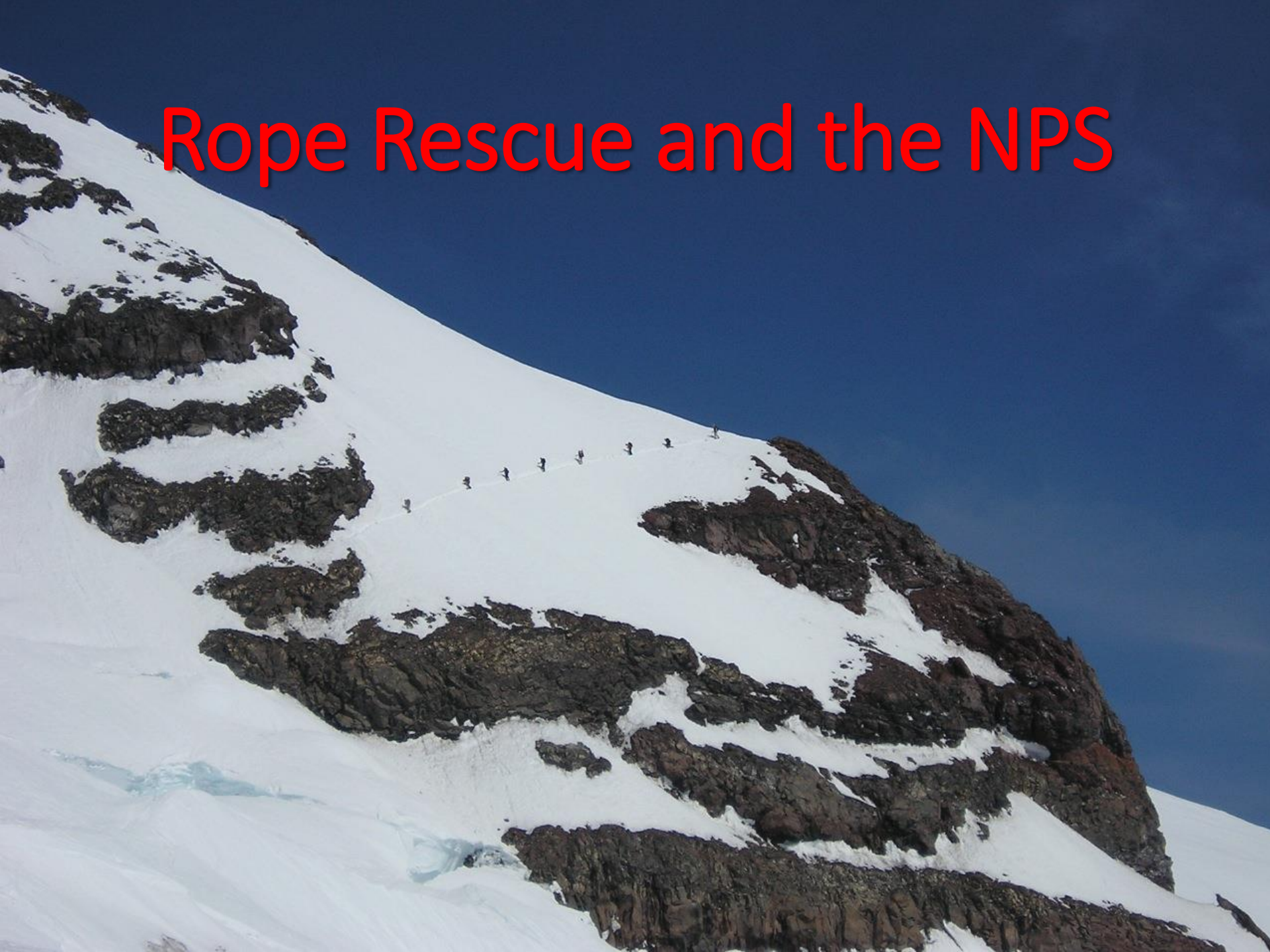


Rope Rescue and the NPS



IMG Rope Rescue Overview

- NPS Rescue Risk Management Plans and Responsibility
- Anchor Systems: What we can learn from SAR
- Simple Skills for Rescue Systems
- Single Rope Lowering Techniques
- Rescue Traverses
- Efficiency in Hauling Systems

