

Emergency Visual Signaling Devices (flares)

Cruising Club of America and New York Yacht Club
Safety at Sea program



Background:

The Cruising Club of America jointly with the New York Yacht Club conduct the US Sailing sanctioned “International Offshore Safety at Sea with hands-on training” courses 6 or 7 times annually for more than 350 students a year. This experience allows us to accumulate observations on how equipment performs, and field questions students have about equipment.

An area that generates a good deal of questions from participants is emergency signaling, particularly flares. We observe the use of hundreds of flares of all types each year. This paper shares our observations in an effort to provide sailors with best, current guidance that we can offer. This represents our opinions and we welcome feedback to improve this paper.

This paper is **focused on sailing offshore**, not inland or coastal waters.

To keep in mind: Far and away **the most effective means of signaling when the sun is visible, and a vessel or aircraft is in sight is a signal mirror** or anything that can reflect the sun. This is particularly effective for signaling aircraft.

Requirements for carrying flares

United States requirements:

“Recreational boats 16 feet and over used on coastal waters or the Great Lakes are required to carry a minimum of either 1) three day and three night pyrotechnic devices, 2) one day non-pyrotechnic device (flag) and one night non-pyrotechnic device (auto SOS light) or 3) a combination of 1) and 2).”

Distress Signal	Day	Night
USCG red handheld flare (500 candela)	X	X
SOLAS red handheld flare (15,000 candela)	X	X
USCG red parachute flare (20,000 candela/400 ft)	X	X
SOLAS red parachute flare (30,000 candela/1,000 ft)	X	X
Red Meteor flare (10,000 candela/100 ft)	X	X
Combination flare and smoke	X	X
Hand orange smoke (50 seconds)	X	
Floating orange smoke (5 minutes)	X	
SOLAS floating orange smoke (3 minutes)	X	
SOLAS floating self-activated orange smoke (15 minutes)	X	
Distress flag	X	
Electric S-O-S distress light		X

Since flares are approved for both day and night use, carrying three flares meets the US requirements.

Note that both SOLAS and USCG approved devices meet the US requirements but only SOLAS devices meet the international SOLAS requirements. Pyrotechnic signals expire 42 months after the date of manufacture.

Canadian requirements:

“Recreational vessels more than 9 metres (29’ 6”) in length, if they have a VHF radio or an EPIRB, are required to carry a total of 6 flares (no VHF radio or EPIRB, 12 flares) that can be: 1) rocket parachute flares (formerly “Type A”), 2) multi-star flares (formerly “Type B”), 3) hand flares (formerly “Type C”), or 4) smoke signals (formerly “Type D”). Not more than 50% smoke signals are allowed. Flares must be less than 4 years old and approved by Canada.”

Other requirements for flares:

World Sailing’s Offshore Special Regulations (OSR) and US Sailing’s Special Equipment Regulations (SER) require 4 red SOLAS handheld flares and 2 SOLAS orange smoke flares. The requirement for parachute flares has been removed, which we very strongly disagree with.

US offshore races like the Newport Bermuda Race generally follow the OSR’s or SER’s. For example, the requirement for the Newport Bermuda Race is 4 red SOLAS hand-held flares and 2 orange smoke flares.

Our recommendation:

- 4 SOLAS red rocket parachute flares
- 4 SOLAS red hand-held flares
- 2 SOLAS orange smoke signals

Exceeds US, Canada, & race requirements

We recommend only SOLAS flares for offshore. USCG approved flares are suitable for inland waters but not for offshore. USCG approved flares’ intensity, effectiveness, reliability (particularly the striker mechanism), and production of hot, dripping slag make them undesirable offshore and significantly less effective than SOLAS flares. A set of SOLAS flares costs approximately 30% more than a similar set of USCG approved flares.

Our top priority is the SOLAS red rocket parachute flares. We have fired/used over 400 parachute, 400 hand-held, and many of the other types of flares in the last 18 months. Based on our experience and reports from vessels where flares played a role in emergencies, there is no comparison to the effectiveness of the parachute flares. In our training sessions, every volley of parachute flares results in numerous emergency 911 calls to the local police and calls to the USCG. Rarely do hand-held flares result in emergency calls and smoke signals never do. The

1,000-foot altitude of the SOLAS parachute flares and the 45 second burn time make them far more effective in alerting others than any other type of flare.

The red hand-held flares and orange smoke signals are potentially useful and are on our list to meet USCG, Canadian, and/or race requirements. Our recommendation exceeds the requirements of both countries and the offshore races.

The newly USCG approved two color electric S-O-S distress light bears consideration because of its duration – at least 2 hours and advertised 8 or more hours. Note that electric distress lights only meet the night signal requirements, so we recommend that if you select one of these that you add it to our recommended list and do not subtract anything from the list. The red parachute flare is always primary in our opinion because of the range of its visibility due to the altitude it reaches.

Desired characteristics of SOLAS flares

“Intuitive” and easy to use:

We think that if you need to use emergency signals, the situation may be urgent and in an adverse environment. We can easily imagine a crew member assigned to use flares in the dark in an emergency. In this situation it is vital the flares be as intuitive as possible.

