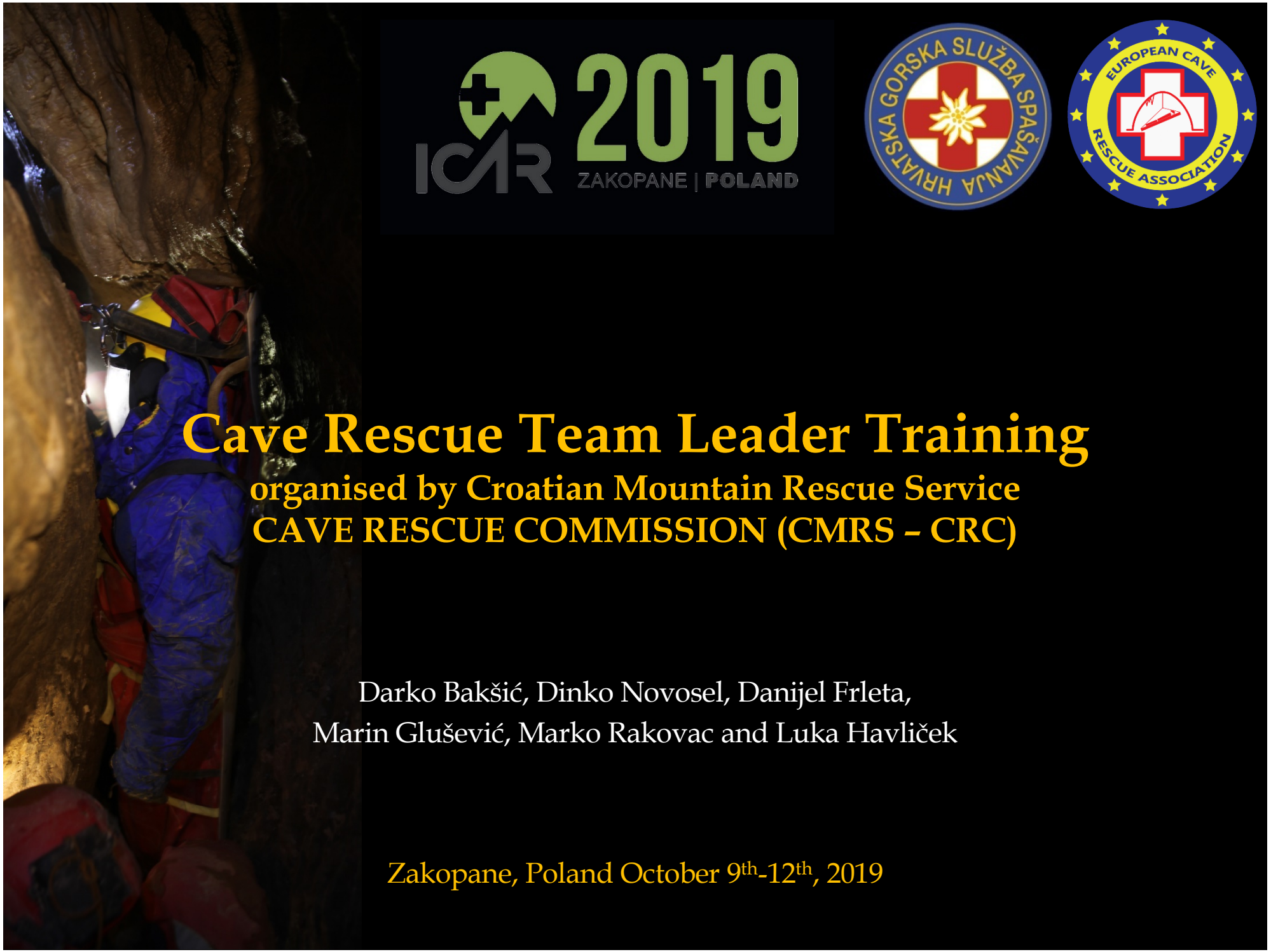


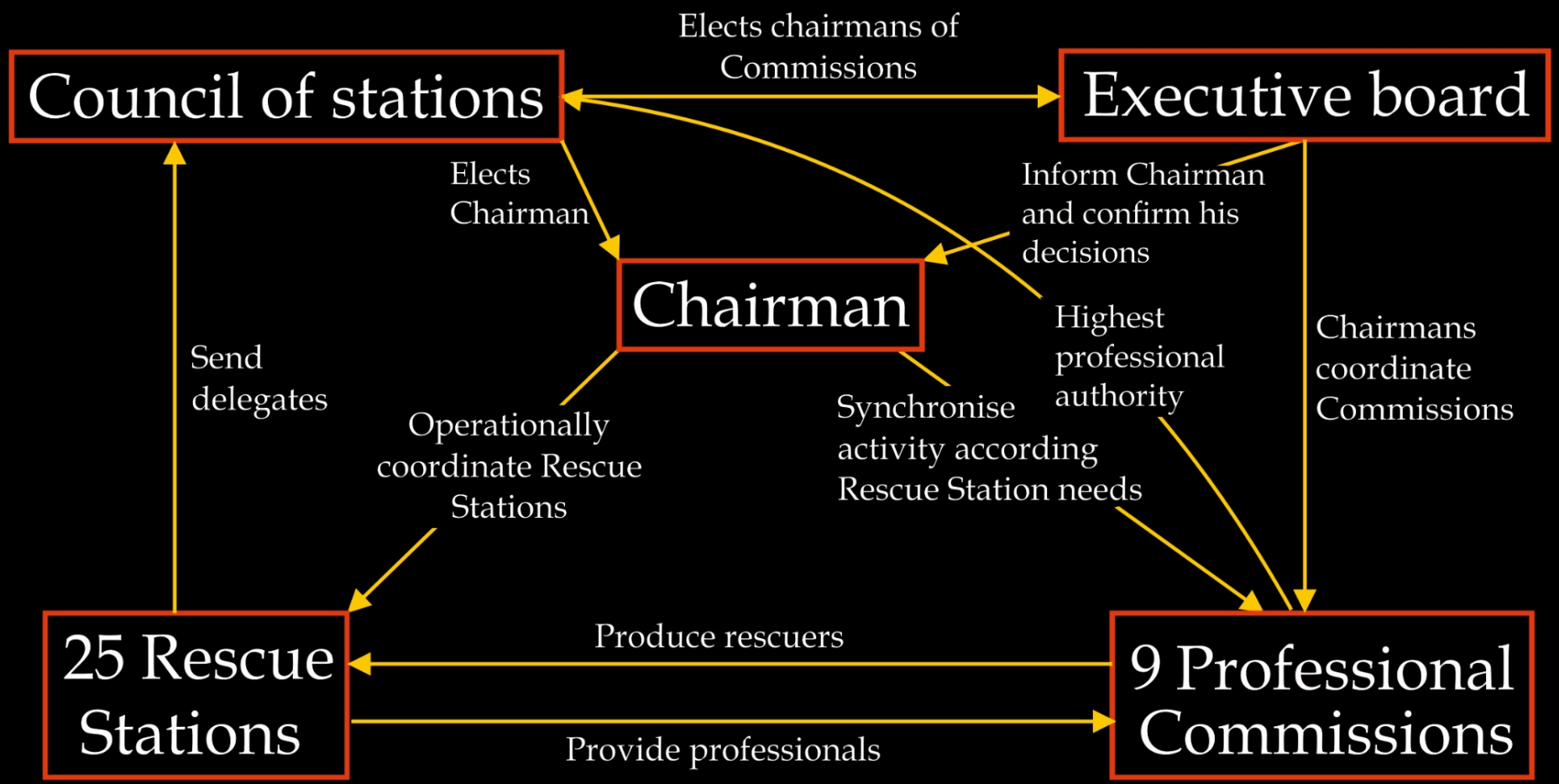
Cave Rescue Team Leader Training

organised by Croatian Mountain Rescue Service
CAVE RESCUE COMMISSION (CMRS – CRC)

Darko Bakšić, Dinko Novosel, Danijel Frleta,
Marin Glušević, Marko Rakovac and Luka Havliček

