aeronautical Search and Rescue (ASAR) in Poland have been set down in articles 140 a and 140 c of the Aviation Act of 3rd July 2001.

In light of that legislation, the ASAR service is responsible for searching for and rescuing all aircraft in Polish airspace. It also operates on land in the air search and rescue area coinciding with the borders of the Warsaw flight information region (FIR Warsaw). The task of the ASAR service is to search a specified area to locate an aircraft as well as the victims of an aviation incident, determine their state of health and undertake rescue efforts at the scene.

The minister in charge of transport, functioning as the public-administration organ mentioned in Annexe 12 to the Chicago Convention, is responsible for organising and carrying out the search and rescue of aeronautical and maritime survivors.

The ASAR service comprises the following units:

1) A civilian-military Rescue Coordination Centre (RCC);
2) Aeronautical search and rescue teams;
3) Alarm stations.

The RCC's tasks include:

1) receiving and analysing information on safety threats to aircraft flying in Polish airspace;
2) verifying and clarifying information on safety threats to aircraft;
3) directing and coordinating the activities of SAR units, particularly the efforts of air search and rescue teams;
4) ongoing analysis and evaluation of the situation and correction of undertaken search and rescue efforts, including the decision to suspend and terminate them;
5) informing civil defence organs and institutions in charge of air traffic of civilian and military flights conducting search and rescue operations.

Search and rescue operations are conducted by aeronautical search and rescue teams including aircraft, the crews and flight personnel of aircraft prepared to engage in search and rescue efforts and on-ground searching groups.

Aeronautical search and rescue teams are provided by the Minister of National Defence of the Republic of Poland. The Minister of National Defence fits the aircraft with the necessary equipment and is responsible for training crews and flight personnel to perform ASAR service. In emergencies, rescue service aircraft belonging to the medical rescue service and law-enforcement agencies as well as other military aircraft may be called up.

The activities of aeronautical search and rescue teams are coordinated by the civilian-military rescue coordination centre functioning within the Polish Air Navigation Service.

Organisational units of the Navy, State Fire Brigade, Border Guards, Police, healthcare institutions and other entities capable of assisting search and rescue operations are obligated to cooperate with the ASAR in the conduct of their tasks.

Search and rescue services function within a system comprising specialist organisations (structures), the network of interconnections between them, communications facilities and executive units functioning in accordance with accepted norms and procedures. Competent state and council authorities constitute those structures.

Prepared to act within the air search and rescue system are specialist services of many different ministries and state organs which are obligated to provide rescue operations with the necessary resources. Those activities include searching for and extending assistance to people in danger following:

- an air accident beyond an airport;
- the disappearance of an aircraft
- the forced landing of an aircraft beyond an airport within the territory of the Republic of Poland excluding areas in which rescue and fire-extinguishing services operate;
- an accident or disappearance of an aircraft within the boundaries of FIR Warsaw (EPWW);
- an accident or disappearance of a seagoing vessel within he competence zone of maritime rescue services;
- other occurrences abroad aircraft or seagoing vessels warranting rescue operations.

