



ICAR 2024 Congress
Thessaloniki, Greece
October 16-19, 2024
MRA TERCOM Report

Tom Wood, Rich Siemer, MRA Terrestrial Rescue Delegates



Practical Day: Wednesday, 10/16/24

The 2024 ICAR Practical Day took place on the flanks of Mount Olympus, about an hour and a half from the conference location in Thessaloniki. This year's ICAR host, the Hellenic Rescue Team, organized the activities on the mountain for the hundreds of mountain rescuers in attendance. Each of the four ICAR commissions staffed hands-on stations that covered everything from avalanche probing techniques to hypothermia prevention and strategies for administering psychological first aid.

Of interest from the Terrestrial Commission were two stations that discussed different aspects of high and low angle rescue.

The first station, led by Chris Blakely from Petzl, focused on bolting. Drill selection, substrate inspection, different types of hardware and bolting techniques were all discussed and demonstrated in the sketchy conglomerate rocks that form Mount Olympus. As always, the practical anchor bolting demonstrations led to best practices and lessons learned from the international group of rescuers participating in the station.

The second station of interest was Kirk Mauthner's station that attempted to standardize the terminology and methodologies we use for two rope rescue systems. Instead of the commonly used terms like two tensioned rope system, twin tension rope system, dual main rescue system, it was proposed that we use the term Shared Tension Rope System, or STRS. This term most accurately describes the types of redundant systems being utilized today.





By identifying the tension as being shared instead of saying twin or two-rope or dual main, STRS allows for a single rope to be used with independent legs supplying the redundancy. Additionally, it removes the debate that arises when a system is labelled as twin or mirrored, since different devices can be used on each rope and there's no assumption that each rope will always see exactly the same amount of tension throughout the course of a rescue.

Additionally, by identifying the characteristics of a STRS, Mauthner feels that we can build better systems. All STRS should have redundancy so that no one point of failure would be catastrophic. Force limiting is another consideration for a STRS. That is, the system should have a built-in ability to limit the amount of force on the system should a rope get cut or a component see a shock load. By setting up and running several variations of systems from different rescue teams from around the world, Mauthner was able to point out the applicability of the STRS terminology with each setup.

Look for STRS to become an ICAR recommendation in 2025.

Here is the link to the Topograph Media video of the ICAR Terrestrial Rescue Practical Day:

<https://vimeo.com/1039464932>

Day 2: Thursday, 10/17/24

WORKING GROUP REPORTS

UIAA Safecom Working Group

The commission started the day with a review of the UIAA Safecom Working Groups. ICAR routinely provides recommendations to UIAA, which often get incorporated into UIAA and EN standards.

Recommendations need to be reviewed every 5 years to ensure that they are keeping up with current technology. The following subjects were covered:

- Static Ropes
 - Need consistent language between US and Europe
 - Need testing standards that clarify differences between low stretch, static and hyper static ropes
- Canyoning Harnesses
 - Failures after only one year (failed at less than 2.5kN)
 - Company used them 2X per day and were heat dried between each use
- Reproduceable sharp edge test for ropes
- Cable slings for quickdraws
- 130 Load Sharing Devices (rigging plates)
- Headlamps create interference with avalanche beacons
- EU Norm for Avalanche Airbags, addressing non-canister versions
- UIAA norm for avalanche transceivers and usability
- Ethics of rescue in high altitude terrain

Other TERCOM working groups presented their progress:



PLBs and Apps Work Group

- Garmin has a completely different connection to the POCs in Austria and Germany. France, US and New Zealand work well
- Apps may require payment for services
- There is no standard in Europe to transfer coordinates from an app to a POC
- Advance Mobile Location (AML) will automatically send location information to and emergency control center (such as 911 in the US) when an emergency call is made

Wildfire Work Group

- Mountain rescue groups (especially in Europe) are increasingly being activated during wildfires. This creates a need for
 - Clear tasks and responsibilities
 - Specific PPE and equipment for the environment
 - Specific training
 - Cooperation and collaboration with firefighters
- Will be drafting a recommendation for ICAR 2025

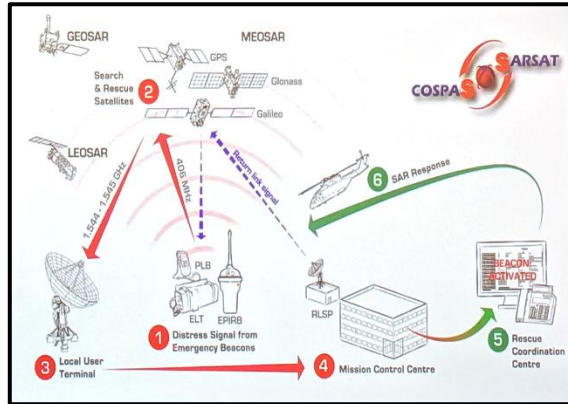
Shared Tension Rope Systems Work Group

- Reduced risk of catastrophic failure from sharp edges
- Reduced system forces
- Reduced stopping distance due to pre-load
- Will be drafting a recommendation for ICAR 2025

PRESENTATIONS

Galileo Satellite System—The Future and Challenges in Personal Locator Beacons, Humberto Hinestrosa

The current state of this European-based satellite system was explained. Galileo supports personal locator beacons and has the advantages of increased accuracy and polar reach. The system is a civilian operated as opposed to the alternative Sarsat-Cospas which was developed jointly by the militaries of Canada, the US and the Soviet Union. Galileo and other similar systems work as shown in the diagram below:



The following are the outcomes from the presentation.