Zakopane, Poland October 9th-12th, 2019

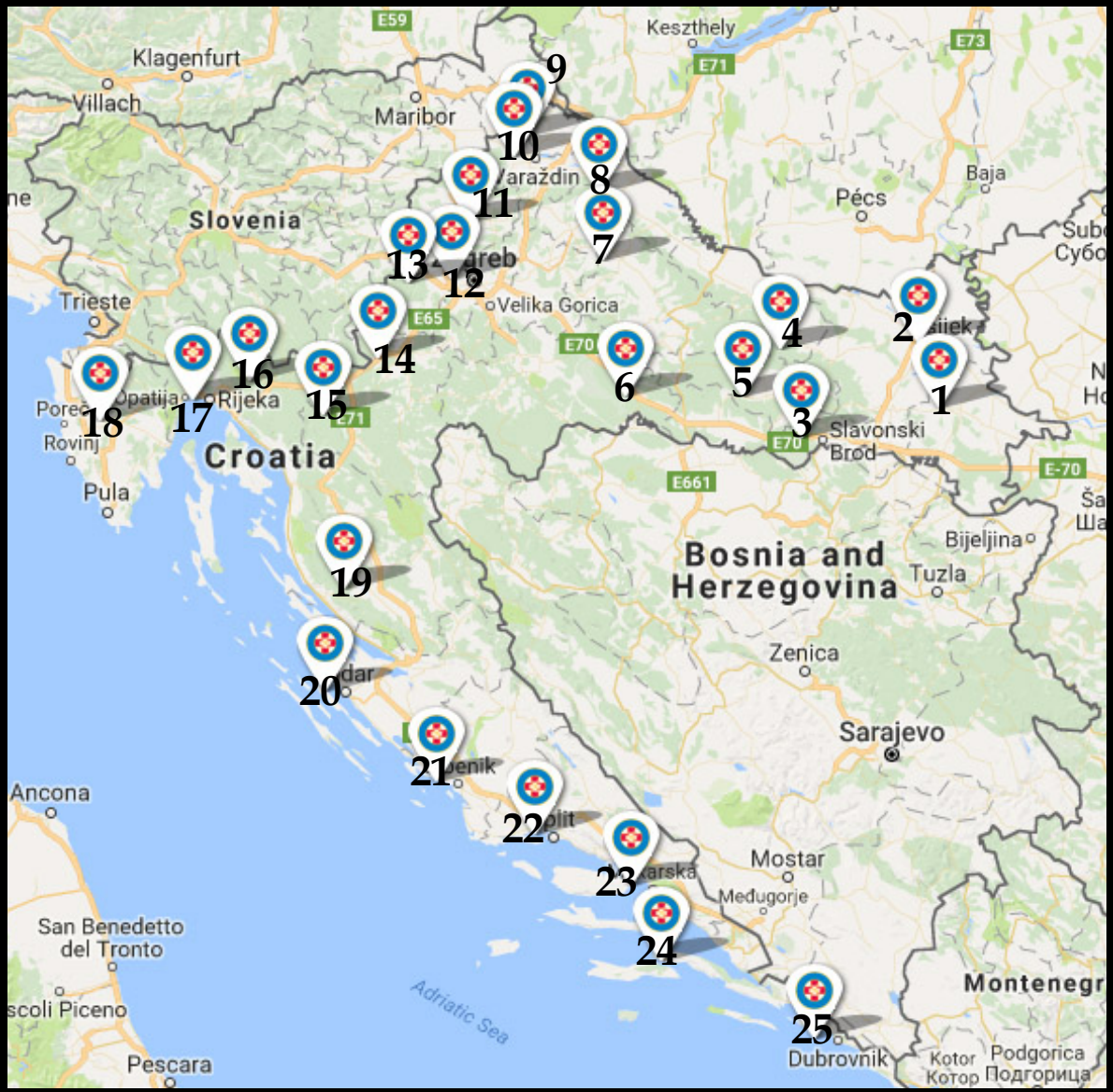
Croatian Mountain Rescue Service (CMRS) structure



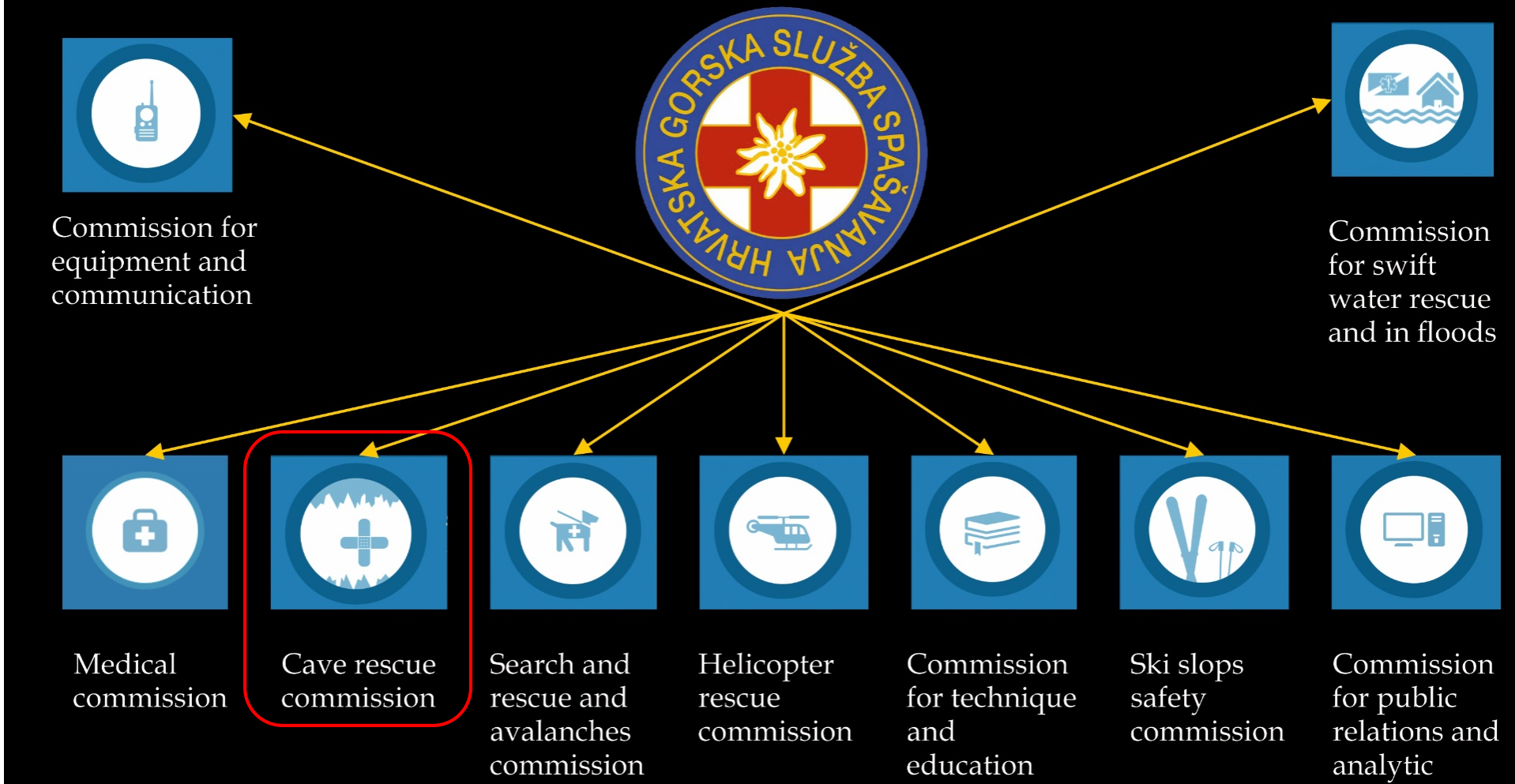
CMRS Stations

25 local rescue stations:

1. Vinkovci
2. Osijek
3. Slavonski Brod
4. Orahovica
5. Požega
6. Novska
7. Bjelovar
8. Koprivnica
9. Čakovec
10. Varaždin
11. Krapina,
12. Zagreb
13. Samobor
14. Karlovac
15. Ogulin
16. Delnice
17. Rijeka
18. Pula
19. Gospić
20. Zadar
21. Šibenik
22. Split
23. Makarska
24. Orebić
25. Dubrovnik.