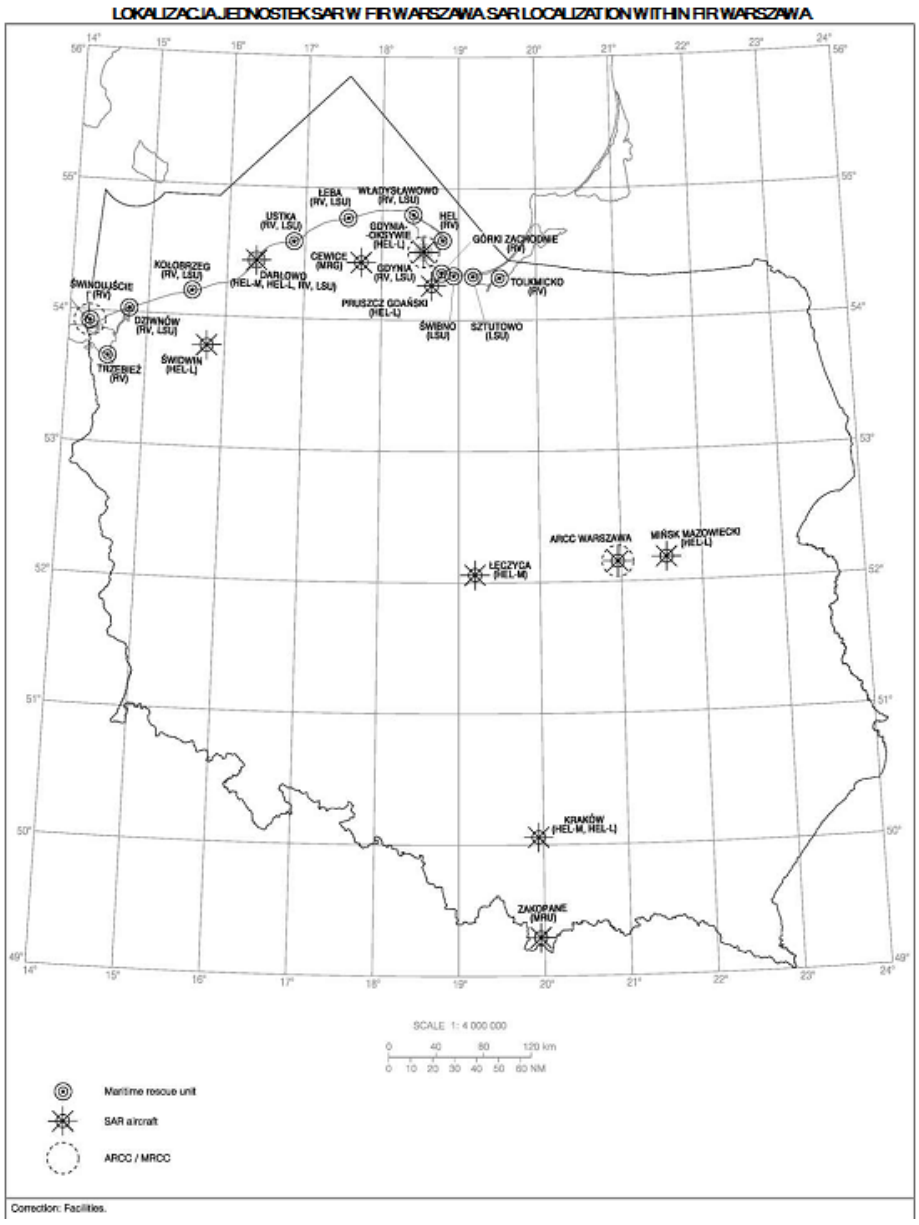

Fig. 1. Location of SAR units in Poland

Regardless of the type or state registry of an aircraft, its crew and passengers are assured of air search and rescue services if the accident had occurred within the boundaries of FIR EPWW. To receive assistance, the proper air traffic service (ATS) or a rescue coordination centre (or sub-centre) should be notified in accordance with binding procedures.

Radio notification is effected on the proper frequencies: 121,500 MHz and 2182 kHz (the frequency used for overseas flights). Monitoring and searching for radio frequency 121,500 MHz is performed during the working hours of air traffic services. Other types of notification are to effected through the use of available communications facilities and accepted visual signals.

When searching for danger signal transmitters (ELT, PLB, EPIRB), search and rescue aircraft use the 121,500 MHz frequency.

National SAR Points of Contact (SPOC) with the Mission Coordinating Centre (MCC) are found at Warsaw's Air Traffic Management Centre and the Maritime Operations Centre in Gdynia. SPOC has been established to receive information on threats relayed over the land segment of COSPAS-SARSAT.

The international COSPAS-SARSAT system detects and locates danger signal transmitters (ELT, PLB, EPIRB) operating at the 406 MHz frequency. From 1st February 2009, the system stopped detecting signals relayed over the 121,500 MHz and 243 MHz frequencies.