NPS Rescue Risk Management and Responsibilities

 Black Diamond

Rope Rescue and the NPS

- Training Overview
- Common Principles of Rescue
- Differences Between Guiding and Rescue
- Working with the NPS in a Rescue
- On Scene: Rope Rescue Start to Finish

Overview of Guide/NPS Training

- Nine Participants: 3 Rangers, 2 Guides per Company
- Objectives:
 - Common Understanding of Roles and Responsibilities
 - “Sync” Techniques
 - Training for Other Guides
- Develop Ideas for a Cleaver Rescue

Common Principles of Rescue



Guide Service Principles

- Right Tool, Right Place, Right Time
- Improvised
- Whistle Test
- AMGA Standards



NPS/SAR Principles

- Formal
- Personal, Partner, Public, Patient
- Critical Analysis
- Static System Safety Factor (SSSF)
- Critical Point Test



Comparing the Two

Climbing (Improvised)

- Dynamic Ropes
- Single Rope Techniques
- Multi-Use Equipment
- Less People
- Lighter Loads
- Inc Risk Acceptance
- Shared Responsibility

Rescue (Organized)

- Low Stretch Ropes
- Double Rope Techniques
- Specialized Equipment
- Lots of People
- Heavier Loads
- Dec Risk Acceptance
- Hierarchical Command

What Are Some Lowering Techniques We Use?



Common Lowering System

Lowering Technique	Guide Services	NPS/SAR
Munter	X	
Super Munter	X	
ATC w/ Redirect	X	X
ATCs in Series	X	X
Parallel Plaquet		X
Brake Rack		X
Scarab		X









What Are Some Belay Techniques We Use?

Common Belay Techniques

Belay Techniques	Guide Services	NPS
Munter	X	
Locking Munter	X	
Plaquet	X	X
Parallel Plaquet		X
Tandom Prussik		X

What Are Some Hauling Systems We Use?



Working With The NPS In A Rescue

Three Main Scenarios

- Injured Client
- Encounter an Injured Party
- NPS Request Assistance



NPS Process

- Communicate
 - On-Scene, Rangers, Longmire, Guide Services
- Available Resources
- Develop a Plan
- Assess the Plan
- Execute the Plan

NPS Risk Management Plan



GAR Model

- Each Category
 - Ranked 1-10
 - 1=Minimum Risk
 - 10= Maximum Risk
- Add Values
- Green= 1-33
- Amber= 34-65
- Red=65-80



GAR Model

- Plan
- Leadership
- Equipment
- Team
- Training
- Communication
- Conditions
- Complexity
- Supervision
- Planning
- Crew Selection
- Crew Fitness
- Environment
- Complexity

AMBER - 30

There's an App for That

Supervision (7)



Planning (4)



Crew Selection (2)



Crew Fitness (6)



Environment (3)



Event/Evolution Complexity (5)



It's Our Job to Paint the Picture



What if NPS is On-Scene?

System Analysis: White Board Test

$$M = \frac{m_0}{(1 - \frac{v^2}{c^2})^{3/2}} = \gamma m_0 \quad F = \frac{d}{dt} \left(\frac{m_0 v}{(1 - \frac{v^2}{c^2})^{3/2}} \right)$$

$$\frac{dY}{dt} = \frac{dY}{dr} \frac{dr}{dt} = \frac{dY}{dr} v, \quad \frac{dY}{dr} = \frac{d}{dr} \left(\frac{1}{(1 - \frac{v^2}{c^2})^{3/2}} \right) \frac{dY}{d\beta} \text{ where } \beta = \frac{v}{c}$$

$$\rightarrow \frac{dY}{dr} = \frac{\beta(1 - \beta^2)^{-3/2}}{c} = \frac{v}{c^2} \left(1 - \frac{v^2}{c^2} \right)^{-3/2}$$

$$\therefore F = m_0 \left[Y \frac{dr}{dt} + v \frac{dY}{dt} \right] = m_0 \left[Y \frac{dr}{dt} + \frac{v}{c^2} \left(1 - \frac{v^2}{c^2} \right)^{-3/2} \cdot a \right] = m_0 \left[Y a + \frac{v^2}{c^2} \left(1 - \frac{v^2}{c^2} \right)^{-3/2} a \right]$$