OUTCOMES

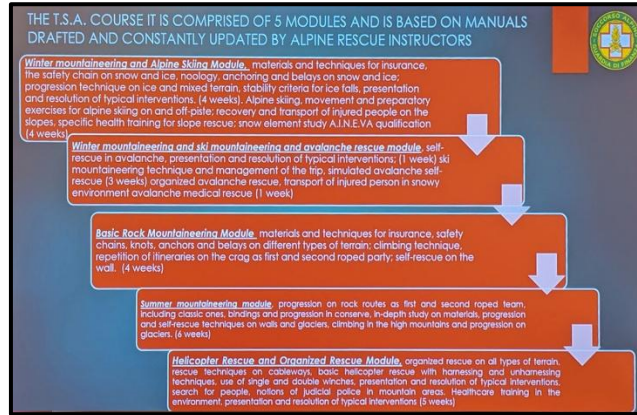
- Compared to the other 406 beacons, in the near future **PLBs are likely to become the leader in incident activation**, and the most numerous of the 406 beacons
- It is possible to increase the value of the SIT185 messages. Many times, the **distress message is not enough** and requires input from SAR Managers
- **SIT185 interpretation becomes a great advantage in calculating our POAs and Theoretical Search area**
- **Education on S/C is necessary in GroundSAR**. It may be the difference for our subject, allowing SAR Managers to know what to ask

Training of Alpine Rescue Technicians, Riccardo Manfredi, Nicolo Boffelli, Guardia di Finanze (SAGF)

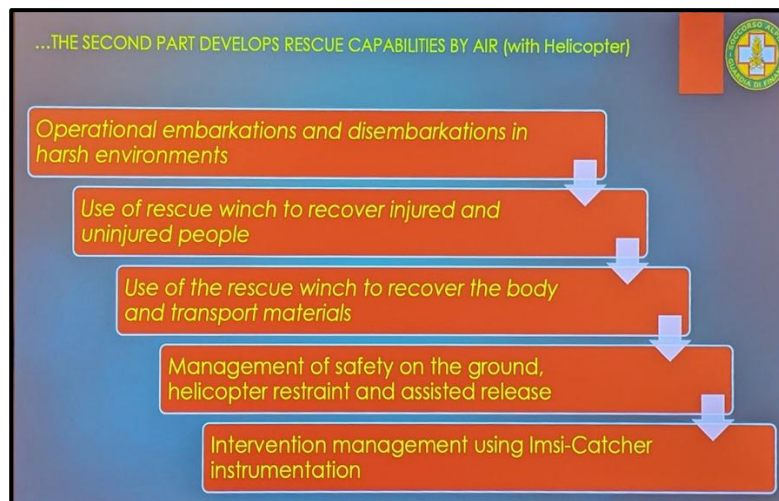
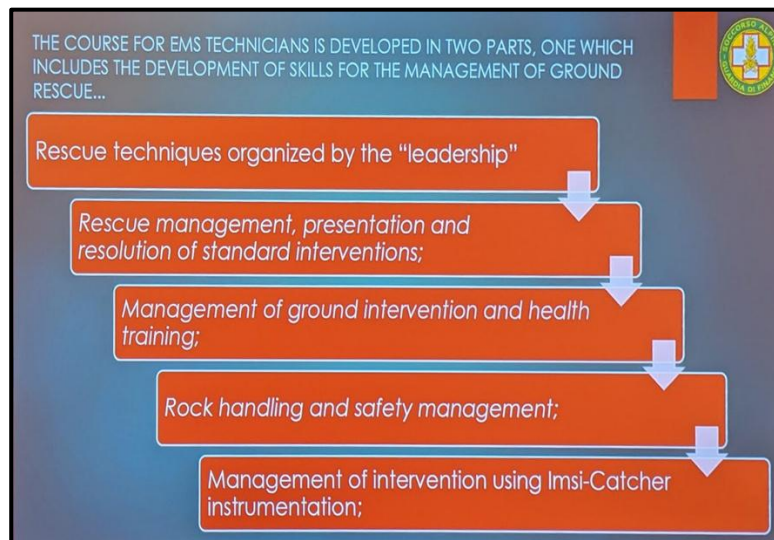
In line with the ICAR 2024 theme of training and education, leaders from the Italian Soccorso Alpino Guardia di Finanza (SAGF) presented on the training necessary to become a Tecnico di Soccorso (TSA). SAGF is considered a branch of the military. It takes eight months to complete the course and the graduation rate is only 40%. A breakdown of the different modules follows.