All danger signal transmitters operating at the 406 MHz frequency are registered in Danger Signal the Flight and Personnel Log at the Civil Aviation Office,

As in most European countries, the basic elements of Poland's air search and rescue system have been subordinated to the military authorities. It is obvious that in complicated actions and rescue operations the resources the Ministry of National defence has at its disposal may be insufficient. Hence the necessity of tapping into the resources of other ministries, the more so since search and rescue efforts are available to all aircraft regardless of their users' and state identity.

The SAR resources provided by the National Defence Ministry function independently as a sub-system and constitute an integral element of the national aeronautical rescue system. The Minister of National Defence is responsible for the proper functioning of basic SAR resources in the FIR Warsaw region. But it is the commanders of all branches of the armed forces having SAR resources at their disposal who are responsible for maintaining them in a state of constant readiness

The commander of the Air Force is responsible for the efficient functioning of the SAR system on the ground and for keeping the SAW resources provided by the Air Force in constant readiness. The Air Force commander is also charged with specialist cooperation with the SAR services of neighbouring states in border areas.

Poland's search and rescue system is based on the state's existing administrative structures such as: the Ministry of Transport, Ministry of National Defence, Ministry of Interior, Ministry of Health and the State Treasury Ministry. However, the actual conduct of search and rescue operations is based on functional elements, namely:

- ASAR service organisations (organs);
- other state service organisations directly participating in SAR operations;
- rescue and search and rescue units properly equipped to perform their tasks.

The Air Operations Centre (COP) is responsible for coordinating and directing search and rescue efforts in FIR EPWW. COP's executive organ responsible for organising and directing as well as overseeing rescue operations in FIR Warsaw is the Aeronautical Rescue Coordinating Centre (ARCC Warsaw). The ARCC Warsaw executive organ responsible for carrying out air search and rescue inconsideration the Baltic Sea region is Rescue Sub-Centre (RSC) Gdynia. The RSC is situated within the structure of the Maritime Operations Centre (COM).

RCC Warsaw is responsible for planning, coordinating and overseeing search and rescue efforts with regards to all aircraft (civilian and military) throughout FIR Warsaw as well as having updated information on:

- the state and quantity of resources at the disposal of rescue units in the FIR Warsaw region and in border areas of neighbouring states;
- the distribution of air traffic organs;
- communications facilities that can be used in search and rescue operations;
- the manner and scope of information sharing with RCCs in neighbouring states;
- the number of subscribers participating in search and rescue operations in the rescue responsibility zone;
- rescue resources from state administration ministries available for search and rescue efforts (operations);
- accessing lists of users of radio beacons operating within the COSPAS-SARSAT satellite rescue system.

In order to ensure the uniform guidance, training and preparation of post holders to perform tasks related to search and rescue operations as well as ensuring the proper functioning of ASAR resources, scopes of competence and responsibility have been set down within the Ministry of National Defence:

a) Commanders of the individual military branches are responsible for training flying personnel, preparing SAR aircraft crews to carry out search and rescue operations and providing them with specialist equipment.
b) Chiefs of staff of the individual military branches are responsible for the functioning of the command, communications and alarm systems as well as for organising duties in the aeronautical
c) rescue system;
d) Commanders of military units are responsible for keeping the forces and resources earmarked for the rescue system in readiness.

4 RESOURCES OF THE AERONAUTICAL SEARCH AND RESCUE SYSTEM

The search and rescue of air accident survivors is carried out by the forces and resources at SAR's disposal which, depending on their readiness to function, are divided into duty and supplementary ones.

The following are regarded as forces and resources earmarked for the air rescue system:

a) duty rotation at DSO COP and command and guidance centres (ODN);
b) organs of air traffic services;
c) sub-units of radio-technical forces on combat duty;
d) on-duty aircraft crews;
e) ground search groups (GNP) and their equipment;
f) military fire-brigade units;
g) ground (and water) transport facilities obtained from military units.

In the air search and rescue system these services are on round-the-clock rescue duty and go into action the moment the degree of threat has been determined.

In the Air Force, duty crews and aircraft on rescue duty are provided from search and rescue groups (GPR).

