Swiss Air Rescue Rega
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Citation

Abstract

BACKGROUND AND HISTORY
The Swiss Air-Rescue has its roots in alpine mountain rescue. From the onset of mountain climbing until after the end of the Second World War, the only form of rescue for people in trouble in the mountains was by land, by means of rescue convoys organized by the Swiss Alpine Club. Using aircraft to rescue people remained just an idea at this stage.

In 1953 the Swiss Air-Rescue founded an association of its own. Beginning with fixed wing aircraft, after 1960 helicopter rescue was playing an increasingly important role in air rescue. The Hiller 306 and Bell 47G2 helicopter types, which were operated during the initial phases, were later on replaced by new models which were better able to cope with high altitudes.

Figure 1
Picture from the early stages of air rescue

The introduction of the Alouette III in 1971 saw the real breakthrough of helicopter rescue in the mountains. The first helicopter of this type was at the same time the first one to be completely financed by voluntary donations.

Figure 2
An Alouette III helicopter in action

The everyday costs of flying helicopters slowly began to exceed the capabilities of the Swiss Air-Rescue, which was entirely run by volunteers. After the Swiss Federal government had rejected his application for support from public funds, Swiss Air-Rescue appealed to the public. It beseeched the Swiss people to enable this work to continue by making individual financial contributions, offering free emergency air rescue in return for a donation. This appeal met with unexpected response. The Swiss Air-Rescue’s patronage system, which in principle has remained unchanged to this day, was born. The continued existence of
the Swiss Air-Rescue was guaranteed.

As the association gradually increased the scope of its missions and took on more and more important functions in the area of rescue, its legal form was found to be no longer appropriate. So in 1979 the Swiss Air-Rescue Foundation, REGA, was founded.

Since 1982 REGA has been a corporate member of the Swiss Red Cross, which in particular facilitates the operation of repatriation flights from all corners of the globe.

THE PRINCIPLES OF THE FOUNDATION
The guiding principles of the REGA Foundation are based on those of the Red Cross:

REGA’s objective is to help people who find themselves in serious difficulties and are in need of assistance without respect of person or his/her

- financial circumstances
- social status
- nationality
- religious or political conviction.

REGA assists everywhere where the life or health of its fellow human beings can be preserved or protected by means of its action.

THE STAFF
REGA employs some 250 full-time members of staff. These can be divided into, among others, the following categories:

- 30 helicopter pilots
- 20 jet pilots
- 20 medical doctors (plus a great number of medical doctors in clinics, working for REGA-missions)
- 15 nurses (for jet operation)
- 30 medical flight assistants (for helicopter operation)
- 30 operators
- 35 members of staff at the maintenance
- at Zurich-Kloten airport
- 80 members of staff at the administration

THE BASES
The assigned locations for REGA’s helicopter operation, which today comprise 13 operational bases each with one helicopter, arose from the promise that a rescue helicopter will reach its destination in no more than 10 - 15 minutes from the time it is called out.

Figure 3
Helicopter base St. Gallen

REGA bases consist of small operational centers which enjoy a great deal of autonomy in their work. Nowadays each base generally has at least two pilots, two fully-employed medical flight assistants and physicians at its disposal. A medical doctor is always on board when the mission involves the rescue of human beings. REGA’s philosophy, particularly outside the mountain regions, is to transport the doctor to the scene of the accident as quickly as possible, where he can then administer first treatment to the patient. The helicopter pilot’s secondary task is to transport the patient by air, while at the same time enduring that he or she is taken to the hospital which is most suitable for dealing with his or her injury.

REGA helicopters may not be used for commercial flights. This guarantees that the bases are permanently in a position to respond immediately to emergencies.
Missions involving the repatriation of people who are injured or seriously ill from countries abroad back to Switzerland, and sometimes, if capacity allows, to other countries, are carried out from the base at Zurich-Kloten airport. Usually two pilots, one doctor and one nurse are on board the fixed-wing ambulance aircraft during repatriation flights.

However REGA does not always operate its own aircraft. If the medical condition of the patient permits and a reservation is possible, emergency cases are also repatriated by means of scheduled airline flights. Again depending on the medical condition of the patient, the members of the accompanying REGA crew comprise a doctor and/or a nurse. About one quarter of all patients repatriated by REGA are transported home using scheduled airlines.

THE OPERATIONS CENTER (COMMAND AND CONTROL)

“Anyone can call us at any time of the day on our alarm number and request assistance”.

