

# Risk a Life to Save a Life?

ICAR 2007 Pontresina

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# Risk management in avalanche rescue operations

Risky rescue operations can cost more lives than they save

”The life you save may be your own”

# Risk management in avalanche rescue operations

Checklists available at ICAR website

Beyond the checklist format:

- Assess risk
- Quantify uncertainties as probabilities
- Compare options
- Evaluate risk vs gain
- Monitor situation and re-evaluate

# US Coast Guard

## Beyond the checklist format

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**U. S. C. G. Aviation Risk Assessment**

Date: \_\_\_\_\_ Mission: \_\_\_\_\_

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**step 1. Risk Assessment**

Review questions and circle the score according to currently available information. Score items according to the examples given and instructions. Absence of data automatically sets the score to maximum point value.

**Planning:** Thoroughness of pre-mission planning. Factors which increase risk: B-0 response assets, in-flight divert of asset.

Adequate Minimal None  
1 2 3 4 5

**Event:** Refers to mission complexity and guidance doctrine available. Factors which may increase risk: sketchy details or non-standard mission profile.

Clear Guidance Innovation Required Complex/  
1 2 3 4 5

**Asset:** Selection of appropriate resources. Factors that effect risk: time at unit, unfamiliar w/OP area, fatigue, flight time (total time & time in type), crew rest, 5181's requestor's knowledge of asset capabilities.

A. Pilots  
Excellent Adequate Marginal  
1 2 3 4 5

B. Aircrew  
Excellent Adequate Marginal  
1 2 3 4 5

C. Airframe/Resources

Fully Mission Pa  
Capability  
1 2 3 4 5

Communications: Ability to maintain c mission. Factors: internal w/command a external w/customer.

Adequate Marginal  
1 2 3 4 5

Environment: External condition surro Weather, night, illumination, mountaino state, terrain, cutter based, alternate airfi water temp, on-scene cover.

Design Marginal  
1 2 3 4 5

Add the values for each Risk Assessm the final Risk Assessment graph. Re-assess from Step 1.

**step 2. Risk Management**

Risk Management is the decision to cont hazards. Determine Control Options to a control or reduction. Review the options risks as appropriate.

Spread-out - Disperse the risk by launch air/surface assets.

Transfer - If practical, locate a better su conduct the mission i.e. different airfram or crew.

8 Low 16 24 Medium

RiskMatrixAvbecker

How to use this Chart:

	High Gain	Medium Gain	Low Gain
Low Risk	Accept the Mission. Continue to monitor Risk Factors, if conditions or mission changes.	Accept the Mission. Continue to monitor Risk Factors, if conditions or mission changes.	Accept the Mission. Re-evaluate Risk vs. Gain, should Risk Factors change.
Medium Risk	Accept the Mission. Continue to monitor Risk Factors and employ Control Options when available.	Accept the Mission. Continue to monitor Risk Factors and employ Control Options when available.	Accept the Mission. Continue to monitor Risk Factors and actively pursue Control Options to reduce Risk.
High Risk	Accept the Mission only with Command endorsement. Communicate Risk vs. Gain to Chain of Command. Actively pursue Control Options to reduce Risk.	Accept the Mission only with Command endorsement. Communicate Risk vs. Gain to Chain of Command. Actively pursue Control Options to reduce Risk.	Do not Accept the Mission. Communicate to Chain of Command. Wait until Risk Factors change or Control Options warrant.

# Avalanche incident, First filter

## At incident notification:

Questions?	Including factors	Excluding factors
Local weather conditions?	<i>Good weather. Little new snow, no or little wind.</i>	<i>Considerable amount of new snow. Snow drift.</i>
Terrain conitions?	<i>Easy, few avalanche areas, easy and quick access.</i>	<i>Complex, several potential avalanche paths, difficult and long approach</i>
Light and visibility?	<i>Daylight, good visibility</i>	<i>Darkness, low visibilty</i>
Incident type?	<i>Small to moderat size single avalanche. Human release.</i>	<i>Large, or several avalanches, some naturally released.</i>
Action:	<b>GO!</b> Instant call out to accident site.	<b>WAIT!</b> Possibly risky mission. Call out to safe meeting place, but await risk assessment before entering potentially dangerous terrain.

