Urban Avalanche Search & Rescue (UASAR)

SOME THOUGHTS...

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Who am I???

- Engineer from The Royal Institute of Technology, Stockholm, Sweden 1987 – Thesis: Avalanche Protection for Neskaupstadur, Iceland
- Engineer at ORION Consulting; specialized in snow engineering and highway engineering
  - Snow, snowdrift, avalanche protection, hazard assessment for roads and urban areas ...
- Since 1984, member of HSSK Urban Search and Rescue Team in Kopavogur, Iceland
- A member of ICE-SAR which is an UN/INSARAG team

Topics to be covered

- Past, (precent) & future - Some examples of threatened sites
- What is UASAR?
- U(A)SAR
- Issues to be considered
- (INSARAG/USAR Guidelines)
- Experience from past accidents

???

- How many of you have participated in urban avalanche search and rescue?

Background

- Urban areas threatened by avalanches can be found in almost every corner of the world where mountains and snow can be found
- It seems to me as less attention has been given to planning of avalanche search and rescue at those sites.
- This presentation is an attemt to put a light on an issue that alpine rescue teams should begin to foucs on.
  Alpine rescue teams ARE part of every countries resources that will (and have to) be used in an urban avalanche search and rescue.

Súðavík Village, Iceland

Sudavik; old village to right and new village to left - Photo: Árni Jónsson, 2005

Súðavík Village, Iceland

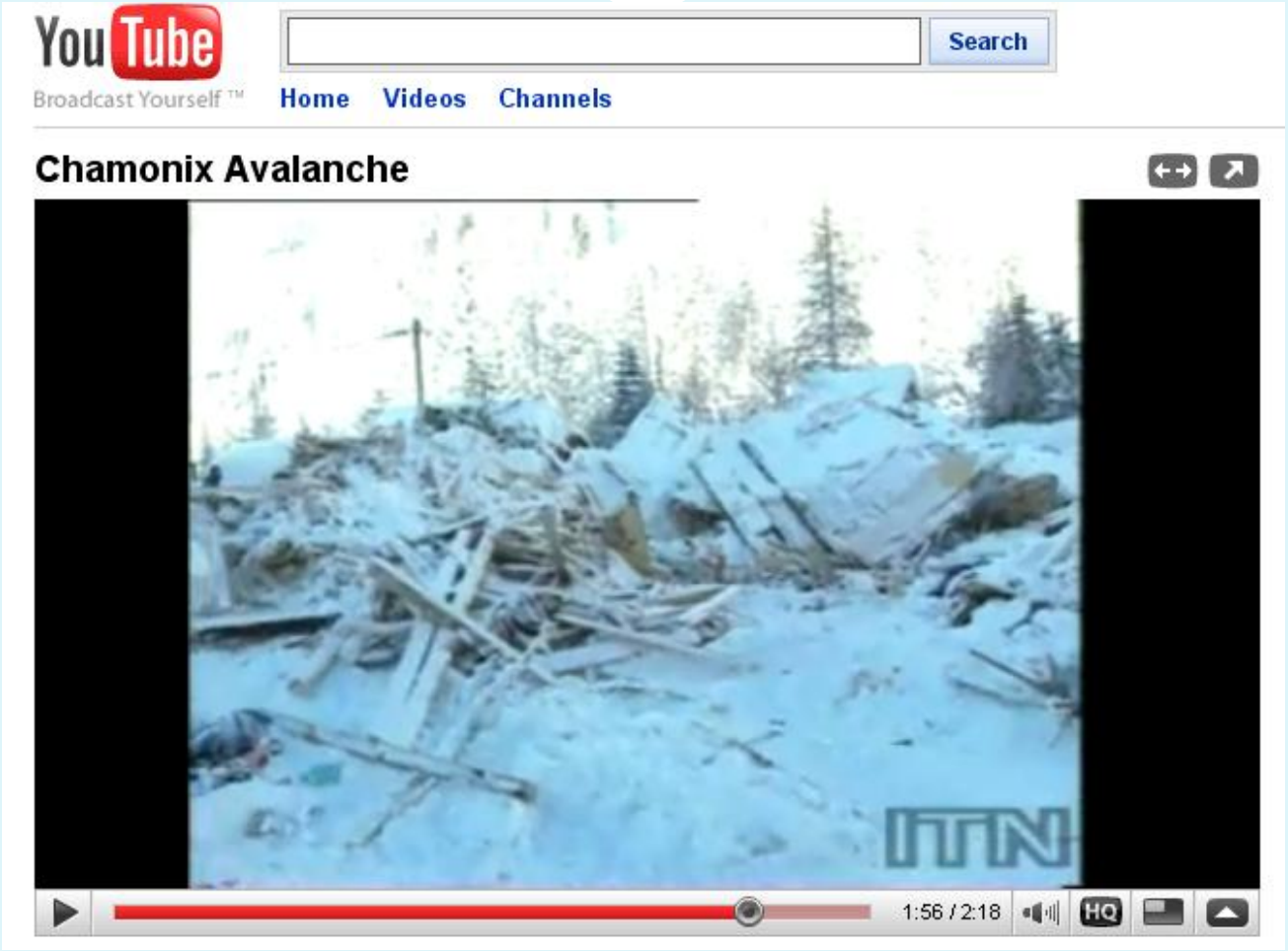
Sudavik just after the avalanche in 1995 - Photo: Árni Jónsson, 1995