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After two years serving at a SAGF station, TSA members are eligible to take an additional course to become an EMS Helicopter Technician. The course consists of two different modules:





Day 3: Friday, October 18, 2024

Friday was a day of joint commission presentations between the Avalanche and Terrestrial Commissions. The avalanche-themed presentations can be found in the MRA Avalanche Rescue Commission report, the Terrestrial-themed presentations are below. Here is the link to the ICAR minutes that contain all of the day's presentations: <https://www.alpine-rescue.org/articles/1416--2024-minutes-of-our-terrestrial-rescue-commission-presentations-friday>

Tete Blanche Rescue, Pierre Metrailler (KWRO)

Detailing a dramatic mass casualty rescue turned recovery, Metrailler gave a minute-by-minute account of rescue attempts for 6 skiers that became lost in a storm at 3,500m on the Tête Blanche in Switzerland on March 9, 2024.

One person in the group activated emergency services, saying that one member of the group was ill and that the storm had trapped them on the mountain.

During the night, the rescue operation was interrupted due to the prevailing conditions (wind up to 120 km/h, heavy snowfall, 30 cm on Tête Blanche, temperature with wind chill -30 degrees). The weather prevented any successful attempts by ground or air until the next morning when the weather cleared.



The chance of survival of the 6 subjects depended on whether the group members had built a snow cave to protect themselves. The teams made preparations to treat hypothermic victims in cardiac

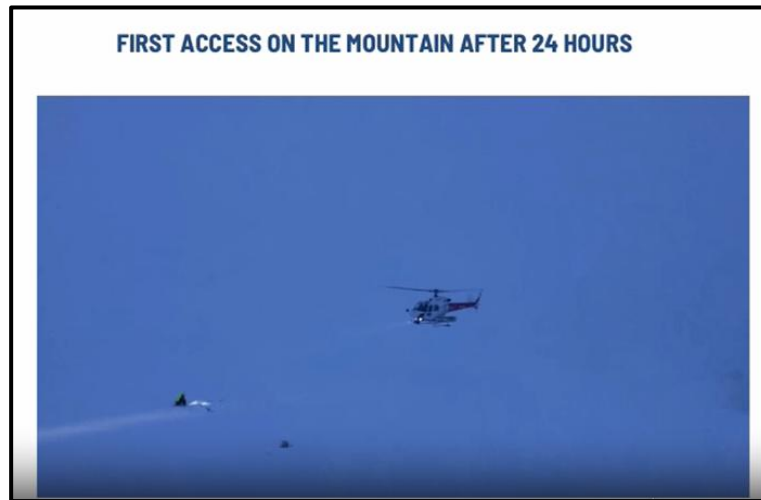


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arrest, which meant immediate CPR, rapid transport, protection from the cold, and drug treatment with adrenaline. CPR is not typically started when the body is frozen.

Fifteen mountain rescuers were deployed on the ground. A window of better weather was expected at 5 p.m. The weather should then improve from 10 p.m. The avalanche danger stayed high at Level 3. After 24 hours, the area was accessed with two helicopter rotations at an elevation of 3200m.



At 5.15 p.m. a team of 4 people was able to ascend to the blocked group. The team consisted of two rescue specialists, a doctor and a mountain rescue specialist from the police. The victims were found at 9.18 p.m. in the snow and in a small hole that offered no protection.

They showed no signs of life.

One man was flown to Sion Hospital under CPR. The core body temperature was 7 degrees, the patient died shortly after arriving at the hospital. Three people were declared dead on site, one person at an intermediate landing site. The sixth person could not be found.

The deceased subjects were rescued by helicopters from Air Zermatt, Air Glaciers, Rega. The rescue teams searched for the 6th victim on March 11th with dogs, Recco, helicopter avalanche transceivers and probing. The search area was expanded, but the body of sixth person was not found until August.

According to Metrailler, this rescue-turned-recovery was psychologically difficult for many of the rescuers for multiple reasons. Until the final subject was found, rescuers were dealing with the prolonged feeling that the operation had not been completed, and some rescuers had relatives among the victims. The team members who were most affected were rotated out of the rescue and protected during the operation. The initial phase of the mission lasted several days and was very media-intensive, which made it difficult to separate work and private life.

A psychologist was called in for the follow-up to assist with psychological first aid and to help deal with the stress injuries that resulted from such a tragic incident.

Matrailler concluded with some valuable lessons learned.

- Never give up hope. Use all available means to help.
- In such operations, the safety of the rescuers is of the utmost importance.
- 3 x 3 safety check: yourself, colleagues, team leader.
- Logistics and organization are crucial.



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- Enough resources must be ensured for each scenario and to maintain routine operations.
- Hypothermia patients: search for signs of life for 1 minute, search for electrical activity with the defibrillator, then decide whether to perform CPR or not (no CPR if the body is frozen, no airway)

Artificial Intelligence Model to Predict Lost People's Location, Roy Hayes Jr., Ph.D. (SEISECURE)

This was the first of two presentations that applied Artificial Intelligence (AI) to improve outcomes for Search and Rescue.



Dr. Hayes leads a multidisciplinary team working on developing an AI model to predict the location of a missing person. Finding the missing person faster, increasing their chance of survival and reducing the cost of search operations is the goal.

The work is carried out using an agent-based model, and the behavior of missing people is recorded based on data collected by Wilderness Search and Rescue. This is how the most likely location of the missing person or accident victim is determined.

An agent-based model is a computer simulation that is used to study the interactions between people, things, places and time. The behavior of missing people is simulated in this way. A specific algorithm is used to determine the most likely locations.


The model assumes that the missing person is reluctant to change their strategy and that if they are on a road or route, they would be reluctant to leave it.