In the Land Forces and Navy, rescue duty is performed by the specialist air personnel of air squadrons and divisions. In special cases, emergency or special rescue duty may be introduced to safeguard military exercises of the national armed forces as NATO forces and commercial firing at Polish military firing ranges as well as events of a state or international nature. Special rescue duty is maintained at readiness level 2 and ready for action during flights as well as during the arrivals and departures of aircraft participating in exercises or other aerial activities for their duration. During special rescue duty on-duty crews are required to observe the same procedures in force during permanent duty.

Supplementary aeronautical rescue forces and resources are those SAR resources whose activities may be useful in rescue efforts or operations. Regarded as supplementary rescue resources are the following:

- airborne aircraft performing tasks which can help search for air-accident survivors and inform of plane crashes noticed by their crew while in flight;
- aircraft belonging to the Air Force, Navy or Land Forces Border Guards, Police or other entities prepared for rescue flights and used in rescue and survivor-transport tasks;
- aircraft of the Medical Air Rescue Service;
- ground-based military search groups;
- police units informing air rescue organs of a plane crash, providing assistance and clearing the crash site of onlookers:
- military fire-brigade units and other fire-control units obligated to extinguish aircraft fires on the ground and other blazes caused by them and to evacuate passengers from a damaged aircraft;
- military and civilian medical transport faculties;
- hospitals and other medical facilities
- regional and local organs of state administration in their conduct of rescue efforts.

As mentioned earlier, the air rescue system comprises specialist forces and resources subordinated to several government ministers. Each ministry is duty-bound provide whatever rescue resources are necessary under given circumstances.

Rescue crews and aircraft from Air Force and Land Forces units assigned to rescue duty come under the direct command of RCC Warsaw the minute they begin their duty.

Rescue crews and aircraft assigned to rescue duty by the Navy come under the direct command of RSC Gdynia the moment they begin their duty.

Ground-based rescue units assist the activities of airborne units, and in some search and rescue actions their assistance is indispensable. The following are regarded as ground-based rescue units:

- On-ground Search Groups (GNP);
- radio-technical airspace observation and control points;
- medical back-up units;
- military and police alarm sub-units;
- local and airport-based fire-control units;
- medical ground transport units;
- mountain rescue groups.

Aircraft and water-going vessels as well as on-ground search groups, including mountain rescue units, are counted among mobile SAR units. Table 1 contains a list of mobile resources on round-the-clock duty used in rescue actions in the FIR Warsaw region. Fig. 2 shows the action radius of SAR helicopters.

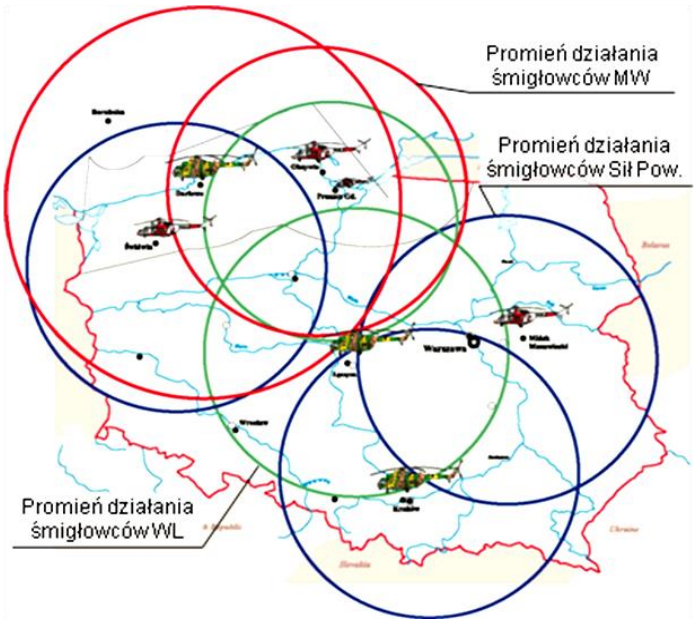

Fig. 2. Action radius of rescue aircraft

On-ground search groups (GNP) provide assistance to aircraft crews and passengers involved in an accident within 100 km of the base where they are stationed; that involves locating the accident site, providing first aid to survivors, transporting the injured to optionals and safeguarding the accident site (documents, aircraft equipment, cargo). Fig. 3 shows the composition of the on-ground search group.