CMRS Commissions



CMRS Rescuers

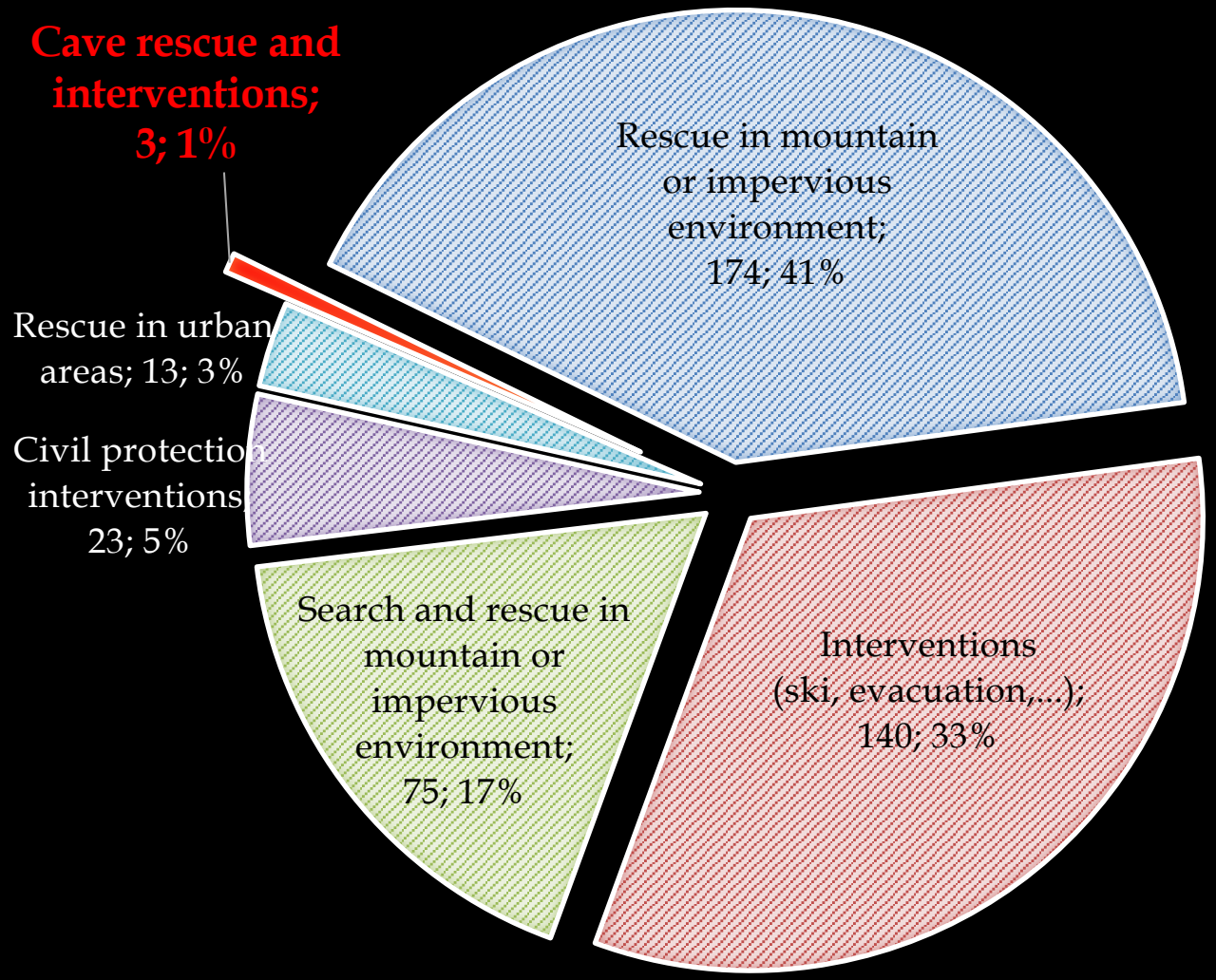
CMRS has totally 952 active members (rescuers and trainees).

In CMRS all members who do rescue are volunteers.

In CMRS there are some people who are professionals - exclusively for administration.

CMRS rescue operations in 2017

428 rescued persons



In 2014 – over 3500 evacuated and rescued persons in the floods.

CMRS basic education




- trauma life support
- rescue in snow condition (ski slopes, cable rescue, avalanches);
- rescue in „summer" conditions (terrestrial, big wall and search and rescue);
- cave rescue (for a team member, how to perform maneuvers with stretchers).

General information's about caves in Croatia

- **There are approximately 9000 known caves in Croatia;**

- **4 caves are deeper than 1000 meters:** Jamski sustav Lukina jama (-1431 m), Slovačka jama (-1320 m), Jamski sustav Velebita (-1026 m), Jama Nedam (-1021 m);

- **13 caves are deeper than 500 m:** Mokre noge (-831 m), Jamski sustav Crnopac (-797 m), Jama Amfora (-788 m), Meduza (-706 m), Muda labudova (-682 m), Jamski sustav A1-Vilimova jama (-589 m), Patkov gušt (-553 m), Jama Olimp (-537 m), Ledena jama u Lomskoj dulibi (-536 m), Ponor na Bunovcu (-534 m), Lubuška jama (-529 m), Crveno jezero (-528 m), Munižaba (-510 m);

- **Large pits:** two of them are deeper than 500 m; two are deeper than 300 m, thirteen verticals are deeper than 200 m, while 100 m deep verticals are quite common.

General information's about caves in Croatia

- **Long and complicated caves:** Špiljski sustav Đulin ponor-Medvednica (16.396 m long), Panjkov Ponor -Kršlje (13.052 m long) and many other ;

- **Long, deep and complicated caves:** Jamski sustav Crnopac (42.075 m long and -797 m deep), Munižaba (9.911 m long and -510 m deep);

- **Extremely tight caves (crawlways):** Jama Amfora, Lubuška jama

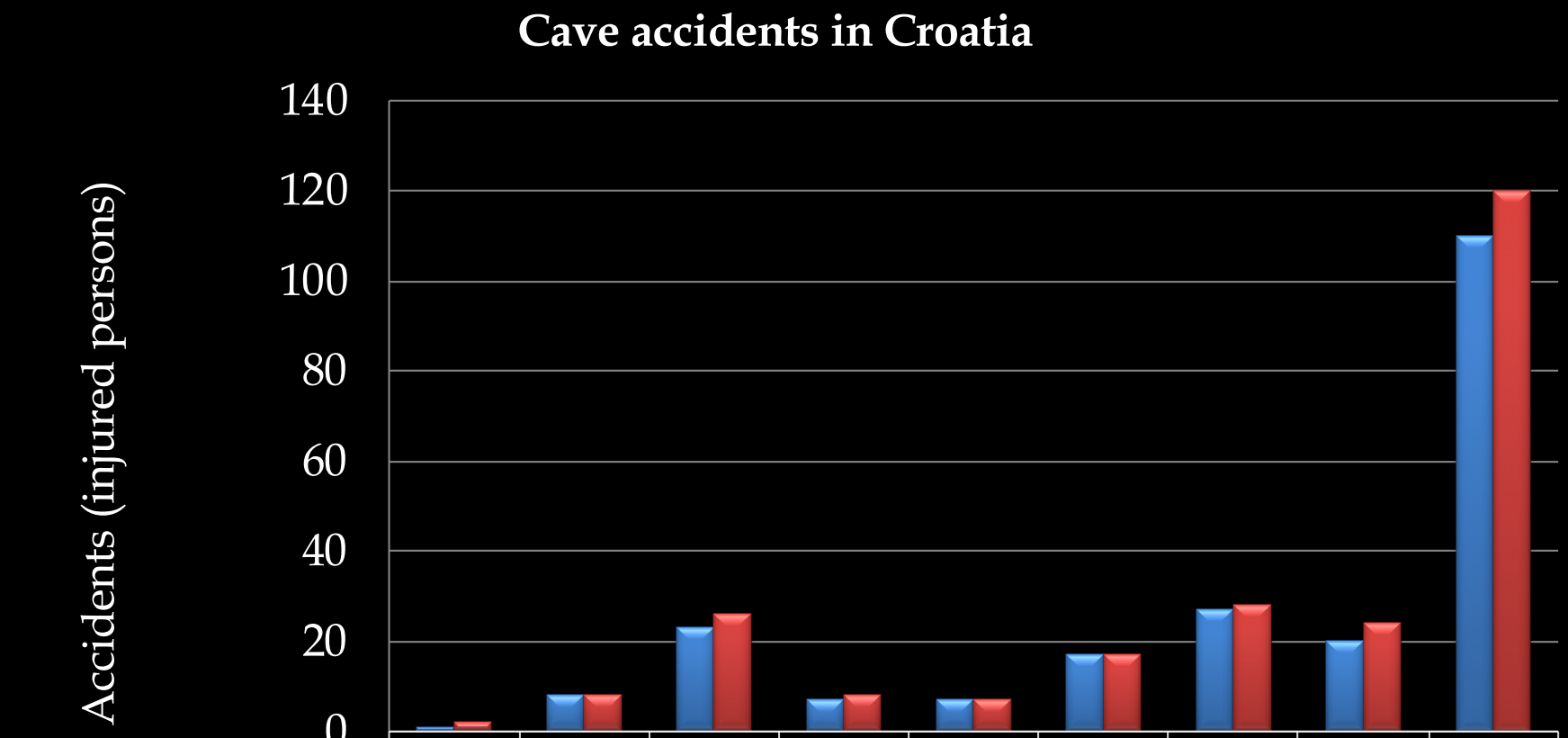
- **Deep sources:** spring of river Una (-248 m);

- **Deep cave sumps:** sump at the bottom of Lukina Jama (-1355 m), sump at the bottom of Slovačka Jama (-1320 m);

- **Sources under sea water (vrulje):** Dubci (-161 m), Modrič (2746 m long);

- **Long and complicated sumps:** Majerovo Vrelo (942 m long and 104 m deep).