Other places

- In the past
  - The alps 1999: Galtuer and other places in Austria, Switzerland and France
  - ... *"Rescue efforts were hampered by the remote location and a lack of heavy machinery to lift debris, Ahmed said. Many villages have been cut off for days by heavy snow and landslides*". Pakistan 2007.
    From: www.theage.com.au/news
- In the future???
  - ..."*Thrilled, that is, until someone showed them a photo of their house in a National Geographic article that said Juneau has the highest risk of an avalanche disaster of any city in America*."

    From: www.foxnews.com /story - 2005

Other places



City of Juneau, Alaska

This photo from False Mt. Troy on Douglas Island shows the urban avalanche paths on the Gastineau Channel side of Mt. Juneau. Photo: Bill Glude http://www.avalanche.org/~seaac/Pages4/JuneauUrbanMapsSAAC04_05.html - 28/8 2009

- Amongst countries where avalanches pose a threat to urban areas are:
  - Switzerland, Austria, France, Italy, Iceland, Norway, Alaska/US, Pakistan, Afganistan, China, India...

What is USAR & UASAR ?

USAR (Urban Search and Rescue)

- Search and rescue of humans, livestock and valuables from collapsed structures

Photo: Árni Jónsson, 2009

UASAR (Urban Avalanche Search and Rescue)

- Avalanche search and rescue of humans, livestock and valuables from collapsed structures

Photo: Árni Jónsson, 2005

Whom are we searching for?

Backcountry accident

- Mountaineers
- Drivers of snow scooters
- Car drivers

- Usually people that are aware of the environment and are prepared (i.e. with transciever etc.)
- Relatively “small” event compared to Urban Avalanche

Accident in an urban area

- “Normal” people in their houses
  - Old people
  - Children
  - Disabled
- Car drivers

- Usually people that do NOT expect avalanches. They are more vulnerable than mountaineers
- Size of event often much larger

Whom are we searching for?

Backcountry accident

Photo: From www.Lexi.is, 2009

Accident in an urban area

Photo: Árni Jónsson, 2009

Who are responding to backcountry avalanche accidents?

- Companions
  - They are on site!
- Police
- Alpine rescuers
- Medical doctors
- Pilots, drivers ....

- ...really not that many compared to ....