# Risk definition (example)

	<i>Probability/mission</i>	<i>"Acceptance by society"</i>
<b>Very high</b>	<b>&gt;1/1000 death</b>	<b>Unacceptable</b>
<b>High</b>	<b>1/50000-1000 death</b>	<b>Unacceptable in peacetime</b>
<b>Considerable</b>	<b>0.1-0.2% non-fatal injury, OR 1/100000-1/50000 death</b>	<b>Risk sport?</b>
<b>Moderate</b>	<b>0.01-0.1% non-fatal injury, OR 1/200000-1/100000 death</b>	<b>Acceptable in some professions</b>
<b>Low</b>	<b>&lt;0.01% non-fatal injury OR &lt;1/200000 death</b>	<b>Commonly acceptable, public transport systems</b>

# Risk calculation worksheet

**Risk score**  
(1-5 low-high)

**Plan**

*Thorough plan, based on good intelligence?*

**3**

**Environment**

*Terrain, visibility, weather, danger degree?  
Access, safe havens, familiar terrain?*

**3**

**Mission**

*Complexity: non-standard mission and need for improvising?  
Intelligence quality?  
Terrestrial/Air mission?*

**3**

**Resources**

*Response time, means of transport?  
Competence of leadership and crew?  
Communication systems working throughout the mission?*

**2**

**SUM**

**11**



**1-4**  
**Low**

**5-8**  
**Moderate**

**9-12**  
**Considerable**

**13-16**  
**High**

**17-20**  
**Very high**

# Risk management worksheet

Reduction factor 0-5

**Plan**

*More intelligence, more detailed plan, external help, limit exposure*

**-2**

**Environment**

*Alternative access route. Wait for better visibility, weather and snow conditions, limit exposure in time.*

**-1**

**Mission**

*Wait for more intelligence. Parallell call out, air transport support)*

**-2**

**Resources**

*Alternative resources available? Can communication systems and lighting be established first?*

**0**

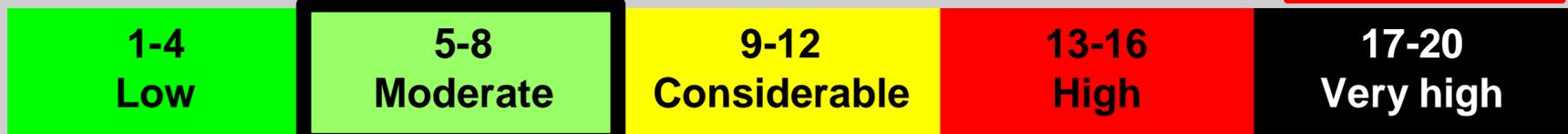
**Reduction**

**-5**

**SUM**

**(11-5)**

**6**



# Residual risk

Reduction  
factor (0-5)