Agents are given different maximum walking speeds to account for different potential fitness levels.



Agent-Based Model Explained

- Agent-based models are simulations that provide simulated entities with a rule set that governs their actions and interaction with the environment.
- The objective of an Agent-Based Model is to study the outcomes that emerge based on the rule set and the agent's interaction with the environment.
- Bird flocking and other examples from the natural world were the first agent-based models.
- We can apply the same technique to lost individuals to determine their most likely location



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An optimization algorithm is used to calibrate the agents' probabilities of action so that the agent-based model's output best matches the locations in the incident dataset. The missing people are then divided into different categories that consider the terrain (flat or mountain), population density (urban or wilderness), ecoregion (arid, polar, urban), and characteristics of the person (baby, hiker, biker, prison inmate who escaped).

Lost Person Categories

Eco-Region

- Temperate
- Dry
- Polar
- Urban

Population Density

- Urban
- Rural
- Wilderness

Terrain

- Flat
- Mountainous

Lost Person Characteristic

- Hiker
- Baby
- Mountain Biker
- Prisoner

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For example, women and men behave differently. The models are integrated into terrestrial SAR so that SAR personnel can use them as a basis for search operations. SAR personnel select and execute the model that is best suited to the specific incident.

Methodology: Reorientation Strategy

- Random Walk** – The agent selects a neighboring cell, within the agent's 180° field of view, and moves towards the cell.
- Direction Traveling** – The agent moves in the same direction they are facing.
- Route Traveling** – If traveling along a route or trail the agent continues moving along the route or trail. If the agent is not moving along a route, then the agent performs the 'Random Walk' strategy.

Random Walk

Direction Traveling

Route Traveling


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Methodology: Reorientation Strategy


- **View Enhancing** – The agent examines the elevation of its 8 neighboring cells and moves towards the cell with the highest elevation. If no neighboring cell has a higher elevation, then the agent performs the 'Staying Put' strategy.

- **Staying Put** – The agent does not move during the timestep.

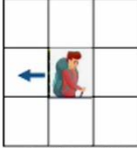
- **Backtracking** – The agent turns 180 ° and begins moving in that direction.



View Enhancing



Staying Put



Backtracking

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In conclusion, the next steps are to find SAR partners to conduct field tests, gain solutions, and gather feedback. Regulatory compliance is still needed to ensure free access for SAR teams. The system has its limitations (e.g. It doesn't work for people who don't want to be found and more data needs to be input), but AI can represent an interesting tool to add to the SAR toolbox on searches.

The Search Intelligence Process Using Artificial Intelligence, Chris Young (Intelligent Search Management)

The Artificial Intelligence for Search and Rescue project aims to use artificial intelligence and related computational methods and tools to support search and rescue (SAR) operations. At the beginning of every search operation, information must be collected and processed. Certain types of information/data are obtained or requested by those responsible for a missing person case.

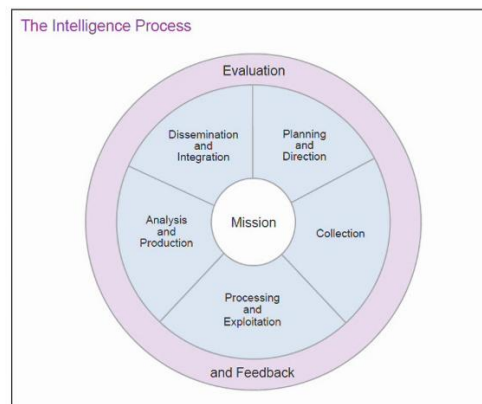
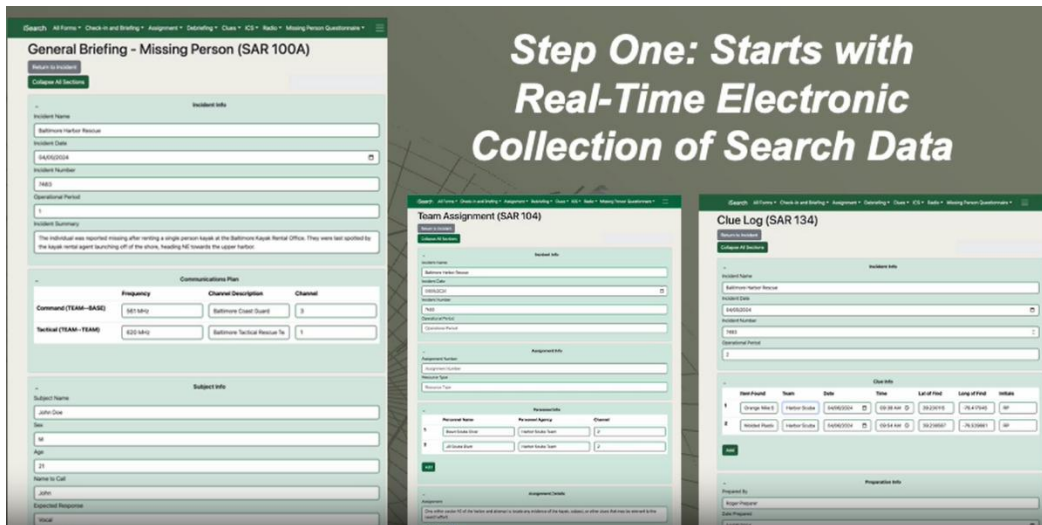


Figure I-3. The Intelligence Process



Traditionally, the collection, processing, evaluation and analysis of data was done by hand on paper. This often made the collection and processing of data very difficult. The project aims to have this work done by computers and artificial intelligence. This will improve the productivity, information flow and results of the search.