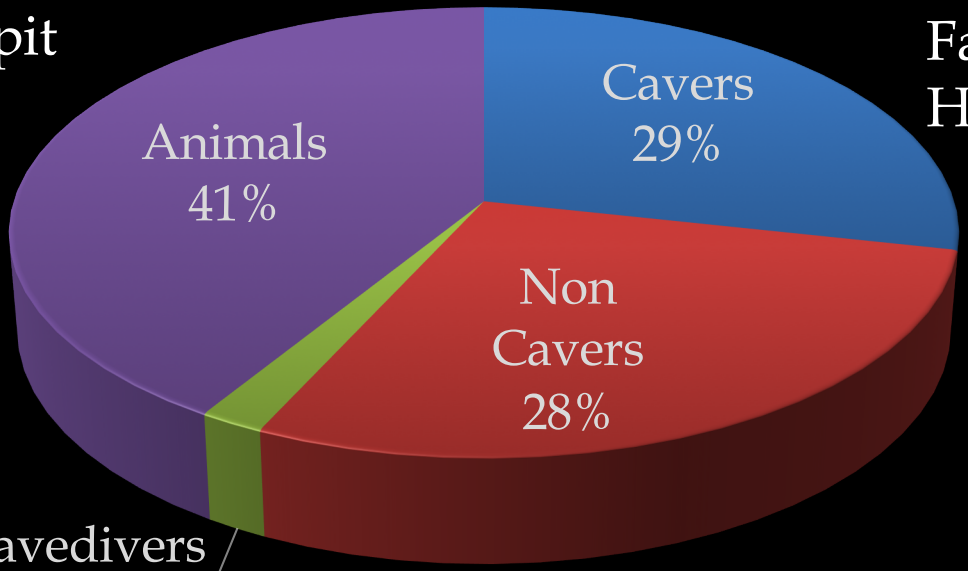
Number of cave accidents in Croatia



	1925	1925-1960	1960-1969	1970-1979	1980-1989	1990-1999	2000-2009	2010-2014	Total
Caves	1	8	23	7	7	17	27	20	110
No of injured persons	2	8	26	8	7	17	28	24	120

+ 84 animals (54 caves)

Cave accidents in Croatia



Fall into the pit

Slipping
Technical problems
Falling stones
Fall
High water

Drowning

Fall into the pit
Suicide
Exhaustion – visiting of horizontal caves

Cave accidents in Croatia and abroad








Cooperation on 10 accidents in Bosnia and Herzegovina, Monte Negro, Venezuela and Germay.

Ativities of CMRS Cave Rescue Commision (CRC)

- Cooperation with caving clubs (self-rescue courses)
- Organization of Cave rescue courses on national and international level
- Organization of Cave rescue exercises on national and international level
- International cooperation (**ECRA**, ICAR, UIS, FSE...)

- Cave search and rescue (combination of surface and cave and inside the cave)
- Cave Rescue operations (simple caves, complex – deep and complicated caves, artificial caves; rescue of people and animals)
- Support to Ministry of the Interior – disposal of mine explosive devices from Caves
- Support to Ministry of the Interior – exhumation
- Cooperation and rescue in earthquakes

- Cave diving Rescue

CMRS CRC capacity

- 501 rescuers finished basic cave rescue training (cavers and climbers);
- all of them had ITLS licence;
- around 120 rescuers could perform cave rescue in deep caves (below -1000 m);
- 21 rescuers finished cave rescue training for team leader in France (Speleo Secours Francais);
- 79 rescuers finished course on approaching and treatment of injured persons in caves;
- 33 rescuers finished training for cave rescue leader;
- 38 rescuers had licence for work with pyrotechnic tool for widening passages
- 5 doctors that can go deeper than -500 m caves;
- 9 cave diving rescuers (experienced) + 12 cave diving rescuers (smaller sumps)

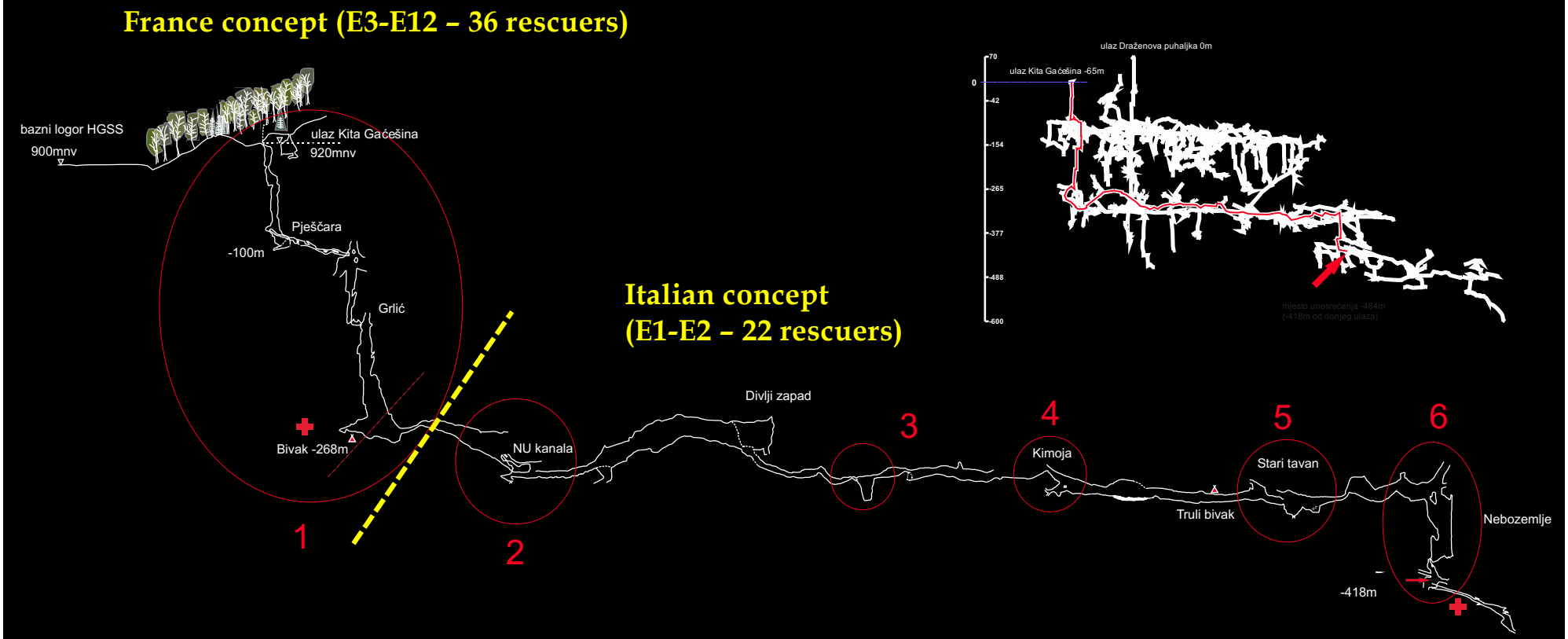
CMRS CRC education

- Basic cave rescue course (for a team member, how to perform maneuvers with stretchers);
- Medical care and assistance of injured person in Cave
- Cave Rescue Team Leader course
- Cave Rescue Operation Leader;
- Course for use pyrotechnical tool for mining

- Cave diving Rescue

Large Cave Rescue operations

- Extensive cave rescues in 2011 and 2012 in Croatian cave system Kita Gaćešina and...



Large Cave Rescue operations

... and participation in a large international cave rescue operation in 2014, in German Riesending Schachthöhle compelled the development of a

new concept of cave rescue team leader training.

