
SAFETY
ALOFT!
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Safety Aloft
Overview

1. The 1997 ASTA/ISTA Safety Forum
2. The Two Surveys: ‘97 & ‘13
3. Incidents/Accidents while Aloft
4. Regulations: What our vessels/organizations are required to do to prevent accidents and manage risk.
5. The Physics of Falling (and stopping)
6. Policies, Procedures, & Training
7. Safety Equipment and Gear

ASTA/ISTA Safety Forum 1997

Presenting: Capt. Tim O'Brien USN (Ret.)
Capt. Manfred Hovener
Captain Chris Baranowski
Captain Frank Scott

"We can do a better job of protecting our sailors that go aloft".

- **Modifications to the rig to minimize risk**
- **Comprehensive policy and standing orders for going aloft or on the bowsprite.**

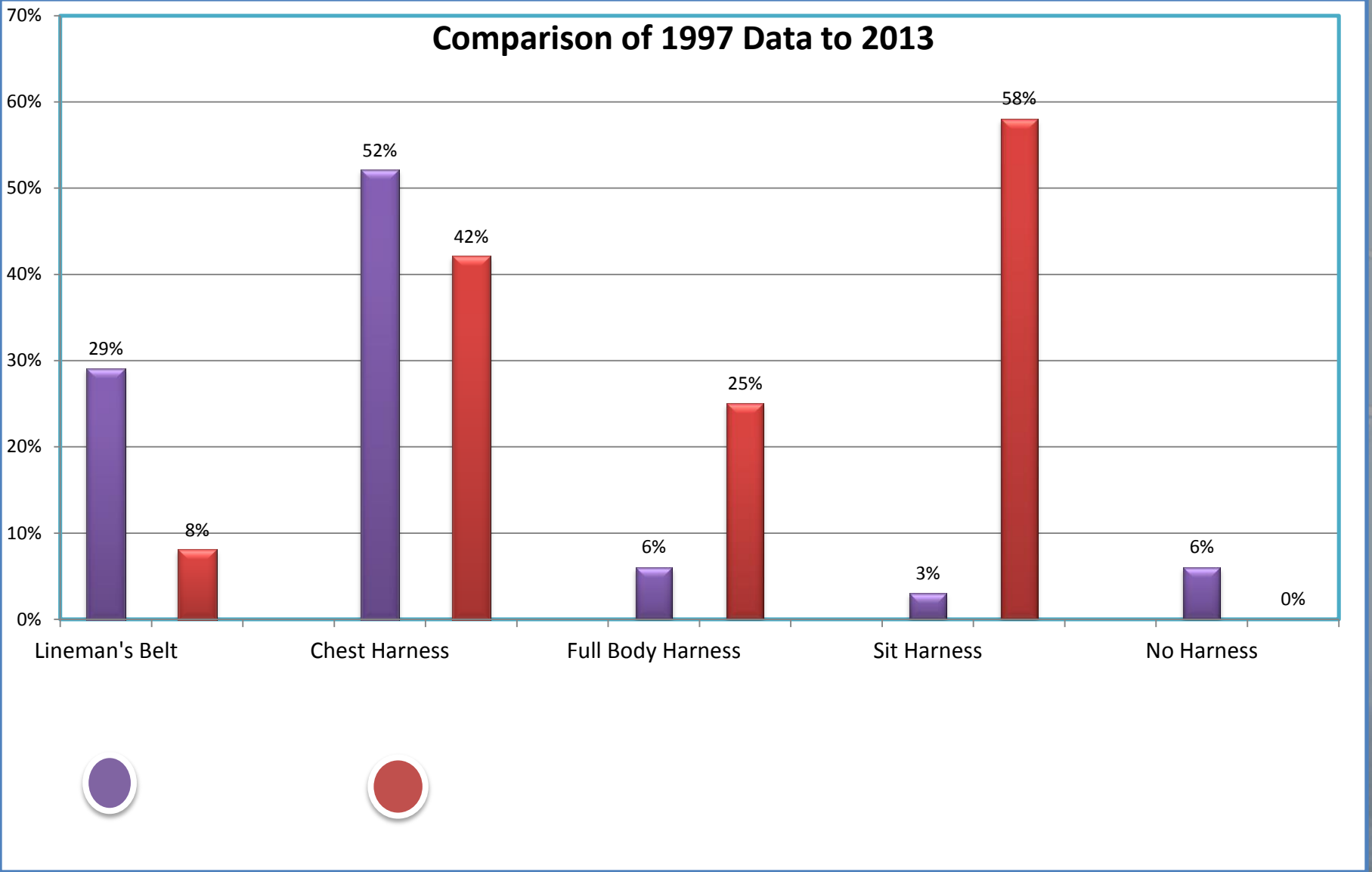
Specifics regarding safety aloft: Futtock shrouds, lubber's holes, jacklines, harsnesses, skylarking, experience, fitness/health