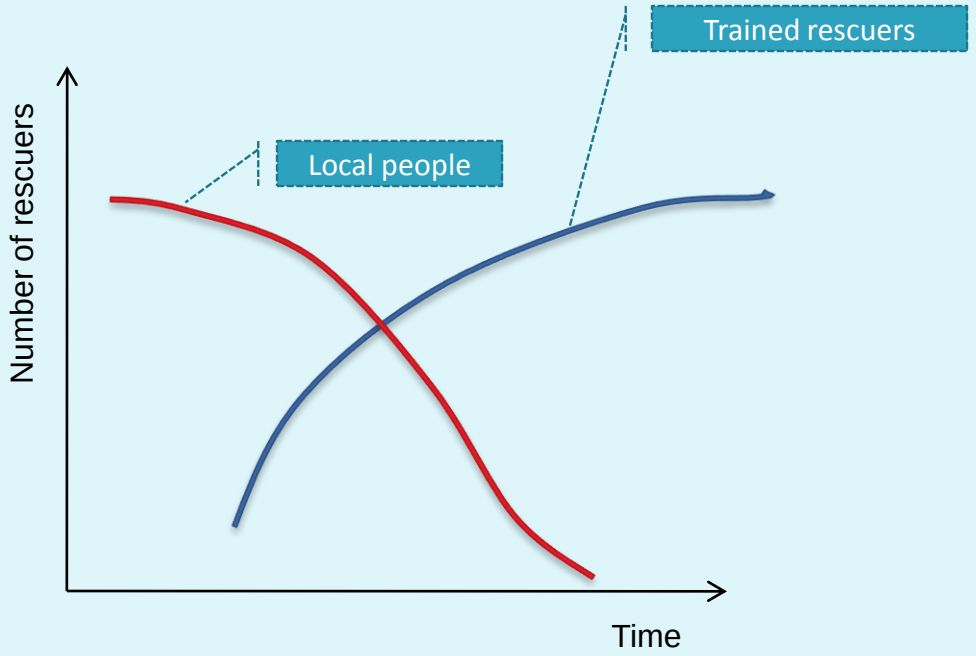
Photo: From www.Lexi.is, 2009

Who are responding to urban avalanche accidents?

- Survivors/local people (in the initial phase)
- UASAR is a joint work of Alpine Rescuers and USAR people ... and lots of more specialized people. Typical needs are:
  - Snow and avalanche knowlegde of Alpine Rescuers
  - Trained people that have special knowledge of collapsed structures; USAR Teams
  - Medical care (in Iceland: A team from University hospital, UH)
  - Police & Fire brigade (All rescue missions in Iceland are a police matter)
  - Shelter, food, drinking water, sanitation and waste (in Iceland: A team from Icelandic Red Cross (RC), and Local Community (LC)).
  - Phsycological support for:
    - Victims, who survive from the accidents (in Iceland: A team from UH or the RC)
    - Rescue personnel (in Iceland: A team from UH or RC or ???)
    - (Relatives (in Iceland: Taken care of by a team from RC))
  - Religious leader
  - Volunteers
  - (Infrastructure), ...

First responders (locals) vs. trained rescuers

- Local people who survive the accident or not caught
  - Will start uncontrolled search
  - Not equipped/dressed properly
  - Exposed to subsequent avalanches
- Takes time to mobilize organized & well equipped rescue force
  - On arrival they take over but full force will probably not take effect untill after a while



Urban Search and Rescue (USAR)

UN / INSARAG Classification of ICE-SAR, Iceland 10.-13. sept. 2009

Photo: Árni Jónsson, 2009

Urban Avalanche Search and Rescue (UASAR)

Do we need conventional avalanche rescue equipments here???

Photos: Árni Jónsson, 1995

Issues to consider

- Structures
- Search and Rescue
- Site
- Incident
- ….

Photo: Árni Jónsson, 1995

Structure Issues

- Master Plan of a village
- Layout of buildings
  - External
    - Long axis
    - Short axis
    - Number of floors
    - Form of roof
  - Internal
    - Shear walls
    - Light walls
    - Bedroom, living room …
- Location of buildings
  - Aspect
  - w/respect to run out distance
- Utilities: Safety issues
  - Electricity
  - Hot water
  - Cold water
  - Gas
  - Sewer

- "Stable" structures
- Building material – structural type
- Classification
  - Wood
  - Steel
  - Reinforced concrete
    - Rebar
    - Pre-stressed cable
  - Reinforced masonry
  - Unreinforced masonry
- Building loadings
  - Basic structural loading

Search and Rescue Issues

- Command posts
  - Incident Command System
    - Small scale
    - Large scale
      - Two or more buildings?!
      - Three or more missing?!
- Logistic
  - Personal equipments
    - Transceiver
    - Shovel - usually not robust enough!!!
    - Probe (steel!!!)
  - Team equipments
    - Steel shovels
    - Steel probes
    - Small electric generator
    - Light + light poles
    - Chain saw for timber AND concrete
    - Light lifting equipment
  - Local authority equipment (Depot)
    - Heavy snow removal equipments
    - Heavy lifting equipment
  - Reserve rescuers

Search and Rescue Issues (cont.)