25 full-time operators (10 women, 15 men) ensure that REGA is able to keep its promise to the public. The operations center is manned 24 hours a day and 365 days a year, which means that someone is constantly available to receive and deal with emergency calls from all over the world. Depending on the time of year, 3 to 5 operators are on duty during the day, while at night (11p.m. to 7a.m.) the phones are manned by one to two operators.
The highly demanding work carried out by an operator can be described as a mixture between that of a police headquarters, a travel agency, an airline and a telephone help-line. These people come from a wide range of professions. What they all have in common are linguistic skills, each speaking German, French, English, Italian, and possibly Spanish or Portuguese.

Each year around 100,000 telephone calls are received over the alarm number; on a peak day there may be as many as 400. Behind each and every call is a personal emergency, which means that the work called for is no less serious or responsible than that carried out in a cockpit or an operating theater.

The requests for assistance (alarms) generally originate from the following sources:

for domestic operations:
- police (road accidents) 30%
- hospitals (transfers) 10%
- ski slope rescue services (ski accidents) 30%
- private (various accidents/illnesses, mountain accidents, plane disasters, etc.) 30%

for repatriations:
- private 60%
- insurances 40%

Whilst all requests from abroad are by telephone, alarm messages from within Switzerland are generally received by telephone, but also to a certain extent by handy-talkies (mountain and hang/paragliding accidents).

The operations center has at its disposal a country-wide radio network which enables it to coordinate the REGA units throughout Switzerland.

The current network was introduced at the end of the 1970s. It operates using conventional analog technology, with 34 different relay stations linked to the operations center by means of leased telephone lines.

Access to the network is achieved by transmitting a 1-tone call. A central processing unit scans all the stations in turn and informs the operator of any call. If several relay stations pick up a call, the processing unit locates and indicates the station which allows the best connection, whereby it is able to distinguish between a portable radio transceiver and a helicopter. The operator then decides which station to tune in to.

A new network, that will be operative in 1997, is based on the digital telephone technology ISDN (Integrated Services Digital Network), whereby voice and data can be exchanged between the operations center and the fixed station via a B channel (64 KBit). In addition the present centralized intelligence functions will be delegated to the periphery, i.e. the fixed stations.

This means that the fixed stations will be in a position to carry out routine work independently without involving the operations center. This includes:
- connection controls
- function diagnostics
- simple network checks
- mutual redundancy.

Access to the new network will be achieved by means of a 5-tone call instead of the current 1-tone call. The fixed station will, however, also be able to receive fully digital calls.

In addition to the fixed stations, the helicopters also play a key role in the new system. From the helicopter, all routine messages relating to a mission can be expressed as prepared message giving i.e. details of the flight time and destination by means of data transfer.
The various texts and times can be selected. These messages are automatically logged at the operations center without the operator being involved in any way.

From the map display in the helicopter, the position coordinates are transferred directly to the communication set, from where they are transmitted to the operations center at 1’ intervals. With the consent of the operator, the pilot may transmit this message at 10” intervals, for example, during unfavorable weather conditions or during night flights. In case of emergency the pilot is able to alert the operations center both acoustically and optically simply by pushing a panic button. In so doing he also triggers off the short interval position report and automatically establishes a continuous radio link.

The operations center can also transmit to the helicopter crew the coordinates and other key data relating to the mission, which then appear on the display of the helicopter radio.

Together with the fixed stations, the LAN at the operations center forms a uniform network of equal nodes (peer-to-peer). The operator can operate the radio, telephone, fax and telex from his personal computer. All PCs are configured in such a way that each one can take over a master function, thus achieving a very high redundancy level.

The work stations will also be equipped with a cartographic display, which allows continual control of availability, as well as optimal and rapid operational planning.

In addition REGA’s new country-wide network is able to pick up signals from private and tourist emergency walkie-talkies. This means that people who have had or witnessed an accident can contact the REGA operations center directly via the radio network and request assistance if necessary.

**THE MAINTENANCE**

As repairs may need to be carried out on the aircraft at any time, including at night, during the weekend and on public holidays, in order to guarantee a permanent stand-by service, REGA performs its maintenance work in its own works at Zurich-Kloten airport. 35 highly qualified people are employed to carry out this important task. In addition to periodical checks and revision work, the development and installation of special REGA equipment on aircraft and helicopters also takes place here.

**Figure 7**

Maintenance in Kloten

*Figure 8*

A Hawker 800-B on mission

- Ambulance aircraft: 1 Canadair “Challenger” CL-601, 2 Hawker 800-B

**THE AGUSTA A-109-K2: A NEW AGE FOR AIR RESCUE**

The A-109-K2 is a modified helicopter version adapted for difficult operational conditions (regarding temperature and altitude).
Figure 9
The Agusta A-109 K2

The A-109-K2 is a twin-engine helicopter (two Turbomeca Arriel 1K1 turbines each with 574 Kw, 771 Hp) which in this class of aircraft gives a good power/weight ratio. To gain the most efficiency from two turbines the A-109-K2 has a modified transition, that with both turbines operating produces 670 Kw output (900 Hp) and with only one turbine operating 477 Kw output (640 Hp). The tail rotor has been modified to provide more stability and safety while operating at altitudes over 4’000 meters.