ASSESSING RISK

Likelihood of Harm	Severity of Harm		
	Slight Harm	Moderate Harm	Extreme Harm
Very Unlikely	Very Low Risk	Very Low Risk	High Risk
Unlikely	Very Low Risk	Medium Risk	Very High Risk
Likely	Low Risk	High Risk	Very High Risk
Very Likely	Low Risk	Very High Risk	Very High Risk

Maritime and Coastguard Agency Code of Safe Working Practices for Merchant Seamen (2010)

Survey Results



What is the vessel type? Fore and Aft rig = 42%
Square Sail Rig = 58%

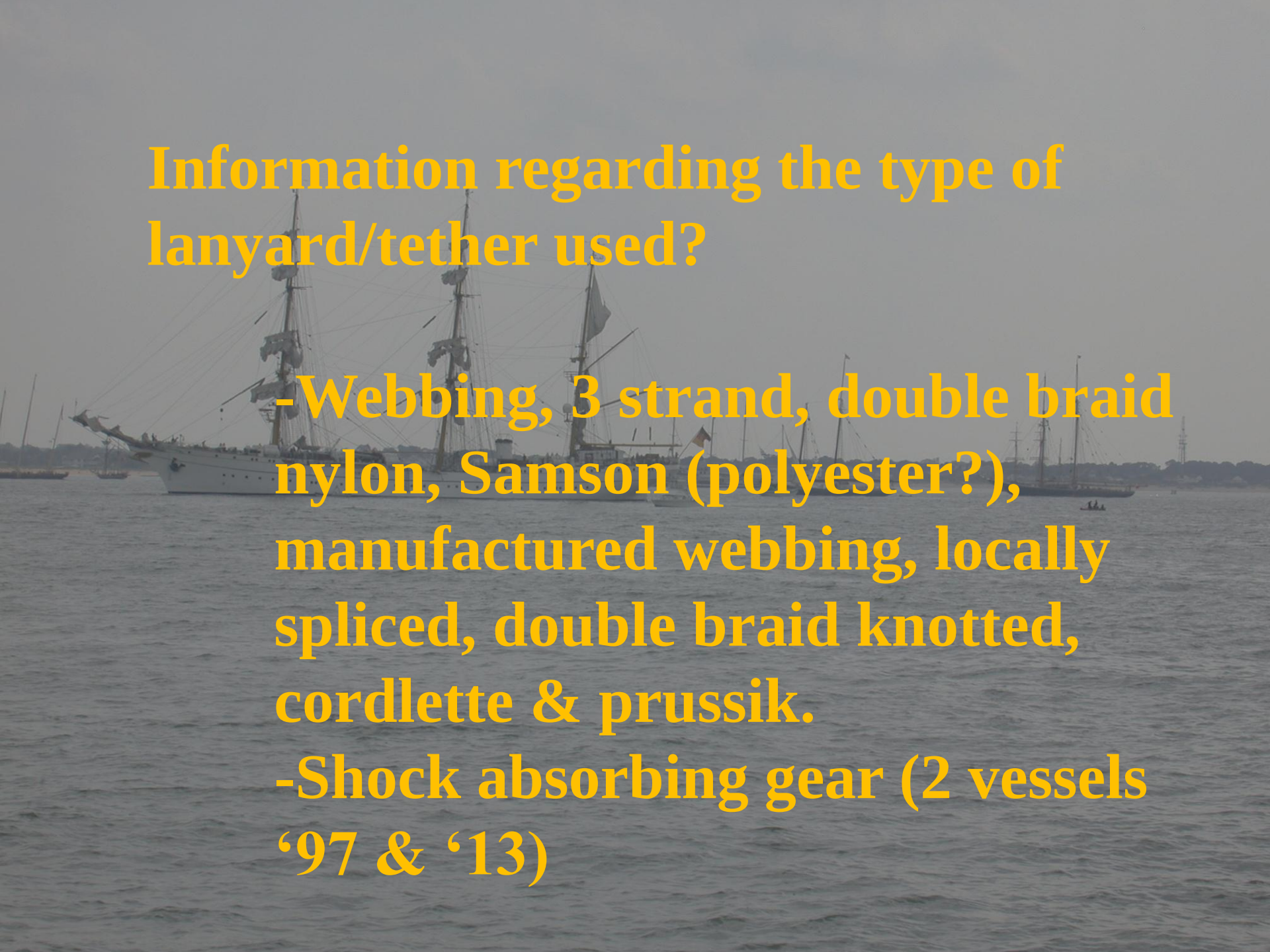
How many tethers are used with the harness? 1 = 58%
2 = 42%