The first step is to collect search data in real time and then next-generation AI technologies are applied to an ongoing search operation to predict where to search, thus improving the time and probability of finding the missing person.



In a second step, this data is supplemented with external data sources such as ISRID (International Search & Rescue Incident Database) or Google Maps.

In a third step, AI is applied to the enriched data to improve search results. The system can be used on mobile phones, tablets, laptops and other devices.





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Conclusions: The Core IntelliSAR platform is ready. Field testing will begin in November, 2024. The AI feasibility analysis is largely complete. Additionally, the project is ready for a partnership, making it a commercial venture.

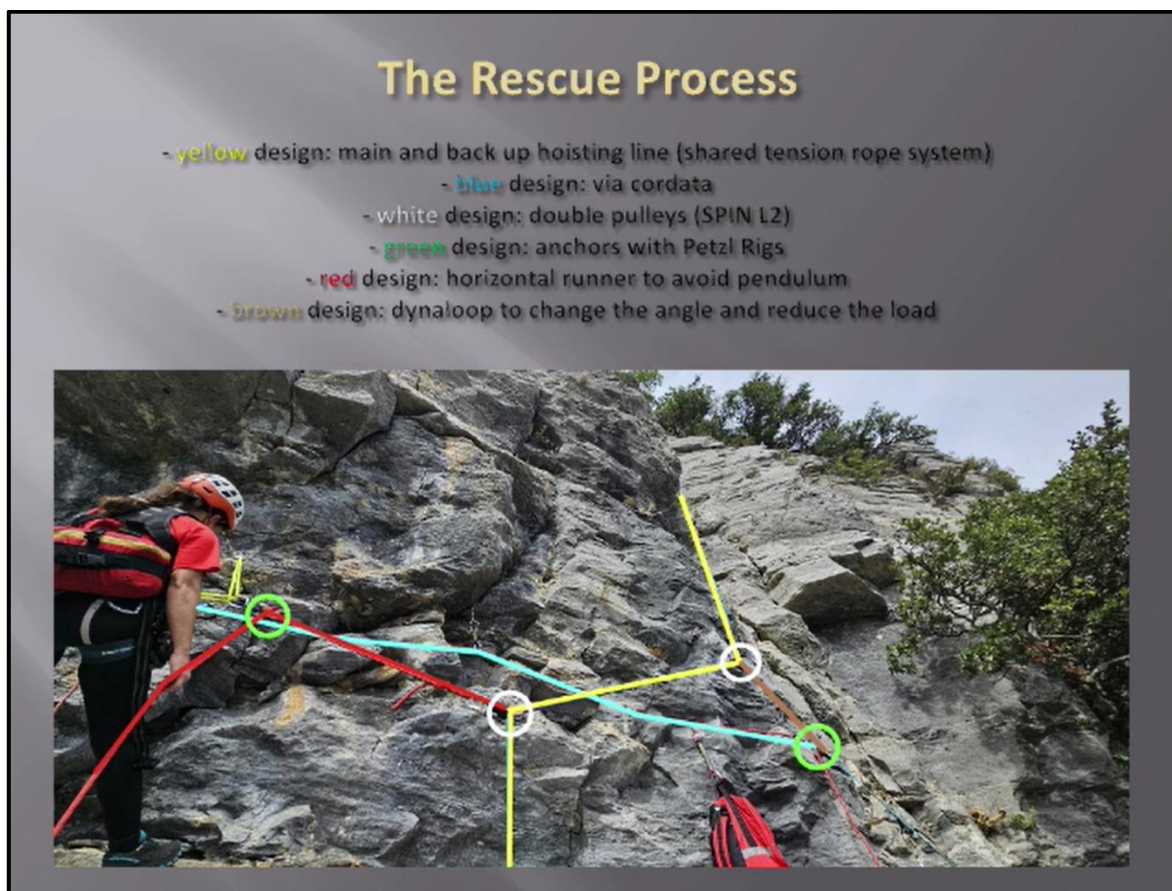
For questions, please contact Christopher S. Young, (415)760-3117, or by email at csy1492@comcast.net

Launching / Lifting Procedure with Remote Access, Vangelis Symvoulidis, Giorgos Lakias (Hellenic Rescue Team)

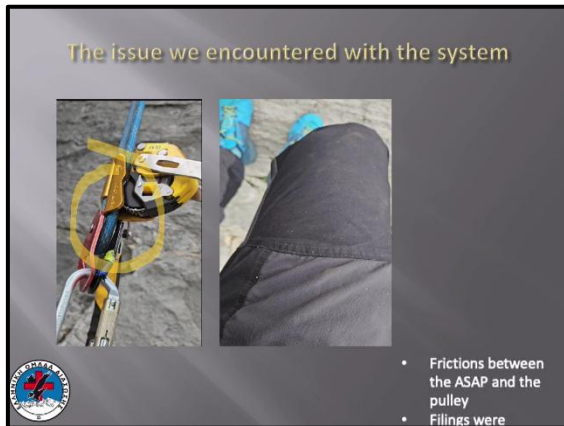
This video presentation, given both ICAR host the Hellenic Rescue Team, offered up a solutions for the rescue of a climber who is suspended under an overhang after a fall when it is not possible to anchor directly above them. The video was shot on a massive face on the flanks of Mount Olympus. The system is shown in the picture below.