- Safety Issues
  - Second avalanche
  - Utilities
    - Electricity
    - Hot water
    - Cold water
    - Gas
    - Sewer
  - Dog handler
    - Shoes for dogs
  - Stability of buildings/rubble
  - Voids
  - Toxics
  - Glass & and other sharp things in the debris/rubble
- Time of day
  - Bedrooms usually facing mountain side
- Debris pattern
  - Logging and relating to buildings
  - Weather/wind influence
- Rescue operation
  - Recon. team
  - Dogs
  - Probing/shoveling
  - Logging team
  - Max 2-3 hour work periods

Search and Rescue Issues (cont.)

- Personal belongings of victims
  - Gathered and mark if possible
  - Handed over to relatives after rescue operation
- Communication
- Transportation

- Victims
  - What caused their death
    - Suffocation
    - Trauma
    - Hypothermia
  - Do not destroy clues when searching and shovelling
  - All kind of things found during shovelling to victim should be kept, logged and handed over to relatives at latter stages

Incident

- Avalanche type
  - Wet
  - Dry
- Avalanche width

- Building Loadings
  - Basic structural loading
  - Probable collapse pattern
- Avalanche type
  - Wet
    - Dense part
      - Snow
      - Debris from other buildings
    - Impact force on lower part of building
    - Relatively slow
  - Dry
    - Two phases of impact - different patterns at different time
      - Snow cloud
      - Dense part
        - Snow
        - Debris from other buildings
    - Dense part acting on lower part, ground floor
    - Snow cloud acting on second and higher floors and roof
- Time of day

Search matrix & occupation of various blds.

- Time of day
- Weekday
- (Time of year)

- Different categories
  - Homes
  - Office blds., Schools,
  - Hospitals

Search matrix

	Working days		Weekends	
	Daytime (workhours) ~from 08:00 to 17:00	**Outside workhours ~from 17:00 to 08:00**	**Daytime ~from 08:00 to 17:00**	**Rest of the day ~from 17:00 to 08:00**
Homes				
Schools, kindergarden (a large number of people)				
Hospitals etc. (a large number of people)				
Offices, workshops etc.				

Site

- Site accessibility (photo)
- Transportation means
- Rescue base
- Communication system
- Shelter
- Affected people
  - Victims
    - Refrigerated container
    - ID commission
  - Survivors
    - Non burial victims
    - Found alive