Is a fitness test required before going aloft? Yes = 42%
No = 58%

How are crew and students trained for going aloft?

Written policy and procedure for professional crew 58%

On site briefing/training prior to going aloft. 100%



Information regarding the type of lanyard/tether used?

-Webbing, 3 strand, double braid nylon, Samson (polyester?), manufactured webbing, locally spliced, double braid knotted, cordlette & prussik.

-Shock absorbing gear (2 vessels ‘97 & ‘13)

Falls from Aloft: (Fatalities)

Appledore II (Camden, Me & Key West, FL – January 2012)

Gorch Fock (German) – November 2010

Star of India – July 2010

TS Royalist (UK) – May 2010

Alabama – July 2006

Constitution – July 2004

TS Albatross (Dutch) – August 2004

USCG Eagle – June 1998

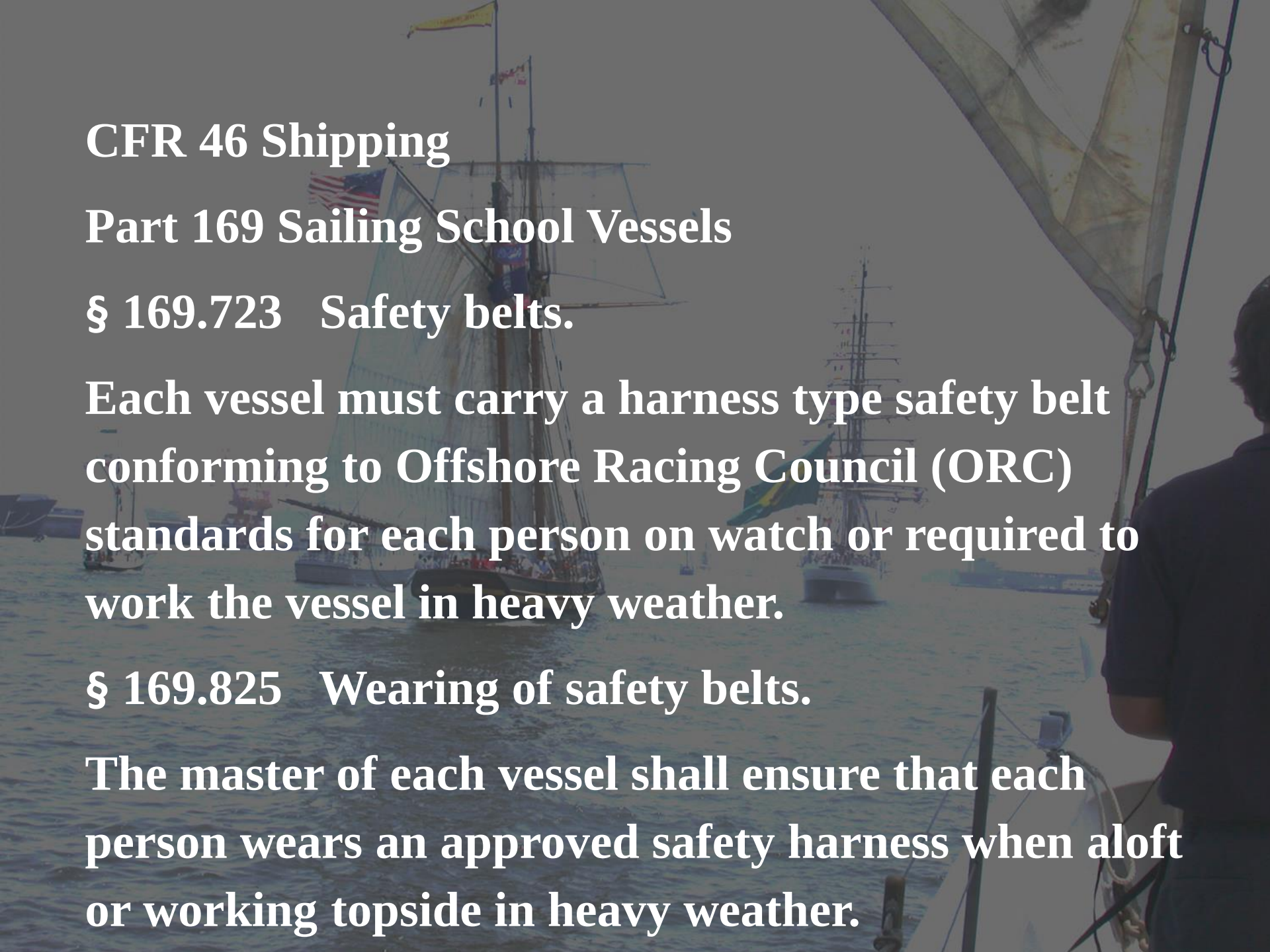
Regulations

Who regulates working at heights on our vessels? USCG (see MOU – USCG/OSHA)