The yellow represents the main and safety rope (shared tension rope system). The blue is the Via Cordata, while the white represents double pulleys (Petzl SPIN L2). Green is the anchor setup that utilizes Petzl Rigs. The red is the horizontal runner (long loop) that is intended to prevent the pendulum. The brown is the dynamic loop that changes the angle and reduces the load.

The system setup and execution relied heavily on clear communication and allowed the rescuers to work in an area that didn't put the subject at risk from rockfall.



The system relied on the lowering of two rescuers a short distance away from the fall line above the climber. A vertical rescue line was developed next to the overhang (vertical axis) and a horizontal rescue line (horizontal axis) and this was combined into a controllable pendulum rescue procedure. There were challenges that had to be overcome during the rescue simulation, as shown below.



The rescue relied on the two on-rope rescuers to be comfortable with extreme exposure, be able to place rock pro to traverse a ledge to reach the subject, and experience using autolocking descenders to capture progress as the subject was hauled horizontally to the rescuers fall line.





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Once the climber (who had a C Collar and splinting applied) reached the fall line, they were packaged in a flexible litter before being hauled up.



Though it was gear intensive, the rescue simulation demonstrated the value of preplanning, clear communication between the rescuers above and below and the rescuers having familiarity with the area where a rescue is likely to occur.

Here is the link to view the video: <https://vimeo.com/1037029015>

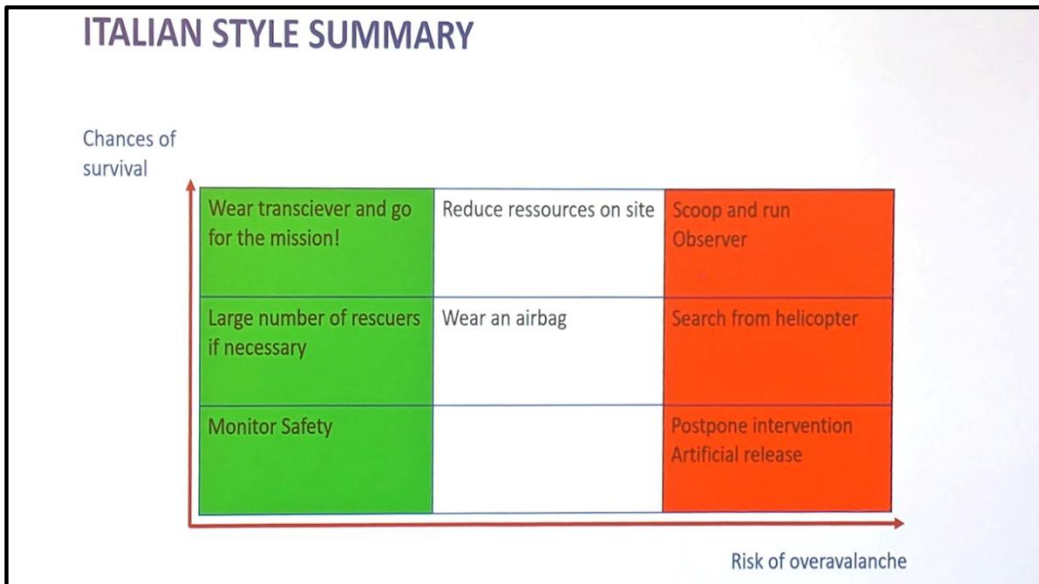
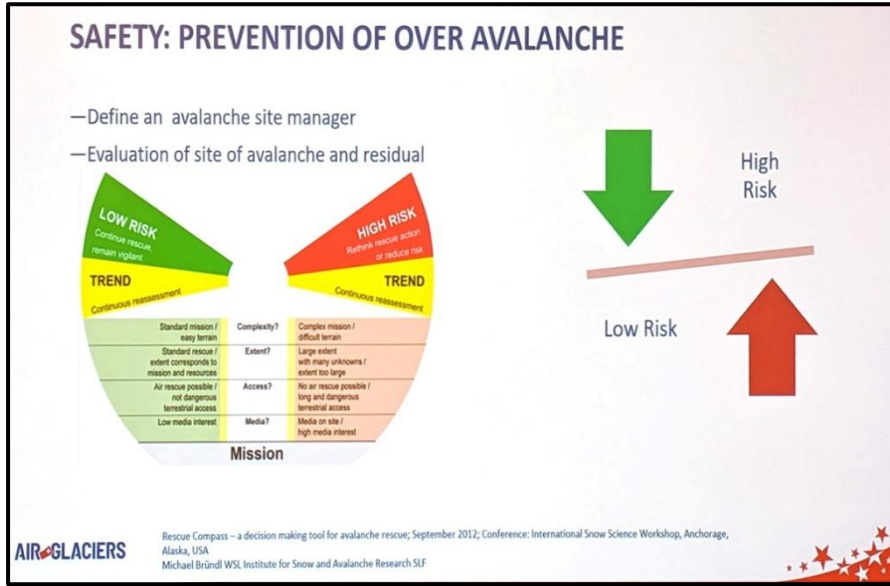
Day 4: Saturday, October 19, 2024

As usual, ICAR scheduled a joint session for all the committees on Saturday. Many of the presentations were covered in more detail by the appropriate ICAR committee report which is indicated below.