The main rotor-blades of the A-109-K2 are constructed of a compound of many different materials and have especially been developed to withstand temperatures ranging from +50° C to -40°C and in a humidity of up to 90 %. The A-109-K2 REGA version is equipped with numerable “Kits”, modifications especially adapted to air-rescue missions, which include an external electrically operated winch with a tow length of 50m, able to lift 200 kg, and a fixed search light as well as cockpit instrumentation for night flying (NVG).

REGA has selected Elbit’s D-Map for their A-109-K2 helicopters. The D-Map is designed for increased flight safety and reduced pilot workload and is in use on Israel Air Force CH-53 helicopters.

Using a pointing-device switch, the pilot can prepare and display his emergency flight plan in seconds. Working at a ground station, it is possible to plan an entire mission in advance, incorporating tactical mission data, flight plans, obstacles, communication data etc.

The Areas of Operation

Primary missions:

1. in mountainous regions: mountain rescue, ski accidents, searches, preventative missions, evacuation maneuvers
2. in lowland areas: traffic, occupational and sports accidents, assistance in emergencies resulting from illness

Secondary missions:

1. transfer of emergency patients, paraplegics and tetraplegics and high-risk new-born babies to medical centers or specialized clinics
2. repatriation flights (secondary missions from countries abroad to Switzerland)
3. transport of organs, blood, serum, medicine and specialists
4. emergency assistance for mountain farmers, transport of animals
5. assistance in disaster areas (avalanches, earthquakes, floods, forest fires)
The origins of air rescue, that is, rescue missions carried out in the Alps, still represent a key part of REGA’s rescue work today.

REGA’s helicopters are equipped with modern, high-performance rescue winches, which enable the rescuers to reach alpine climbers in distress. Nowadays 95% of rescue missions in the mountains are carried out using a helicopter, while 5% involve related activities from the ground.

REGA enjoys a close and exemplary working relationship with the Swiss Alpine Club, both in the air and on the ground.

Since the REGA bases are on stand-by around-the-clock, they are very often the first to bring help in disaster situations. As soon as other rescue services are ready for action (military, commercial helicopter companies), the REGA helicopter withdraws from the scene and is once again able to resume its usual duties.

The control of forest fires is one of the tasks facing the mountain units. Here too REGA’s main objective is to deal with the task in hand as rapidly as possible until other services are ready to take over.

All REGA helicopters are also used for night flights, both for secondary missions (hospital - hospital), as well as for direct flights to the scene of an accident. For this purpose, our pilots have at their disposal third-generation night vision equipment (NVG).

**Figure 11**
Night vision equipment

**HOW DOES REGA PROCEED WHEN IT COMES TO CHARGING FOR ITS RESCUE SERVICES?**

The matter of who is to bear the cost of a primary rescue mission naturally only comes up after the event. This is determined by means of the following questions relating to the patient and his or her financial circumstances:
THE FINANCES

REGA is not an airline. It is much rather a charitable organization which, due to the fact that it operates in two very costly areas, aviation and medicine, needs considerable financial resources and is therefore totally dependent on public support.

While annual expenses amount to Sw.Frs. 100 million, revenues from rescue missions total a mere Sw.Frs. 50 million. So, REGA’s activities are not cost-covering. This operational deficit is covered by private funding, and above all by annual contributions from patrons. We would be completely justified in saying that it is these donations that keep REGA in the air.

For missions to be guaranteed, the creation of reserves for the purchase of new aircraft is vital if the fleet is to be continually brought up to latest technological levels as regards safety and medical equipment.

REGA’s current investments speak for themselves. The entire helicopter fleet has been replaced during the last years. This means that the total investment volume for helicopters amounts to over Sw.Frs. 120 million. In addition to this, the cost of replacing the 3 ambulance aircraft will be around another Sw.Frs. 100 million.

Taking into account a period of depreciation of 15 years, the Sw.Frs. 200 million invested in this way gives rise to an annual volume of investment of around Sw.Frs. 13 million for aircraft alone.

The question arises, whether all this is necessary: Flight technology and medicine are two areas where standing still means taking a step backwards. Today’s innovations are all too soon tomorrow’s antiques. We mean to continue to consciously uphold our policy of not counting the pennies when it comes to two elements which have always been of prime importance to us: our staff and our rescue equipment. In our area of work, where each day minutes decide between life and death, only the very best is good enough in both these spheres.

CONCLUSION

The key to perfection in air rescue lies in the combination of idealism, state-of-the-art technology, personal commitment and a background of people financing all this with their annual contributions.

References
Author Information
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