**Consequence  
reduction**

*Personal protection gear, beacons, ABS  
a.s.o, rescue personnel ready*

-1

5

**SUM Residual risk:**

**Assesment of the mission:**



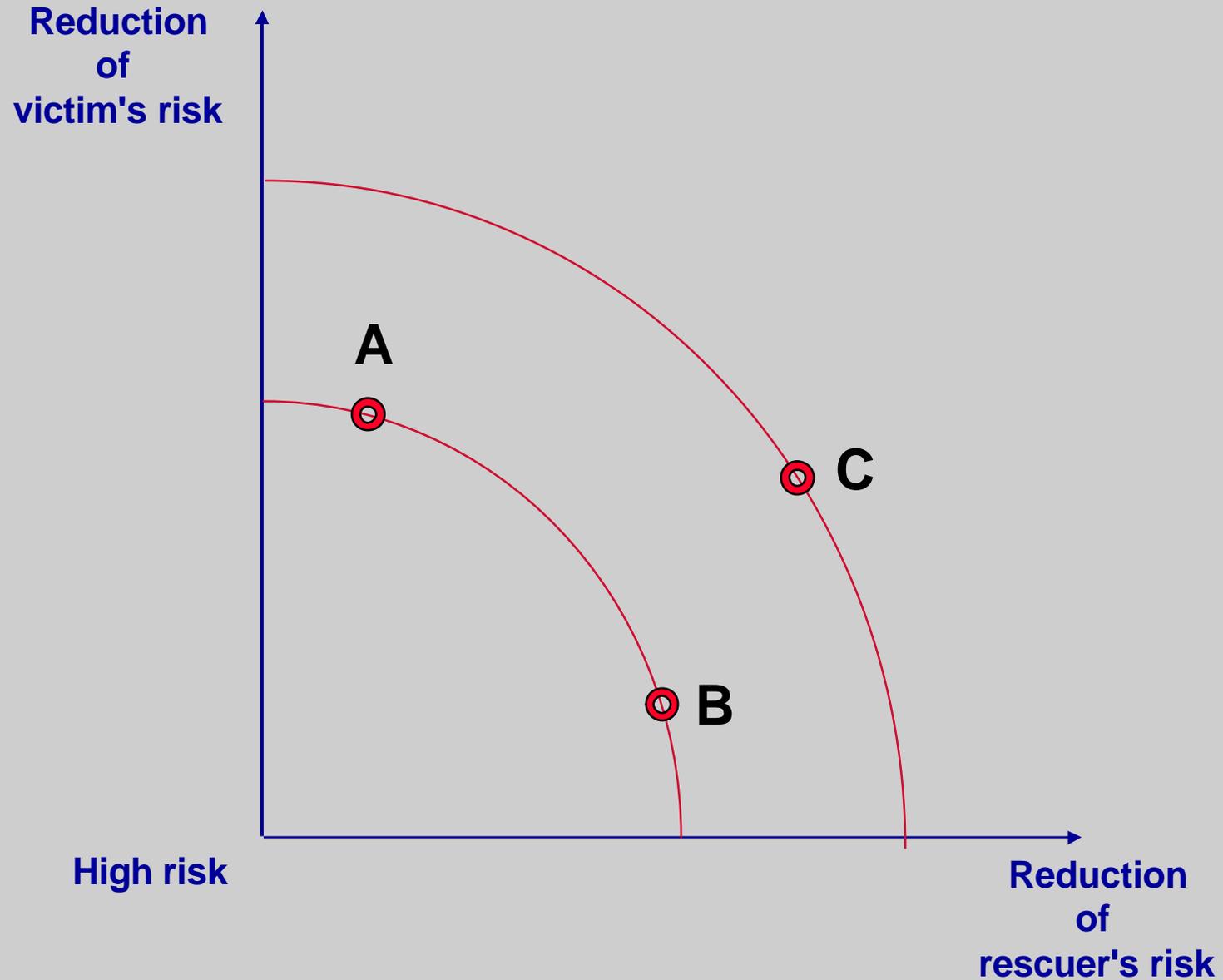
# Benefit definition (example)

	<i>Victim survival probability</i>	<i>Possible situation</i>
<b>High</b>	High probability of survival given a speedy rescue	Buried less than 30-45 minutes, carries ABS and beacon (alt. RECCO). Small avalanche, shallow deposit, even run out. Carries helmet, Avalung, (in the future, vital data indication?)
<b>Medium</b>	20-50% probability of survival	Completely buried more than 45-60 minutes, carries beacon. Potential trauma. Carries helmet.
<b>Low</b>	<20% probability of survival	Completely buried more than 60 minutes. Large avalanche. Uneven avalanche path with cliffs, steep sections, rocks and/or trees. Trauma likely. Carries no avalanche protection gear. Thin clothing.

# Risk/benefit matrix (example)

<i>Risk \ Benefit</i>	<i>High</i>	<i>Medium</i>	<i>Low</i>
<i>Low</i>	Acceptable, common risk reduction measures.  Continuously monitoring of risk factors	Acceptable, common risk reduction measures.  Continuously monitoring of risk factors	Acceptable, common risk reduction measures.  Continuously monitoring of risk factor
<i>Moderate</i>	Acceptable, common risk reduction measures.  Continuously monitoring of risk factors	Acceptable with all available consequence reduction measures. Continuous monitoring and rescue preparedness. Limit exposure in time	Not acceptable at present. Wait until risk factors change.
<i>Considerable</i>	Acceptable with all available consequence reduction measures. Continuous monitoring and rescue preparedness. Limit exposure in time.	Not acceptable at present. Wait until risk factors change.	Not acceptable at present.
<i>High</i>	Acceptable only with consensus and all available consequence reduction measures. Continuous monitoring re-evaluation and rescue preparedness. Limit exposure in time and space.	Not acceptable at present.	
<i>Very high</i>	Not acceptable at present.		

# Non zero-sum solution



# Goal for rescue missions

**Risk for rescuers should not markedly exceed other accepted risks in society**

**Best possible risk/benefit ratio**