PRESENTATIONS

Pierre Metrailler, Air Glaciers, Avalanche Response

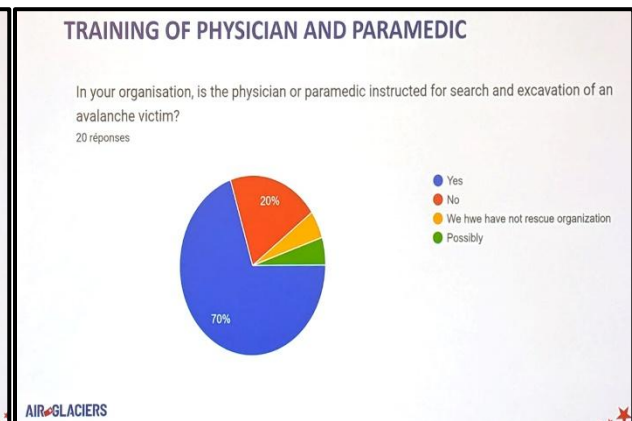
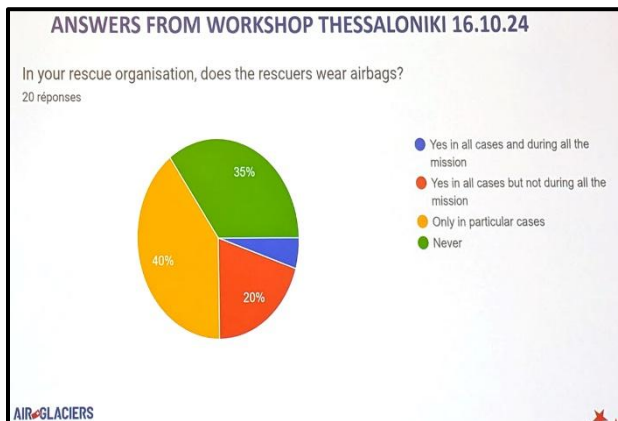
The presentation focused on a system where the results of the risk assessment and the chances of subject survival determine the type of response.

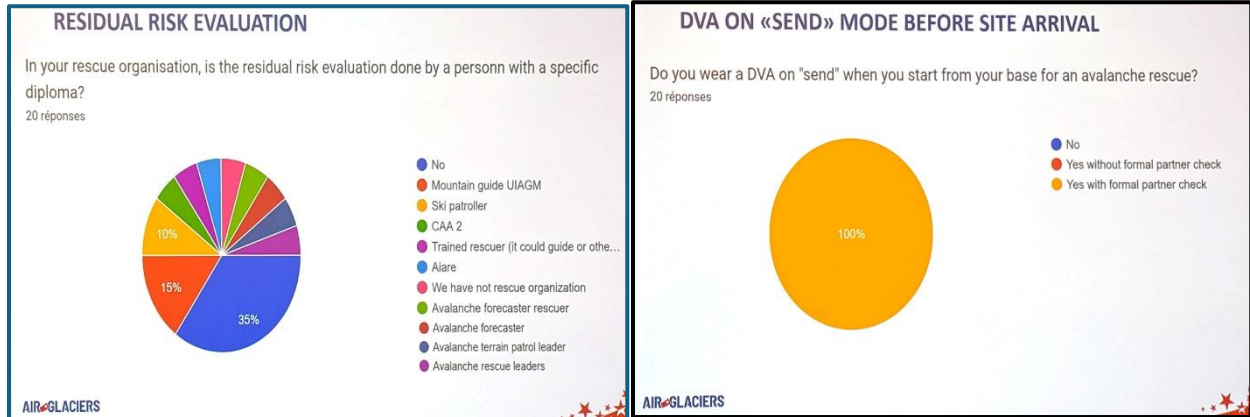


One technique of avalanche rescue used for high-risk situations is the scoop and run technique where rescuers are connected to a short haul line with the helicopter hovering overhead, prepared to quickly ascend in the event of an avalanche.



The presentation also included the results from a survey conducted on the practical day, see below.





Rescue at Very High Altitude, John Ellerton

This position paper from the chair of MEDCOM discussed the ethics of rescue at very high altitude (VHA). As more people travel at VHA, the feasibility of rescue has expanded to higher elevations partly because of technological improvements. In recent years, stories of heroic rescues at VHA as well as accounts of climbers walking past injured porters to pursue the summit have appeared in global media.

Summary

- Rescue from Very High Altitude has additional risk
- 'Trial' by Media has flourished; this can be harmful
- The ethics of performing a rescue has been discussed but is incomplete
- Organised mountain rescue developed from improvised rescue
- Organised rescue evolved a system of 'Rules of Rescue Conduct' to manage the risk – benefit equation
- ICAR are producing technical and medical papers based on the literature and expert opinion and a position paper on the Ethics of Very High Altitude
- Could Improvised Rescue adopt systems from Organised Rescue

A more extensive summary is included in the MEDCOM report.