1. **National Maritime Occupational Health and Safety regulations**

2. **Code of Safe Working Practice for Seafarers**

3. **Relevant national standards for equipment**



CFR 46 Shipping

Part 169 Sailing School Vessels

§ 169.723 Safety belts.

Each vessel must carry a harness type safety belt conforming to Offshore Racing Council (ORC) standards for each person on watch or required to work the vessel in heavy weather.

§ 169.825 Wearing of safety belts.

The master of each vessel shall ensure that each person wears an approved safety harness when aloft or working topside in heavy weather.

NVIC 3-92 (Occupational Health Hazards)

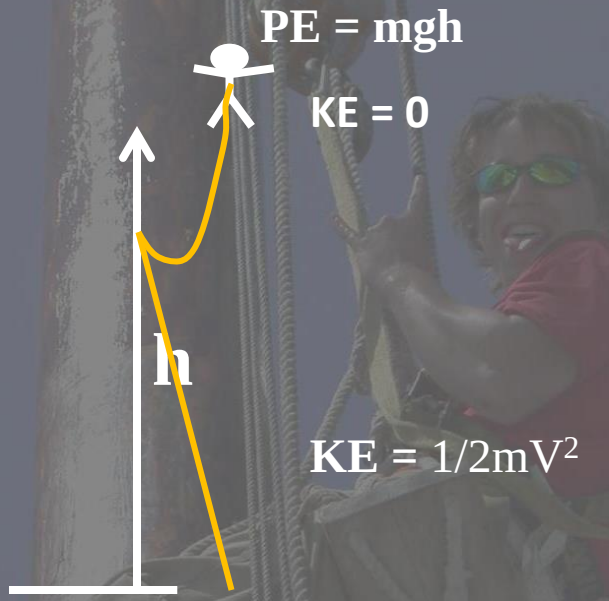
IV.B.3. Safe work practices

a. Personnel to be trained. Each vessel owner/operator needs to provide training in safe work practices to all personnel conducting hazardous job tasks or working in hazardous locations.