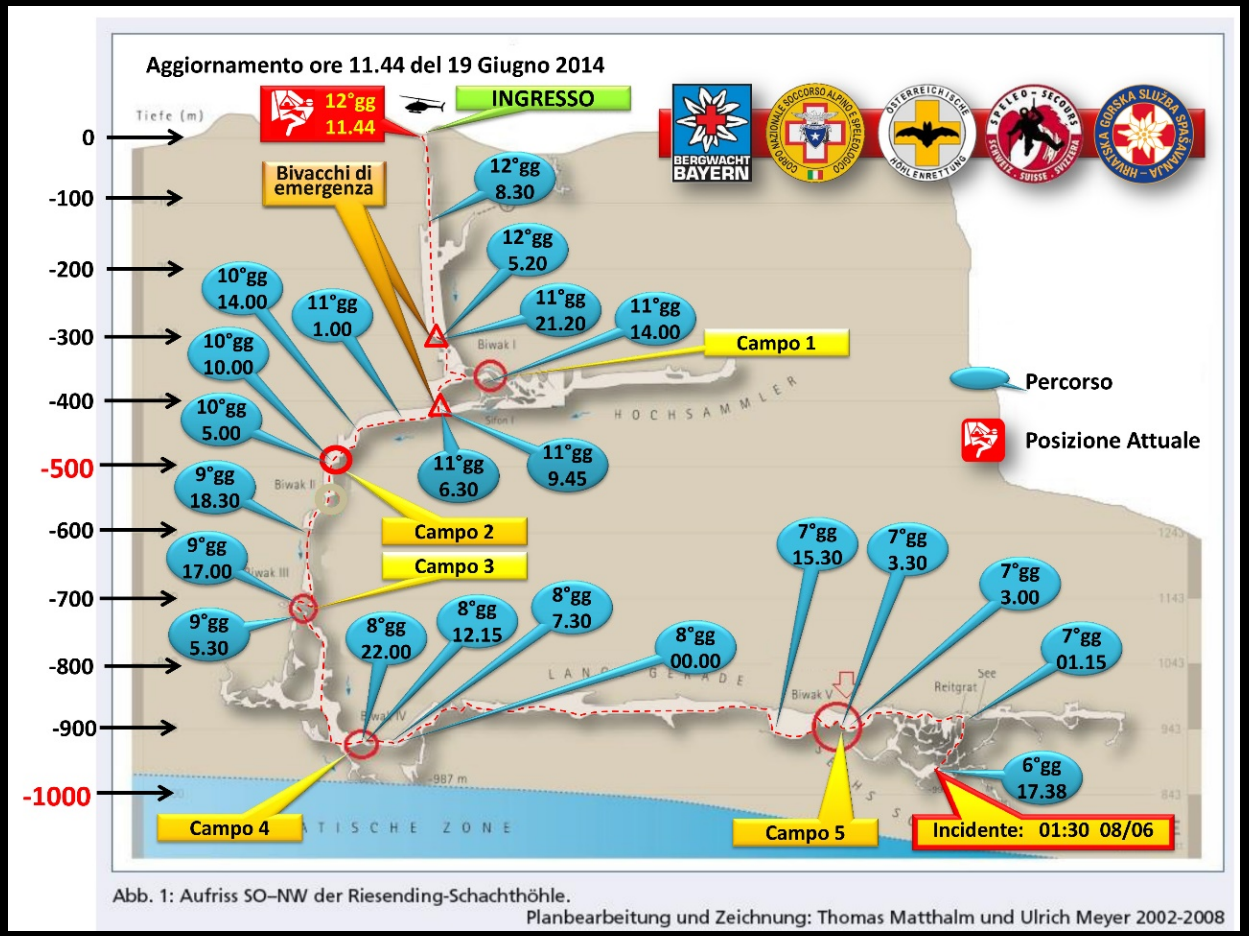


Abb. 1: Aufriss SO–NW der Riesending-Schachthöhle.
Planbearbeitung und Zeichnung: Thomas Matthalm und Ulrich Meyer 2002-2008

Cave Rescue Team Leader course

- The aim is to form completely autonomous rescue teams, capable of staying underground and performing cave rescue operations during longer periods of time (during several days if necessary), in more complex and/or deep (more than 1000 m) caves.

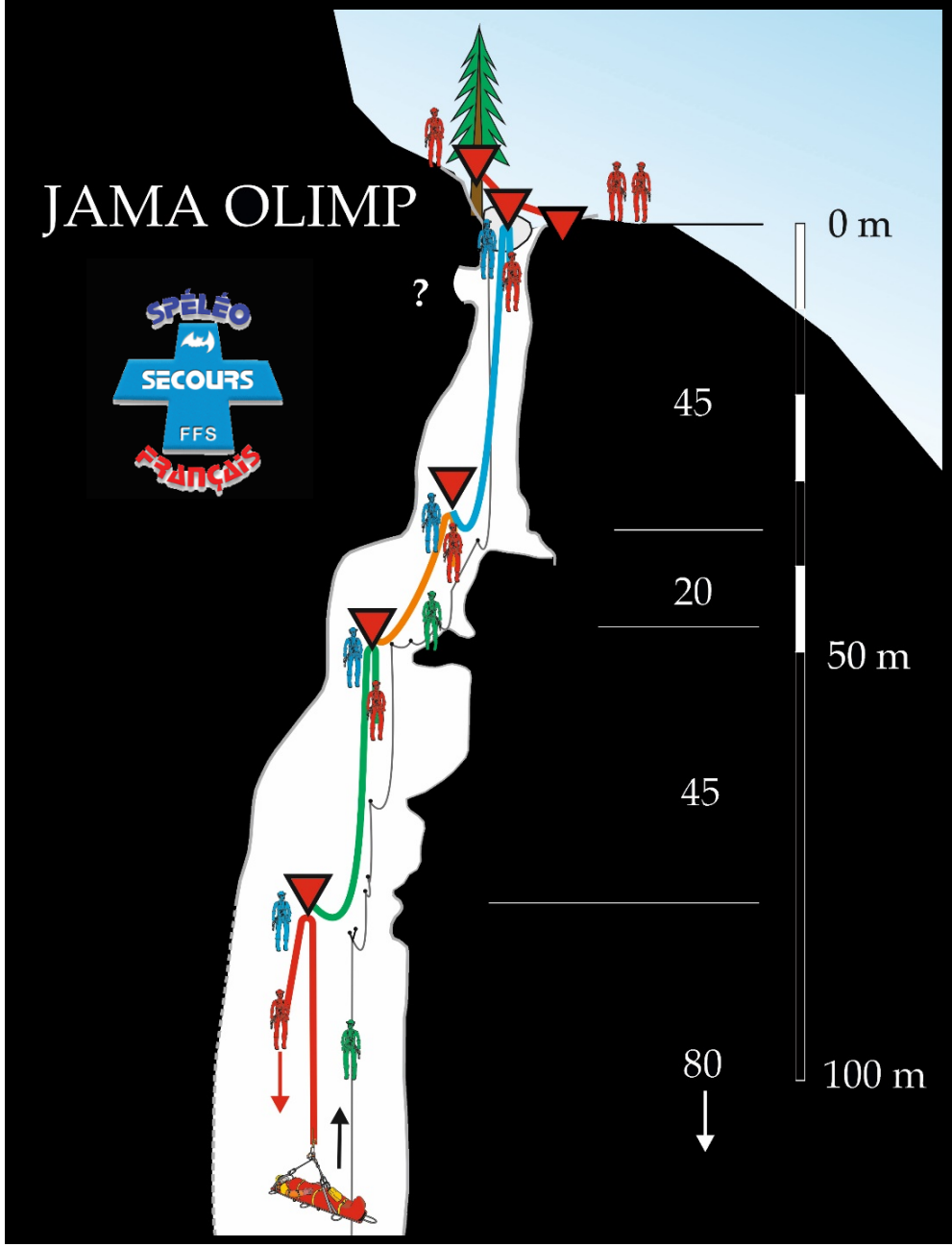
Cave Rescue Team Leader course

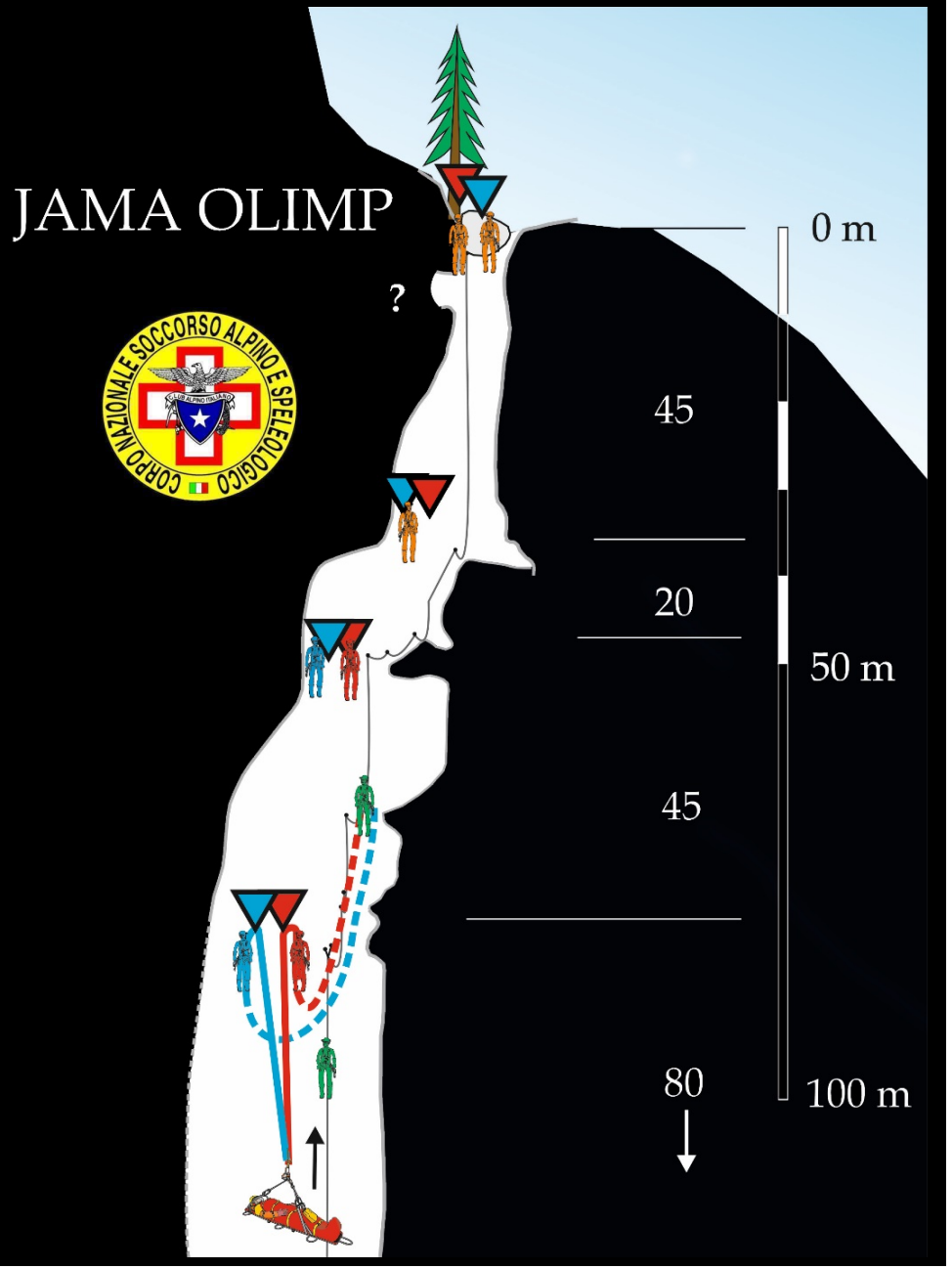
Selection - a course was dedicated to cave rescuers with a very good caving expirience