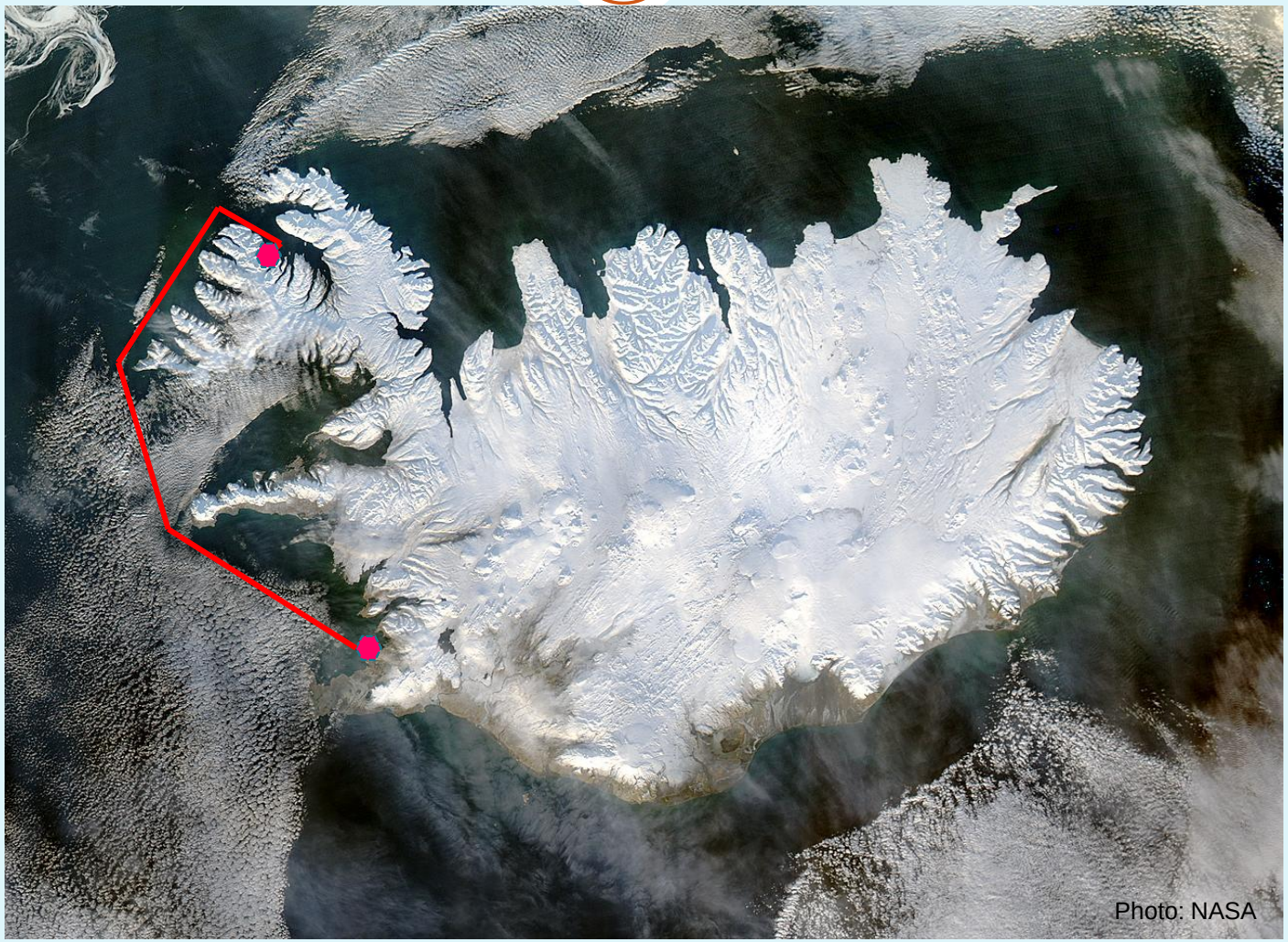
- Valuables
  - Gather in a bag
- Public relation issues

Figure 7.5 a) The media at work in an avalanche devastated area. b) Focal point person for media contacts. (Photographs by the Government of the State of Tyrol, Austria)

From: Hervás, Javier. 2002. Recommendations to deal with Snow Avalanches in Europe. NEDIES project. European Commission

Sudavik Iceland 1995: Due to persistent avalanche threat only one photographer, one from the TV and one reporter were allowed to access the site. They were obliged to share all information with other media.

Easy access???