Body Belts

- **As of January 1, 1998, use of a body belt for fall arrest is prohibited by OSHA**
  - **Damage to spine and internal organs**
  - **Average tolerable suspension time is 90 seconds**
  - **Maximum of only 900 pounds of arresting force**

THE PHYSICS OF FALLING (AND STOPPING!)



KE = $1/2mV^2$

Impact velocity (Stopping velocity)
$V = \sqrt{2gh}$

KE converts to W (work)

W = Fd

d = distance traveled after impact
or, the stretch in the system – static/dynamic

If an object of a certain mass (in kg) is dropped a specific height (in m) it will reach a determined velocity (m/s) due to the acceleration of gravity (g), developing a kinetic energy (KE) just prior to impact or being arrested, as in falling tethered to a fixed anchor.

This alone does not inform us of the force generated until we factor in the distance (d) traveled after impact (coming up short on the tether).

Applying the work-energy principle we can calculate that force (F) = work(W)/d

170 lb. crew (77 kg)

6 ft. tether (1.83 m)

10 ft. fall (3.048 m)

5 in. stretch in gear (.13 m)

Will generate a force of -

3983 lbs. **18 kN**

1806.7 kg

Consider your safety system:

- **Harness**
- **Tether**
  - **Static or Dynamic (effects d)**
  - **Decelerator/Absorber (increases d)**
- **Clips**
- **Anchor Points:**
  - **Vertical Wire (potentially increases h)**
  - **Horizontal Wire (CAUTION!)**

(6) Horizontal lifelines may, depending on their geometry and angle of sag, be subjected to greater loads than the impact load imposed by an attached component. When the angle of horizontal lifeline sag is less than 30 degrees, the impact force imparted to the lifeline by an attached lanyard is greatly amplified. For example, with a sag angle of 15 degrees, the force amplification is about 2:1 and at 5 degrees sag, it is about 6:1. Depending on the angle of sag, and the line's elasticity, the strength of the horizontal lifeline and the anchorages to which it is attached should be increased a number of times over that of the lanyard. Extreme care should be taken in considering a horizontal lifeline for multiple tie-offs. The reason for this is that in multiple tie-offs to a horizontal lifeline, if one employee falls, the movement of the falling employee and the horizontal lifeline during arrest of the fall may cause other employees to fall also. Horizontal lifeline and anchorage strength should be increased for each additional employee to be tied off. For these and other reasons, the design of systems using horizontal lifelines must only be done by qualified persons. Testing of installed lifelines and anchors prior to use is recommended. (OSHA Personal Fall Arrest Systems - Non-Mandatory Guidelines for Complying with 1926.502(d)

Policy, Procedure, and Training

Policy (required):

- **Introduction/Overview (square rig or fore & aft?)**
- **Safety**
- **Training and Certification for going aloft:**
  - **Crew**
  - **Trainees/students**
  - **Fitness**
- **Rules for laying aloft or on bow sprit**
- **Specifics for the type of rig and vessel safety systems**
  - **Working on yards, futtock shrouds, crosstrees.**