How to meet the goal?

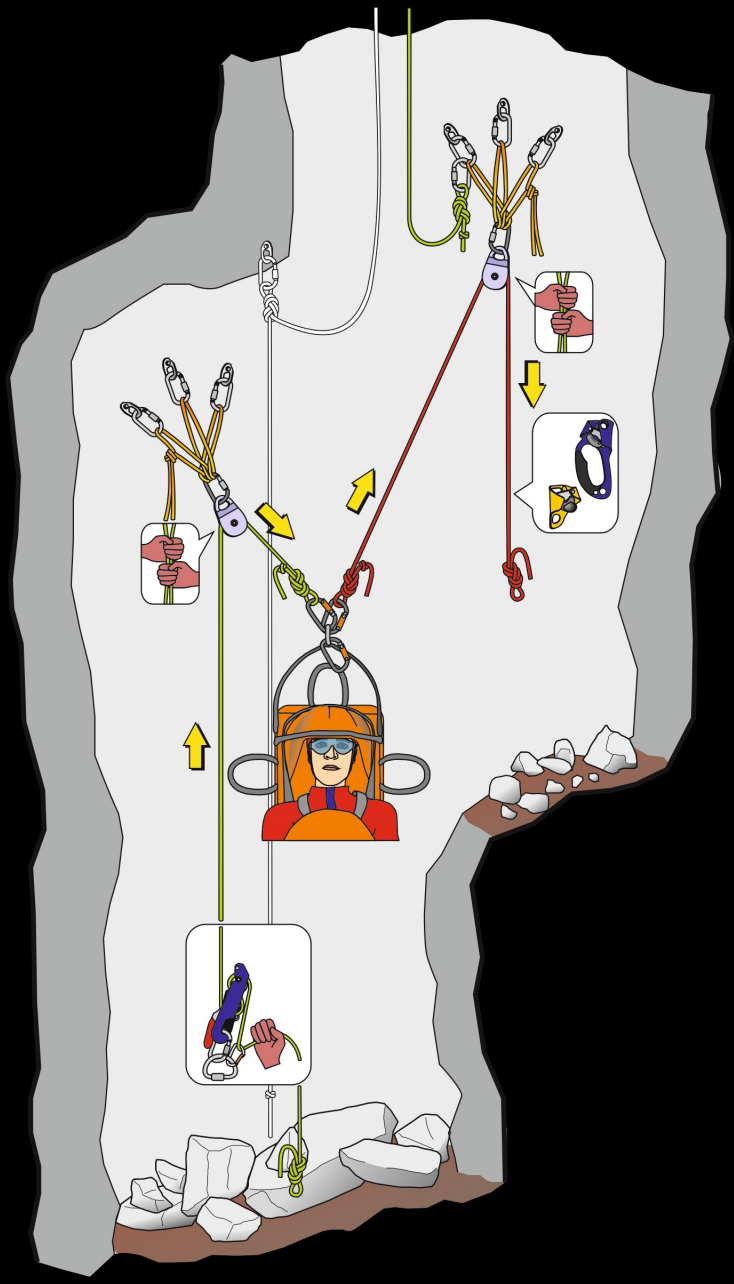
- to improve technical skills;
- to change the way of thinking - combine rescue concepts (French and Italian)
- to accommodate for a long-term stay in the cave;
- the team must be able to function autonomously even in the event of a long-term interruption – loss of communication with headquarters on the surface.

Basic concepts for stretcher transport





French rescue concept (technique)



Principe

- Basic assessment of casualty, first aid;
- Medical assessment, to set bivouac;
- to establish communication between bivouac and surface (telephone line)
- Rescue teams are instructed to work on segments/parts to be ready for evacuation of strechers;
- when all is ready, transport or evacuation of the casualty can start.

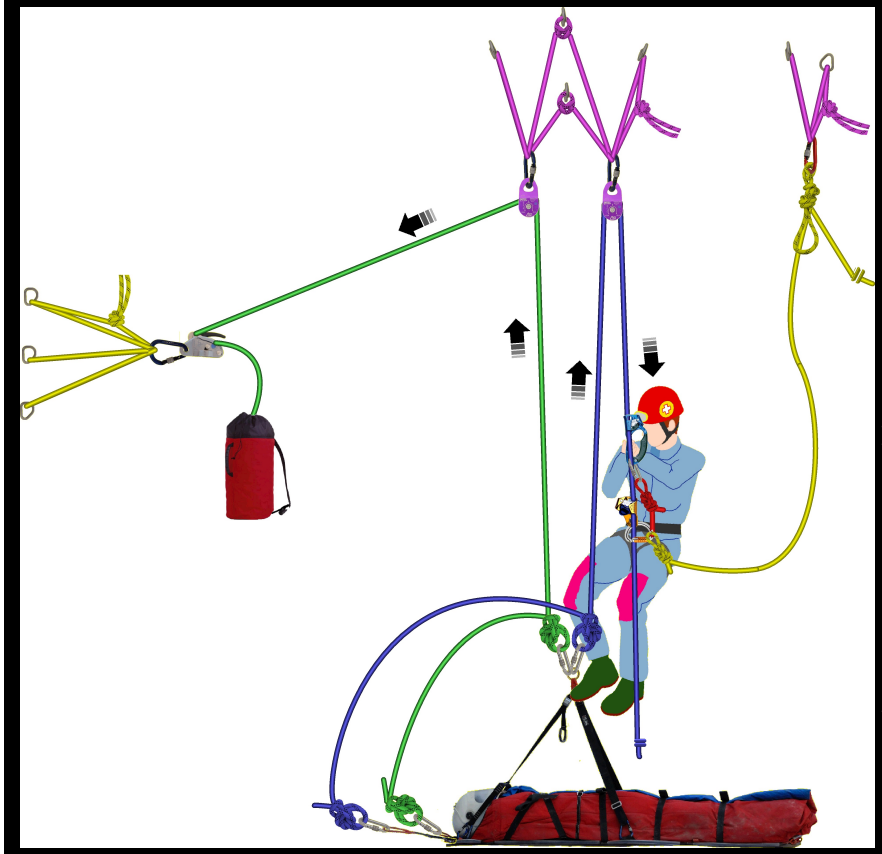
Advantage

- Casualty is shortly expose to the transport, less endanger;
- Its possible to climb not just using progression ropes than using fixed rescue ropes.

Disadvantages

- Material and ropes have to be prepared according to rescue evacuation plan for each segment;
- Much more material and ropes;
- More rescuers;
- All bivouac for rest have to be set in advance (it's possible improvisation).