How the Banking Scandal Saves Lives in Scotland, Paul Russel, Scottish Mountain Rescue

Like many MRA teams in the US, Scottish Mountain Rescue is not a government-funded organization even though they operate under Police Scotland. SMR has 26 different teams and is independent from the other UK rescue organizations.



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In 2012 there was a banking scandal where it was found that multiple banks, including Barclays and the Royal Bank of Scotland, were manipulating the interest rates between banks that were lending money to each other. As part of the settlement, the UK set up the UK volunteer training fund which started dispersing fund in 2016. The funds are awarded via an annual application process. The funding has come in the right time since incidents in Scotland have increased from 562 to 716 in the last seven years. Courses are weighted toward the balance of mission type and include rigging (7), avalanche (2), remote medical (various), mental health first aid (2), PPE inspection (2), search management (1), water rescue (2), 4x4 (9), and rescuer well-being (1). There is an annual National Conference that is also funded by the program.

The results of the UKSAR Volunteer Training Fund are impressive. Participation has increased by 60% and gender equality has increased from 20% to 32%. Two thousand volunteer rescuers have been trained since 2016. However, the funding is going to expire in 2026 so SMR is currently trying to plan to create a new financial model.

The Future of Training Starts Now: HHO Hoist AR Simulation, Jorg Redetzky, DRF Luftrettung

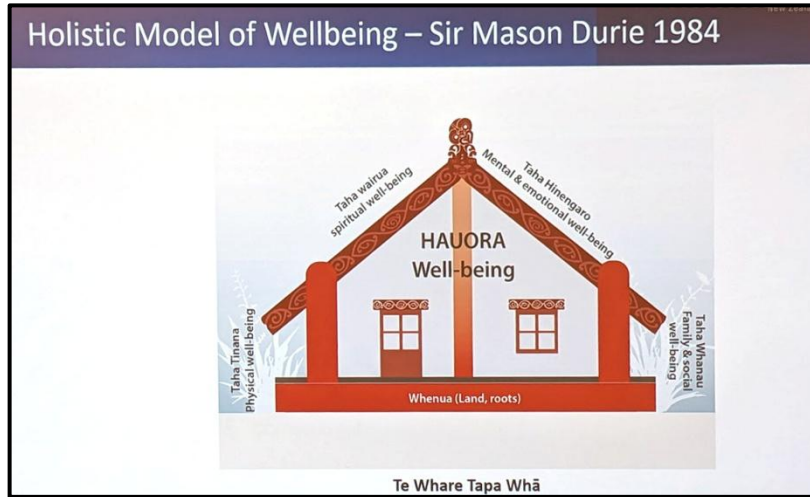
This company had built a mobile augmented reality hoist simulator which they brought to ICAR. The simulator increases quality of training, has a lower environmental footprint and reduced risk.

This augmented reality system can also connect a flight simulator with the hoist simulator in two different locations. A live demo of this was shown.



Member Well-Being, Peter Zimmer, LandSAR New Zealand

This presentation detailed how Land SAR New Zealand promotes rescuer well-being. Their program borrows many stress resilience and stress injury treatment concepts and elements from the Responder Alliance but has infused it with elements from New Zealand’s culture. The program was partially funded by a fuel excise duty starting in 2020.



<p>Te Whare Tapa Whā</p>	<p>Taha whānau (family/social/community health) represented by one wall</p> <ul style="list-style-type: none"> Member Assistance Program (MAP), the service is also available to immediate family (at no cost) Whānau recognition – Groups can host a whānau event each year Guidance documents available on the members portal for Volunteer whānau Valued Employer Program 	<p>Te Whare Tapa Whā</p>	<p>Taha wairua (spiritual health) represented by the other side of the roof</p> <ul style="list-style-type: none"> Some groups have developed local iwi connections and ensure blessings/karakia's are carried out after an operation involving a deceased subject Mark Pirikahu is LandSAR's Kaihautū (facilitates partnerships with Mana Whenua)
<p>Te Whare Tapa Whā</p>	<p>Taha tinana (physical health) represented by another wall</p> <ul style="list-style-type: none"> Discounts are available for members with Specsavers, Mole Map, Flu vaccinations Physically fit for the role – <ul style="list-style-type: none"> fitness testing and training ownership of looking after one's own health – fitness, food, sleep love for the outdoors Fatigue Management IMSAFE – health self-check 	<p>Te Whare Tapa Whā</p>	<p>Whenua (Land/ Roots) represented by the base / foundation</p> <ul style="list-style-type: none"> Online Education/Induction about LandSAR and its history – Online LMS Mark Pirikahu (LandSAR's Kaihautū is able to consult with iwi in case of searches on sites of significance)

Conclusion

The 2025 ICAR Conference will be held October 8-11 in Jackson Hole, Wyoming and will be hosted by Teton County Search and Rescue. By all accounts, the Practical Day should be very hands-on, and in mountainous locations. Registration usually opens in late Spring or early summer, keep an eye out on the MRA website for ICAR registration announcements.