$$= m_0 a \left[\frac{1}{\left(1 - \frac{v^2}{c^2} \right)^{3/2}} + \frac{v^2}{c^2} \frac{1}{\left(1 - \frac{v^2}{c^2} \right)^{3/2}} \right], \quad \alpha = 1 - \frac{v^2}{c^2} \Rightarrow F = m_0 a \left[\frac{1}{\alpha^2} + \frac{v^2}{c^2} \frac{1}{\alpha^2} \right] = m_0 a \left[\frac{1 + \frac{v^2}{c^2}}{\alpha^2} \right] = m_0 a \left[\frac{1}{\alpha^3} \right]$$

$$\therefore F = m_0 a \left[\frac{1}{\left(1 - \frac{v^2}{c^2} \right)^{3/2}} \right], \quad W = \int F dx = \int \frac{m_0 a}{\left(1 - \frac{v^2}{c^2} \right)^{3/2}} dx = m_0 \int \frac{1}{\left(1 - \frac{v^2}{c^2} \right)^{3/2}} \frac{dv}{dt} dx = m_0 \int \frac{v}{\left(1 - \frac{v^2}{c^2} \right)^{3/2}} dv$$

$$u = 1 - \frac{v^2}{c^2} \Rightarrow W = m_0 \left[\frac{c^2}{-2} \int \frac{du}{u^{3/2}} \right] = m_0 \left[\frac{-c^2}{2} \left[\frac{-2}{-1/2} \right] \right] = m_0 \left[\frac{c^2}{u^{1/2}} \right] = m_0 \left[\frac{c^2}{\left(1 - \frac{v^2}{c^2} \right)^{1/2}} \right] + C$$

$$W=0 \Rightarrow v=0 \Rightarrow C = -m_0 c^2, \quad W = \frac{m_0 c^2}{\left(1 - \frac{v^2}{c^2} \right)^{1/2}} - m_0 c^2 \Rightarrow W + m_0 c^2 = \frac{m_0 c^2}{\left(1 - \frac{v^2}{c^2} \right)^{1/2}}$$