Italian rescue concept (techniqe)



Principe

- Basic assessment of casualty, first aid;
- Medical assessment, to set bivouac;
- to establish communication between bivouac and surface and all teams in cave (telephone line);
- Rescue teams do NOT work in relation to space but to time

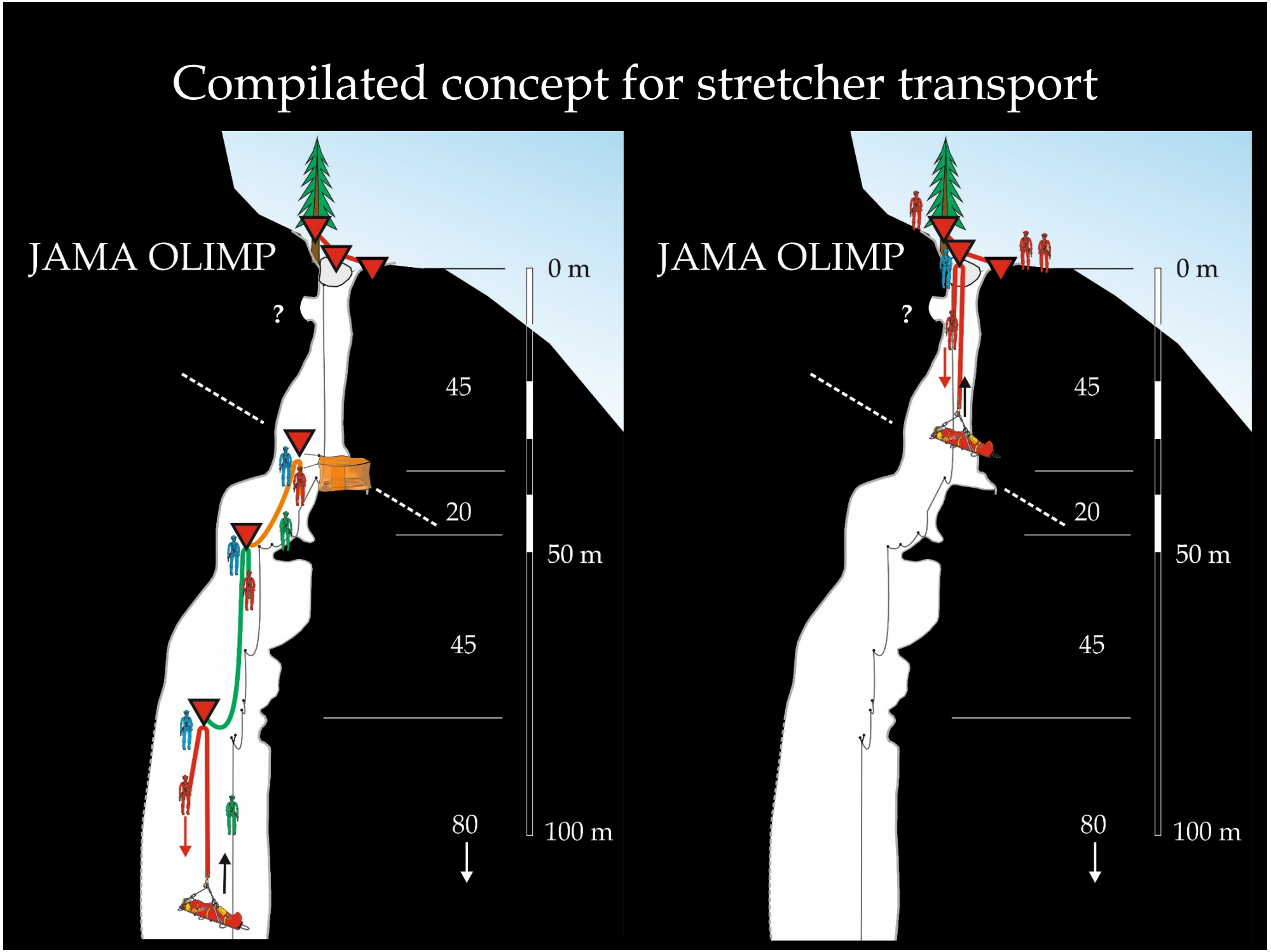
Advantage

- Material and ropes are prepared in advance, not necessary to waste time form preparation
-Plan of cave is not necessary;
- Less rescuers;
- Its possible to set more bivouacs quickly
- continuous hauling with two ropes offer more flexibility in anchor setting.

Disadvantages

-Time of evacuation is longer;
- Requires more experienced rescue team organization and an average surplus of technical skills among members;
- Less rescuers so it is more exhausting, requires rotations of rescue teams.

Compilated concept for stretcher transport



Cave Rescue Team Leader course

Cave Rescue Team Leader course

Teoretical presentations

1. Cave accidents and rescue operations in Croatia and abroad;
2. Cave rescue material;
3. Anchors - type, creation, forces;
4. How to rigg the cave for cave rescue operation;
5. Comparison of "French and Italian Concept of Cave Rescue";
6. An overview of some cave rescue maneuvers testing;
7. Access to and care of the injured caver;
8. Communication in Cave rescue operation;
9. Organization of Cave Rescue operation;
10. Presentation of experiences from major Cave rescue operations.

Cave Rescue Team Leader course

FIRST WEEKEND (work on a rock wall)

FRIDAY

Teoretical presentations (1, 2)

Personal equipmnet check

SATURDAY

Self-Rescue techniques (rescuer coming from below and above)

- Counterbalance using long cowstail
- Croll on foot loop
- Croll to Croll
- Rope-cutting method
- Climbing with victim
- Passing Rebalay and knot
- Rescue with a spare rope
- Removing casualty from a horizontal line

Teoretical presentations (3, 4, 5, 6)

SUNDAY

Cave Rescue techniques

- Rescue anchors
- Different stretcher types
- Stretcher attachment (horizontal and vertical transport)
- Hauling up (with single and multiple pulleys, changing direction, passing a knot, counterweight system, counterbalance, two counterweights on single pulley,...)
- Lowering (using stop and simple descender, italian hitch, passing a knot,...)
- Changeovers (changing from lowering to hauling up and oposite)

Deviations (pulleys, „human deviation", different angle...)
Tyrolean traverses (anchors, aplying tension, different methods of passing stretcher
Carrying a stretcher (different Cave morphology)...

Cave Rescue Team Leader course

SECOND WEEKEND (work in cave)

FRIDAY

Teoretical presentations (7, 8)

Preparation of equipment for cave rescue (withouth any informations about cave)

Briefing for exercise

SATURDAY

Exercise in cave

- Lowering steretcher from entrance to the bottom and lifting it on surface.

Debriefing

Teoretical presentations (9, 10)

Briefing for next exercise

SUNDAY

Exercise in cave

- Medical care
- Preparing different type of bivouacs for inyured person
- Communication in cave

- Bivouacking for cave rescue team

Debriefing

Cave Rescue Team Leader course

THIRD WEEKEND (work in complex cave)

FRIDAY

Exercise in cave

Briefing

- Preparation of equipment for cave rescue (standard configuration).

- Instructors and trainees go deeper into cave to reach the „injured" caver.

- Putting communication line.

- Take care about „injured" caver and prepare bivouac for him and all the team.

SATURDAY

Exercise in cave

- Partially rigging the cave for cave rescue and transport the „injured" caver in stretcher; prepare bivouac for him and de-rigg the cave...

- Reapet this procedure till the entrance of the cave.

- Team should be self-sufficinet during whole exercise just giving information about its position to the surface headquater. If it will be necessary whole team may bivouaking again.

SUNDAY

Exercise in cave

- Exit from the cave and de-rigg it.

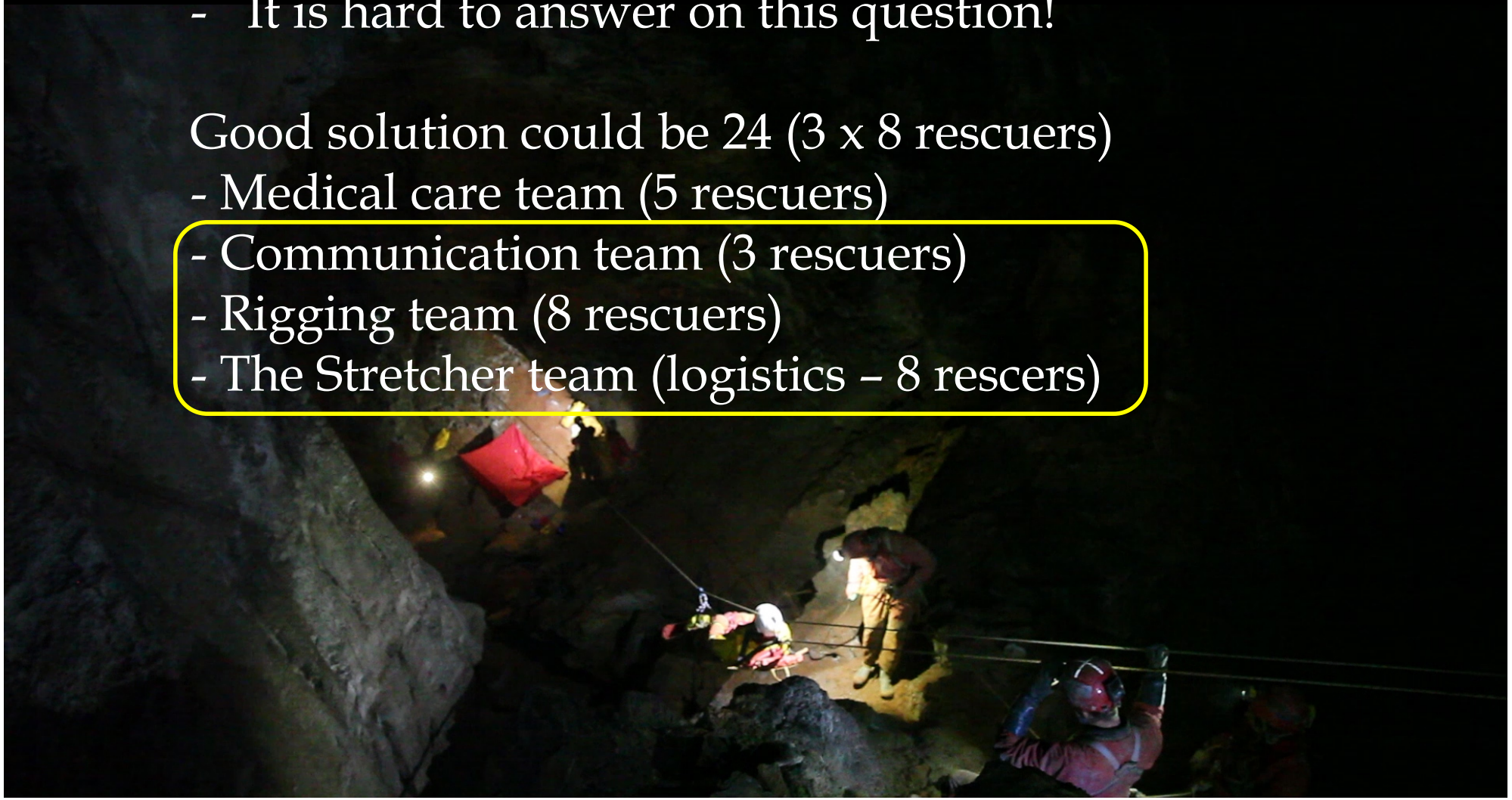
Debriefing and rest.