Safety Gear and Equipment

Harnesses

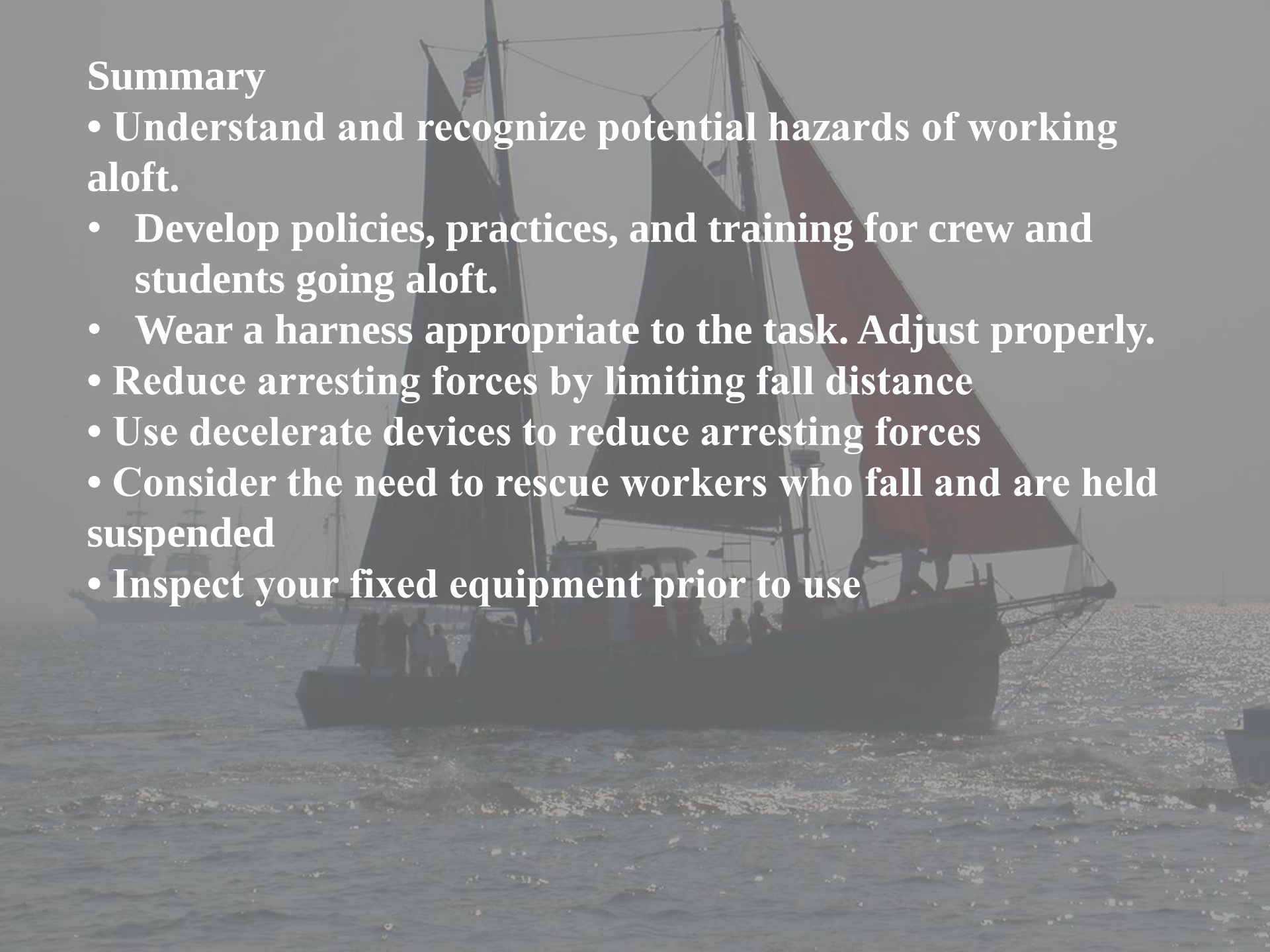
Tethers and Clips

Anchors

Fall Protection Equipment Inspection

- Inspect before every use
- Cuts, tears, abrasions, stitches coming ou
- Cracks or burrs
- Parts move freely
- No alterations
- Appropriate labels
- Periodic inspections should be done on fixed

fall protection systems (record)



Summary

- **Understand and recognize potential hazards of working aloft.**
- **Develop policies, practices, and training for crew and students going aloft.**
- **Wear a harness appropriate to the task. Adjust properly.**
- **Reduce arresting forces by limiting fall distance**
- **Use decelerate devices to reduce arresting forces**
- **Consider the need to rescue workers who fall and are held suspended**
- **Inspect your fixed equipment prior to use**