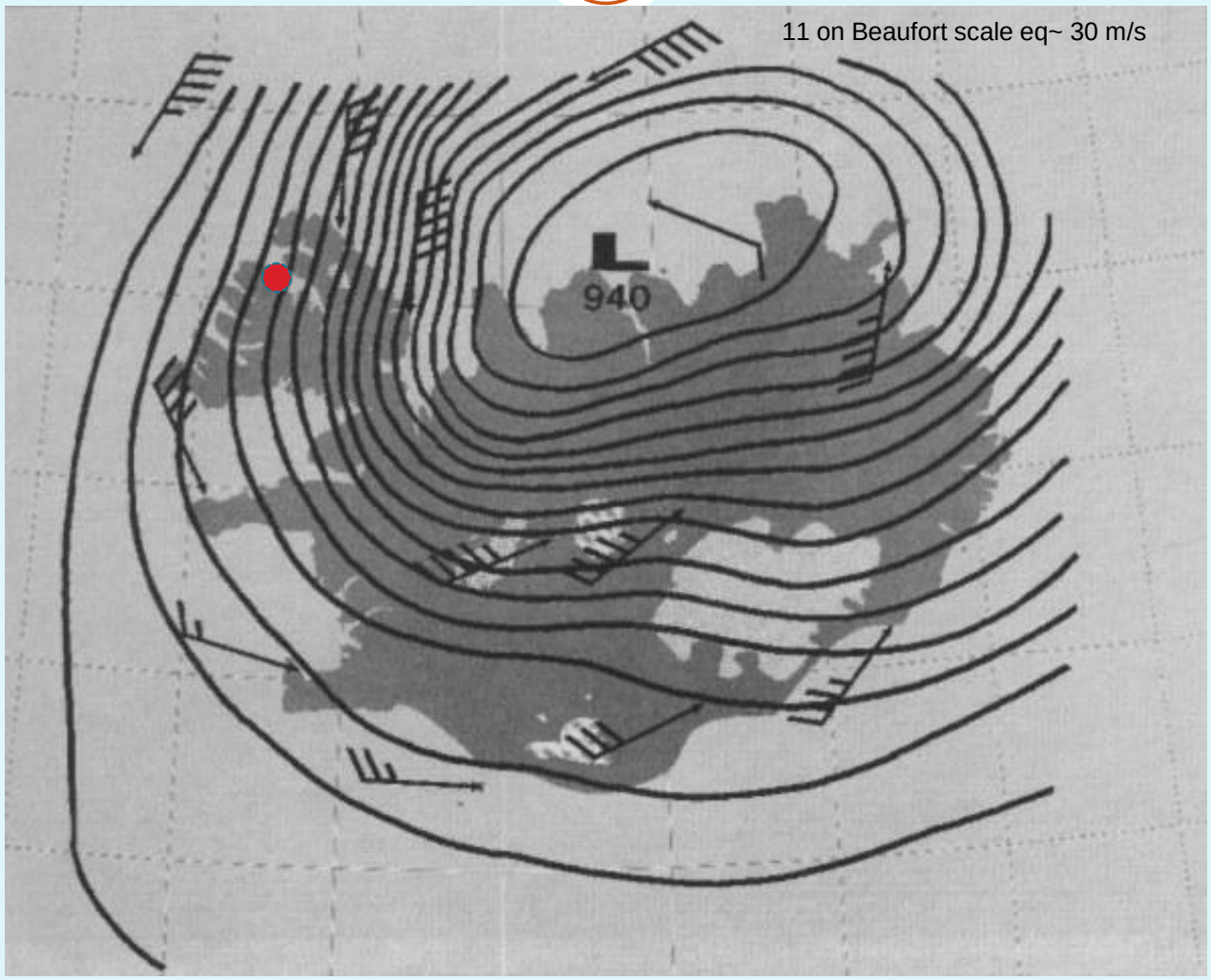
Transportation!

Rescuers boarding the coastguard ship before action.
24 hours travel time in 110 knots wind. Most rescuers were seasick!!!

Rescuers boarding small boat (Zodiac) before entering accident site.

Landsbjörg – Fréttarit/RAX, 01/1995

Weather during emergency!?