In specific situations, the GNP's tasks also involve:

1) freeing survivors from the aircraft's wreckage;
2) removing survivors from difficult to access areas;
3) freeing (removing) parachuting crews from buildings, trees and other tall obstacles;
4) extinguishing fires;
5) providing survivors with basic supplies (food, beverages, survival items).

The decision to use GNP is taken by RCC Warsaw and relayed for implementation to the duty service of the military unit providing the GNP in instances when:

- difficult atmospheric conditions make aerial location of the accident site impossible;
- it is uncertain whether an aerial search will be effective;
- the topography of the terrain at the accident site or atmospheric conditions make the landing or hovering of an aircraft impossible.

Table 1
Mobile ASAR units

MOBILNE JEDNOSTKI ASAR MOBILE ASAR UNITS				
NAZWA NAME	**LOKALIZACJA LOCATION**		**ŚRODKI FACILITIES**	**UWAGI REMARKS**
Cewice	54°24'58"N**	017°45'47"E**	An-28 B1R (MRG)	HEL-L - lekki śmigłowiec, promień działania do 100 NM, możliwość ewakuacji 2 do 5 osób; HEL-L - light helicopter, radius of action up to 100 NM, evacuation capacity 2 to 5 persons; HEL-M - średni śmigłowiec, promień działania od 100 do 200 NM, możliwość ewakuacji więcej niż 5 osób; HEL-M - medium helicopter, radius of action from 100 up to 200 NM, evacuation capacity more than 5 persons; MRG - samolot średniego zasięgu, promień działania 250 NM; MRG - medium range airplane, radius of action 250 NM; MRU - górska grupa ratownicza; MRU - mountain rescue unit; LSU - brzegowa stacja ratownicza; LSU - land-mobile SAR unit; RV - okręt ratowniczy; RV - rescue vessel.
Darłowo	54°24'17"N**	016°21'11"E**	Mi-14 PS (HEL-M), RV, LSU	
Dziwnów	54°01'30"N**	014°43'30"E**	RV, LSU	
Gdynia	54°31'17"N**	016°21'11"E**	RV, LSU	
Górki Zachodnie	54°22'20"N**	018°47'00"E**	RV	
Hel	54°37'00"N**	018°49'00"E**	RV	
Kołobrzeg	54°11'00"N**	015°35'00"E**	RV, LSU	
Kraków	50°04'41"N**	019°47'10"E**	Mi-8 RL lub/or Mi-2 RL lub/or W-3 RL	
Łeba	54°46'00"N**	017°33'24"E**	RV, LSU	
Łęczyca	52°00'19"N**	019°08'45"E**	Mi-8 RL (HEL-M)	
Mińsk Mazowiecki	52°11'50"N**	021°39'46"E**	W-3 RL lub/or Mi-2 RL lub/or Mi-8 RL	
Oksywie	54°34'45"N**	018°31'07"E**	W-3 Anakonda (HEL-L)	
Pruszcz Gdański	54°14'55"N**	018°40'23"E**	Mi-2 RL (HEL-L)	
Sztutowo	54°19'35"N**	019°11'35"E**	LSU	
Świbno	54°19'00"N**	018°55'00"E**	LSU	
Świdwin	53°47'26"N**	015°49'34"E**	W-3 RL lub/or Mi-2 RL lub/or Mi-8 RL	
Świnoujście	53°55'00"N**	014°15'00"E**	RV	
Tolkmicko	54°19'35"N**	019°31'30"E**	RV	
Trzebież	53°39'40"N**	014°31'15"E**	RV	
Ustka	54°35'30"N**	016°51'05"E**	RV, LSU	
Władysławowo	54°48'00"N**	018°25'20"E**	RV, LSU	
Zakopane	49°18'00"N**	019°58'00"E**	MRU	

** - współrzędne geograficzne w układzie lokalnym
** - geographical coordinates in local datum

An on-ground search group comprises 8-15 soldiers (including one medic or medical rescuer), has a specific organisational structure, means of transport and necessary auxiliary equipment adjusted to the time of day, atmospheric conditions and the terrain's topography. A soldier from the military unit providing the GNP is chosen as its commanding officer. The most GNPs are provided by Land Forces.