Total Energy = $W + m_0 c^2 = M c^2$

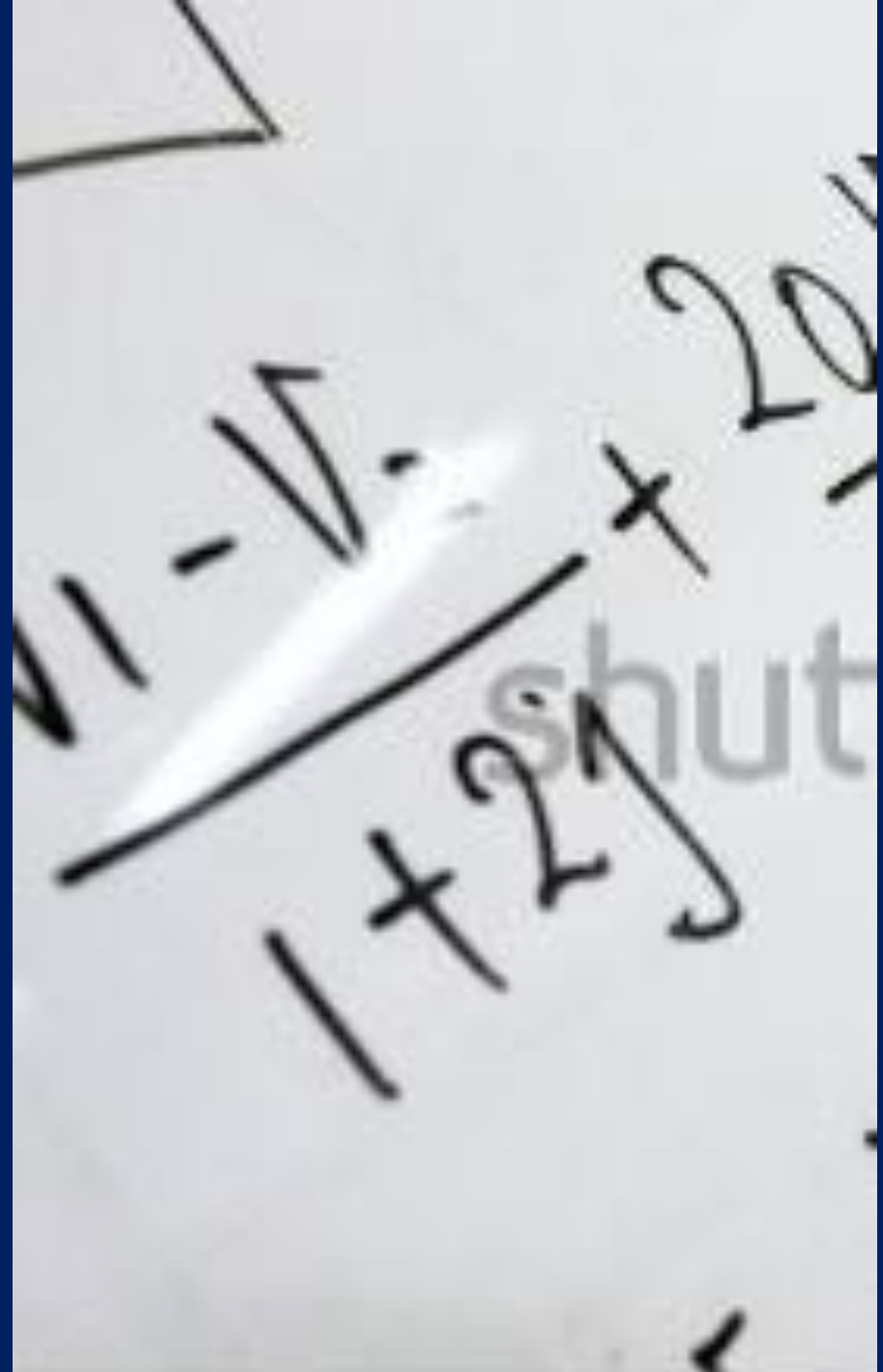
Moving \nearrow not moving \nearrow

or $E = M c^2$

White Board Test:

- Static System Safety Factor
- Critical Point Test
- Whistle Test
- Other Important Factor

- Comparative Analysis
- Failure Analysis



Static System Safety Factor

- Desired Breaking Strength VS Static Force Applied
- Ration kN:kN
- SAR: 10:1

- SAR (Vertical Environment)
 - UIAA 1 Pereon=100kg = approx. 1kN

Critical Point Test



Whistle Test



Other Items:

- Anchor Inspection
 - EARNEST
 - Static System Safety Factor
 - Well Focused?
 - Security?
- Independent and Hands-On Inspection



One Rope or Two?

What Causes the Failure of a Single Rope?

What Causes Rope Failure

- People
- Methods
- Materials
- Environment

How Steep Is Too Steep?

Welcome Back to High School Trigonometry

- Load (kN) x $\text{SIN } \theta = \text{Force on Anchor}$
- $30 = 0.5$ or 50%
- $45 = 0.75$ or 75%
- $90 = 1.0$ or 100%



Rope Rescue Start to Finish



Rope Rescue Start to Finish

- Scene Size-Up
- Make a Plan
- Team Briefing
- Stations
- Communication/Action

Scene Size-Up

- Hazards...Mitigation
- Patients
 - Number
 - Location
 - Condition
- Environment
- Resources



Make a Plan: Work Backward

- Edge Transition (Where am I going?)
- Rope Alignment
- Focal Point
- Anchors



Team Briefing

- Here's what I think we face
- Here's what I think we should do
- Here's why
- Here's what we should keep our eye on
- Now talk to me

Stations

- Team Leader
- Command
- Belay
- Mainline
- Edge
- Attendent



Communication/Action

- Roll Call
- Position the Load
- Pre-Tension Phase
- Move Phase

Conclusions

A scenic view of a snow-capped mountain range under a clear sky, with a dense forest of evergreen trees in the foreground. The mountains are rugged and covered in white snow, with some rocky outcrops visible. The sky is a pale, clear blue. The foreground is filled with the dark green, pointed tops of many evergreen trees, creating a silhouette effect against the lighter background.

- NPS is in command
- Take off the Guide hat
- Paint a clear picture
- Be flexible and understanding

QUESTIONS?