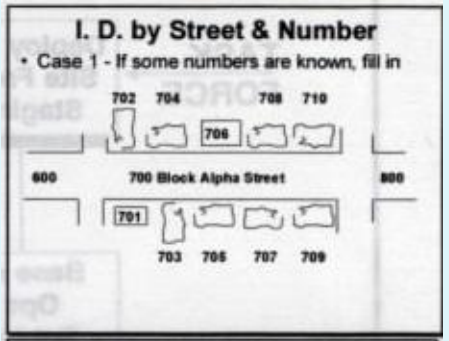
11 on Beaufort scale eq~ 30 m/s

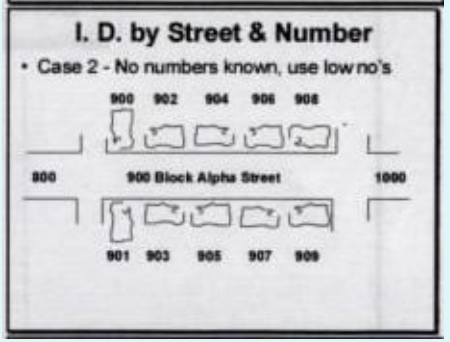
16th of January 1995,
Sudavik accident

Picture: Jón Gunnar Egilsson
Landsbjörg-fréttarit 1-95

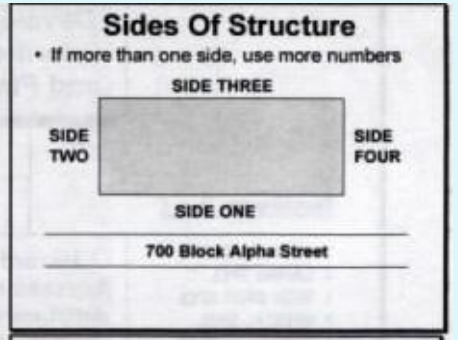
INSARAG structure marking system

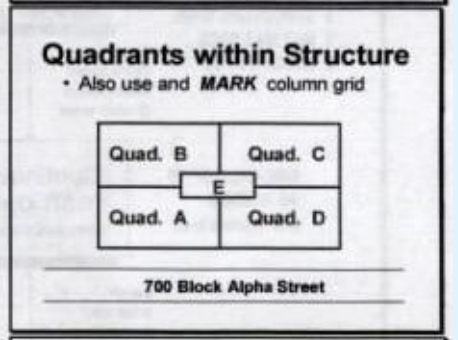
- INSARAG has quite well defined marking system
- The system needs to be modified due to displacement of structures in snow avalanches

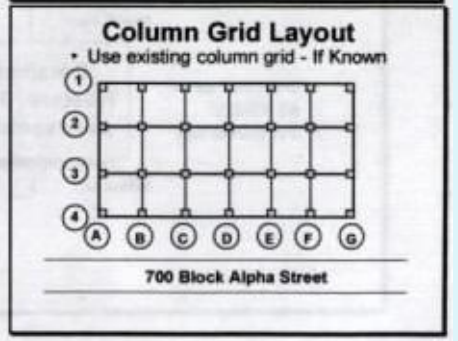




From: U.S. Army Corps of Engineers, R
eadiness Support Centre (2003)







Triage criteria

- Occupancy
  - Type of building and #people
- Structural type
  - Type of material & collapse
- Collapse mechanism
  - How it failed
- Time of day
  - Important! During workhours or nights or ...

- Prior intelligence
  - Info from various sources concerning known trapped victims
- Search and rescue resource available
  - Are more resources needed?
- Structural condition of the building
  - Can SAR teams proceed wo/ further stabilization effort

From: U.S. Army Corps of Engineers, Readiness Support Centre (2003)

Can we use this in avalanche rescue???

Experience from 1995 accidents in Iceland

- Extreme weather
  - Rescuers and dogs last short time on site
  - Radios and batteries last short
  - Use phone to locate damaged buildings (phonecall not answered)!
- Important to gather and log victims belongings while operating
- Dogs were misleaded due to flooding of scent along “tunnels”
- Every rescuer should be equipped with Tetra (or similar radio) so the on-site commander can track every move of the rescuer.