Cave Rescue Team Leader course

What is optimal number of rescuers?

- It is hard to answer on this question!

Good solution could be 24 (3 x 8 rescuers)
- Medical care team (5 rescuers)
- Communication team (3 rescuers)
- Rigging team (8 rescuers)
- The Stretcher team (logistics – 8 rescers)



Cave Rescue Team Leader course

What is targeted (optimal) time for work?

72 and 96 hours

Cave Rescue Team Leader course

Bivouacs for injured caver

Cave Rescue Team Leader course

Rigging team - What is optimal equipment configuration for 8 rescuers?

Transport bag 1	650
Rotary hammer + 2 batteries	3200
Rescue Anchor 1	806
Rescue Anchor 1	806
Rescue Anchor 1	806
Rescue pulley	185
Rescue pulley	185
Down jacket	1200
Fix Inox 8x78 (20)	660
	8498
	1002

Transport bag 2	650
Rotary hammer + 2 batteries	3200
Rescue Anchor 1	806
Rescue Anchor 1	806
Rescue Anchor 1	806
Rescue pulley	185
Rescue pulley	185
Down jacket	1200
Fix Inox 8x78 (20)	660
	8498
	1002

Transport bag 3	650
Rope type A 10.5 mm - 70 m	5040
Rescue Anchor 1	806
Rescue pulley	185
Down jacket	1200
Fix Inox 8x78 (10)	330
	8211
	1289

Transport bag 4	650
Rope type A 10.5 mm - 70 m	5040
(3 Bolt hangers, 3 OK, 2	806
Rescue pulley	185
Down jacket	1200
Fix Inox 8x78 (10)	330
	8211
	1289

Transport bag 5	650
Rope type A 10.5 mm - 50 m	3600
Rescue Anchor 1	806
Rescue pulley	185
Fixe pulley-ascender + OK	300
Down jacket	1200
Fix Inox 8x78 (20)	660
	7401
	2099

Transport bag 6	650
Rope type A 10.5 mm - 50 m	3600
Rescue Anchor 1	806
Rescue pulley	185
Fixe pulley-ascender + OK	300
Down jacket	1200
Fix Inox 8x78 (20)	660
	7401
	2099

Transport bag 7	650
Rope type A 10.5 mm - 40 m	2880
Rescue Anchor 1	806
Rescue Anchor 2	749
Rescue pulley	185
Fixe pulley-ascender + OK	300
Down jacket	1200
"Steinberg" bivouac	500
	7270
	2230

Transport bag 8	650
Rope type A 10.5 mm - 40 m	2880
Rescue Anchor 1	806
Rescue Anchor 2	749
Rescue pulley	185
Fixe pulley-ascender + OK	300
Down jacket	1200
"Steinberg" bivouac	500
	7270
	2230

Maximum weight 9500 g

Rest for water, food, first aid, batteries, spits...

Rescue Anchor 1
(3 Bolt hangers, 3 OK, 2 AmD, 5 m rope type A)
Rescue Anchor 2
(3 Rings Anellox 8mm, 1 AmD, 5 m rope type A)

Cave Rescue Team Leader course

Cave Rescue Team Leader course

How to solwe safe (comfort) long-term stay of rescue team in the Cave with minimum equipment?

Cave Rescue Team Leader course

How to solwe safe (comfort) long-term stay of rescue team in the Cave with minimum equipment?

Cave Rescue Team Leader course

How to solwe safe (comfort) long-term stay of rescue team in the Cave with minimum equipment?

Cave Rescue Team Leader course

Food?

The menu is not yet ready for whole rescue team!

New task: Disposal of explosive devices from Caves

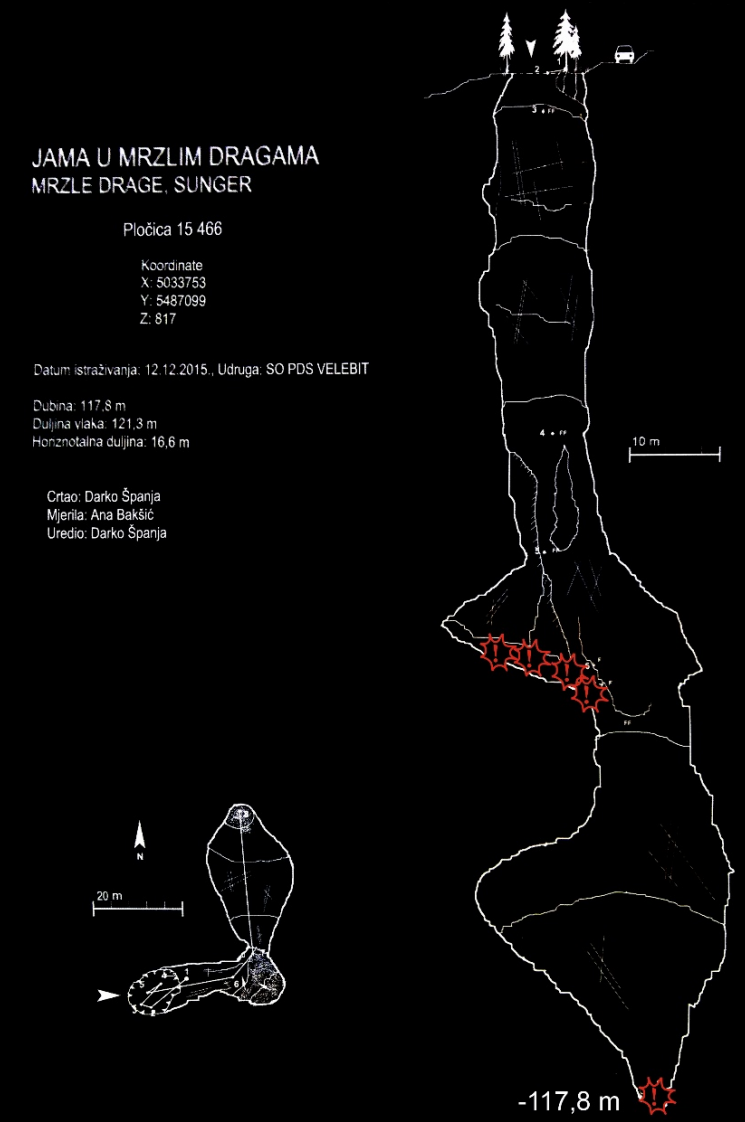
- Cooperation between Police and CMRS

- Small pits (-150 m is maximum)

New concept and safety procedures

- Way of cooperation: Police experts for explosives work with explosive devices – CMRS rescuers rigg and de-rigg the cave, take care about police experts and prepare everything for rescue;
- It is not allowed for CMRS rescuers to be in contact with explosive devices;
- Best solution is rescue from the surface;
- Work with motor winch is very good solution but rope line should be in air;
- We try breathing apparatus (BA) and saw that BA gives small autonomy (30 min)

New task: Disposal of explosive devices from Caves



- Inspection (30th January 2016.)
- Rigging the cave (with progression and rescue anchors)
- Disposal of explosives (23rd and 24th May 2016.)

New task: Disposal of explosive devices from Caves

Standard operative procedure is still on progress!

Questions?

ICAR 2019 ZAKOPANE | POLAND

HRVATSKA GORSKA SLUŽBA SPAŠAVANJA

EUROPEAN CAVE RESCUE ASSOCIATION