Basic GNP equipment encompasses:

- maps of the area showing a 100 km radius from the basing site (a 1:250 000 – 1 map set and a 1:50 000 – 1 map set);
- GPS, digital devices, protractors, compasses and scaled rulers as per the unit's requirements;
- illuminating signal devices (1 flare gun + 3 10-unit sets of flare cartridges);
- available communications devices permitting information exchange with the crew of the aircraft engaged in a SAR action or with the military unit's duty officer;
- facilities making it possible to set out signal signs used by air accident survivors;
- technical rescue equipment (saws, spades, axes and colour lines to delimit the accident site);
- first aid medical equipment.

Fig. 3. An on-ground search group prepared for action in the SAR system.

In mountainous areas, special mountain units may be deployed such as the Volunteer Mountain Rescue Service (GOPR), the Volunteer Tatra Rescue Service (TOPR) and others with the proper equipment and training to function in mountainous terrain.

GOPR is represented by 7 regional groups. GOPR's rescue base encompasses:
7 central rescue stations, 37 year-round rescue stations and 74 seasonal rescue stations. GOPR's
technical faculties comprise wheel-based transport vehicles (all-terrain vehicles and four-wheeled TRX vehicles – totalling about 60 units), snowmobiles and specialist (winter and summer) rescue transport means. To ensure reliable, independent communications over GOPR's entire area of activity it operates its own radio communications involving: base stations (app. 95 units), mobile stations (app. 37), portable stations (app. 320) and re-transmitting stations.

In order to perform its statutory tasks GPR affiliates: full-time rescuers (60), seasonal rescuers (app. 30) and candidate rescuers (app. 300). Its specialist staff comprises: mountain rescue instructors (app. 140) and senior mountain rescuers (app. 350) Both the full-time rescuers as well as the volunteers are highly qualified in to conduct rescue operations in mountainous areas. Every GOPR rescuer is well acquainted with the terrain he is operating in and has been tried to give premedical first aid. GOPR has at its disposal a W-3 Sokół rescue helicopter.

5 CONCLUSION

Summing up, aeronautical search and rescue service is provided over the entire aeronautical information region (FIR Warsaw). Searches are launched and assistance is provided to the crews and passengers of aircraft that have gone missing or had accidents in FIR Warsaw beyond airport areas. Service is provided round-the-clock. Basic resources for rescue efforts are provided by the Minister of National Defence who is also responsible for training aviation and flight personnel.

NOTES

[1] On the basis of the Government statement of 20th August 2003 Poland is bound by 18 annexes to the Convention. Their text has been published in the Official Journal of the Civil Aviation Office.

[2] ICAO document, Doc 9731 – AN/958 replaced the previously binding manual Doc 7333 – AN/854.

[3] NATO Standardisation Agreement.

4 In 2009 Poland ratified STANAG 7030 Ed. 4 (Rat. Draft 1) of 27th September 2004 Combat Search and Rescue (CSAR) – ATP-.3.9.1. (ATP-62); its Polish-language title is Poszukiwanie i ratownictwo podczas zagrożenia i wojny (Literally: Search and rescue during threat and war).

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[3] Instrukcja ratownictwa lotniczego w obszarze lądowym RP. (Aeronautical Land Rescue Instructions in the Republic of Poland)(sign. WLOP 390/2008, wprowadzona Rozkazem Szefa Sztabu Generalnego WP nr 834/Sztab. z 17 października 2008 roku [introduced by the 17th October 2008 Order of the Polish Army's Chief of Staff]).
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