- Survival probability

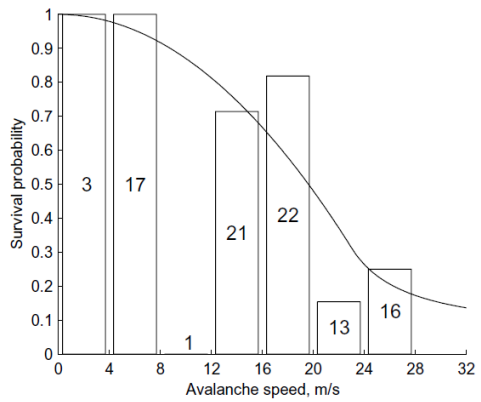
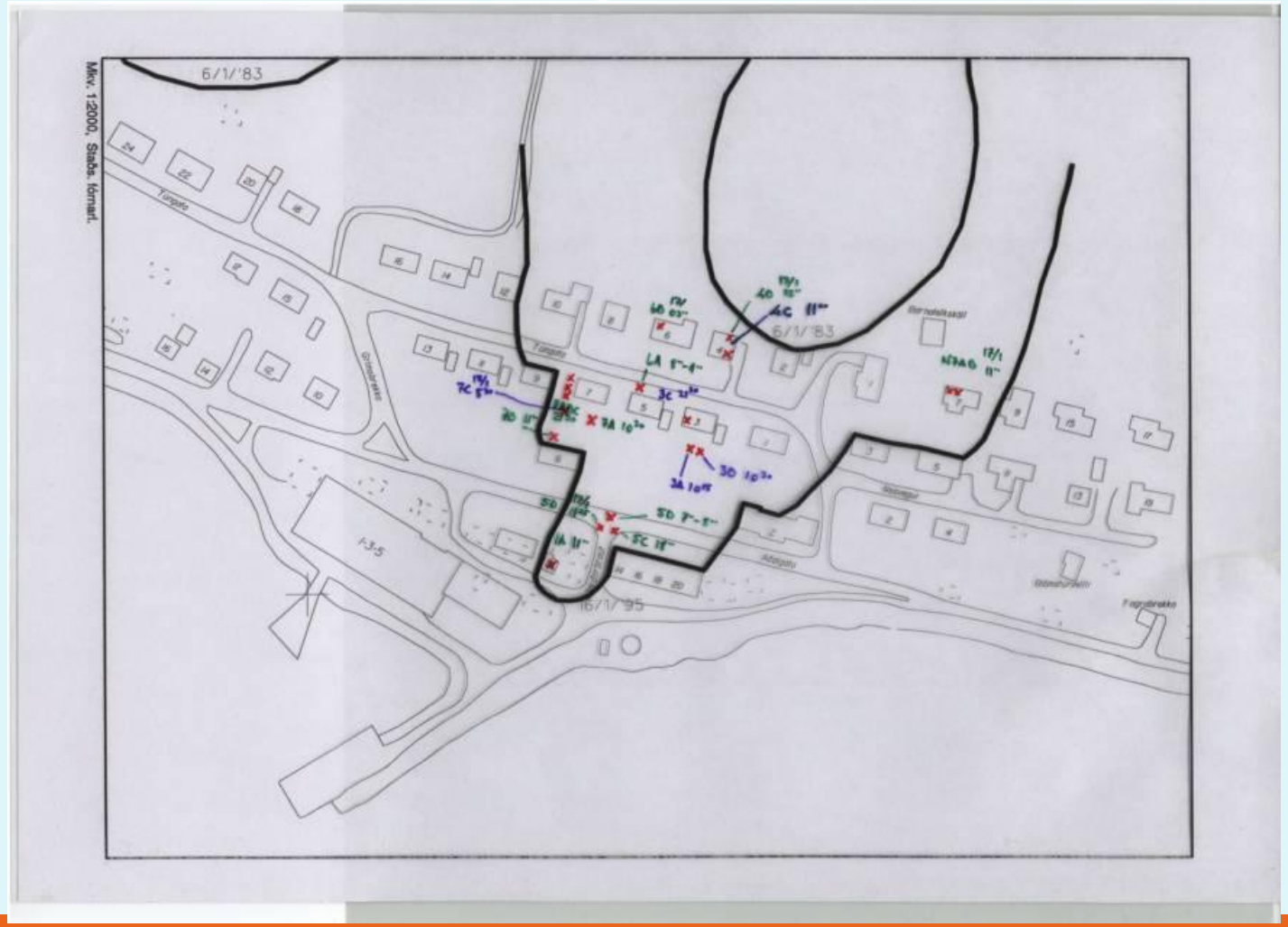


Figure 13. *The dependence of survival rate in Flateyri and Súðavík on the avalanche speed. The numbers in the bars show the total number of people at home for each speed group and the height of the bars gives the proportion surviving. For instance, 25% or 4 people out of 16 survived in the 24–28 m/s speed group.*

*(Report from IMO: ***Estimation of avalanche risk*** written by Jónasson. K, Sigurðsson. S. Þ, Arnalds. Þ.)

Sudavik accident



Survey

- Is UASAR a relevant topic for ICAR Avalanche Commission?
- How many of you have participated in UASAR?
- Do you know of friends/colleague that have participated in UASAR?
- Do you know of any UASAR assessment or report?

Papers read and/or referenced

- Jónasson. K, Sigurðsson. SÞ, Arnalds. Þ. 1999. *Estimation of avalanche risk*. IMO report no. VÍ-R99001-ÚR01
- Hervás, Javier. 2002. *Recommendations to deal with Snow Avalanches in Europe*. NEDIES project. European Commission
- Jónsson, Árni. 1995. *Hvers vegna varð tjónið svona mikið?* Unpublished notes and draft of a report
- U.S. Army Corps of Engineers. 2003. South Pacific Division, *Urban Search and Rescue Structures Specialist Training Manual*, Readiness Support Centre
- INSARAG. 2006. International Search and Rescue Response – Guidelines. UN/OCHA


Thank you for your attention!
Questions?