The problem we always observe is that the instructions for all flares of all manufacturers are printed on the flare in small print or small diagrams. Many brands have red or yellow colored print. This makes it difficult to read under good conditions and very difficult or impossible to read at night or by a person who needs reading glasses.

There are two challenges. First, which end of the flare do you hold? Second, how do you ignite or launch the flare?

The best solution we have seen to make it easy to figure out which end of the flare to hold is shown in figure 1. PainsWessex’s design of their MK8A parachute red rocket flare and their MK8 hand-held red flare have an obvious hand grip which makes it almost certain that even someone that has never seen the flare before will grip the correct end. In our experience no other brand compares in this regard. Obviously the user needs to understand that you must point the end without the handgrip away from yourself.



Figure 1 PainsWessex MK 8A red rocket parachute flare (top) and MK 8 red handheld flare (bottom).

It follows that all flares in your kit should be the same brand. Having a mixture of brands just adds to the complexity when you really need simplicity.

PainsWessex flares, based on our experience, have the additional advantage of having the easiest to use, most foolproof, and most reliable trigger mechanism. For both the parachute and hand-held flare, the user unscrews a red plastic cover exposing a small red ball on a string. The user simply pulls the string to ignite/fire the flare. An additional advantage of this mechanism is that the pulling motion is in line with the long axis of the flare, so pulling the trigger string is unlikely to cause the user to point the flare in an unintended direction as it fires. (see next section)

How to use flares and smokes

Hand-held flares: As SOLAS hand-held flares burn, they create an extremely hot metal tube. They produce no slag that can burn a life raft (USCG approved hand-held flares drip hot slag), but the red-hot metal tube certainly would damage a life raft or severely burn a person. Occasionally the end of the handgrip closest to the hot tube may start to smoke or even have small flames at the end of the time the flare burns. We recommend that the user wear a welding glove to hold the flare. Throw the expended tube overboard immediately.

Smoke flares: SOLAS smoke flares are in a metal can. After triggering the smoke flare, throw the can in the water. Do not hold the can.

Rocket parachute flares: The primary element that makes the rocket parachute flare so effective is the altitude it achieves, nominally 1,000 feet, which gives it the longest range of visibility by far. We observe three problems. PainsWessex flares eliminate all three problems.

1. Problem #1: The trigger mechanism requires the users to exert force not in line with the long axis of the rocket causing the launcher to tilt to the side as the rocket is launched and the rocket does not go straight up to achieve maximum altitude. The force of the user

pulling the trigger string on PainsWessex flares is in line with the axis of the flare which avoids this problem.

2. Problem #2: The user attempts to use a complex method of holding the rocket parachute flare that most often results in not pointing the flare straight up for maximum altitude. These methods of holding the flare seek to avoid item #3 below or are an effort to ensure the user does not point the rocket at someone or themselves. We have found that users who simply hold the PainsWessex parachute rocket flare vertically above themselves allowing them to pull the trigger string downward have almost universal success in achieving maximum altitude of the rocket.
3. Problem #3: Some brands of parachute rocket flares occasionally allow a small amount of hot particles to escape from the bottom of the launch tube. This is hazardous if it lands on your scalp or in your eyes. PainsWessex parachute rocket flares do not have this problem.

In summary, we observe the best overall performance with PainsWessex rocket parachute flares. The user should hold the flare vertically above themselves being sure to point well clear of sails and rigging. Fire the flare for maximum altitude. You do not need to worry about the flare drifting back down on your boat if you shoot it straight up.



Figure 2 Launching a PainsWessex rocket parachute flare

In the figure 2, the flare is being held in the person's left hand. Note that the person's right hand is directly below the flare (in line with the flare's long axis) after pulling the ball & string trigger mechanism. This alignment prevents the action of pulling trigger from causing the flare to go somewhere other than straight up. This is a unique advantage of this manufacturer's trigger mechanism.

Other considerations

Is the flare likely to be seen? Obviously, the flare is only effective if there is another vessel or aircraft that can see it. Since you have a limited supply of flares, you want to use them when there is a probability they will be seen. AIS can be a big help for this. This is another good reason why we very strongly recommend that all boats offshore have AIS that transmits their position and that they operate it continuously in that mode.

Storage of flares:

- We strongly recommend that flares be stored in a waterproof container. This is critical if you choose USCG flares rather than SOLAS flares. USCG flares use a striker arrangement rather than a trigger. The striker is simply a large match and like a match, if it gets damp it is likely to not work.
- We recommend a pair of leather welding gloves be stored in the container with the flares.
- We recommend that as flares expire, they be stored in a separate watertight container that is labeled “Expired” or “Outdated”.

We use expired flares for our training courses. We have found that flares that are 4 or 5 years out of date will work just fine. We observe an increasing number of problems as the flares get older than 5 years past their expiration date. Therefore, we recommend that as your flares expire, move them to the expired storage container until the next set of flares expire. Then discard the old flares and move the newly expired flares to the expired storage container, and so on.

Disposal of old, expired flares: Fire departments, police stations, and most marinas do NOT accept expired flares. The only reliable way we have found in the US Northeast to dispose of flares is to take them to a vendor that repacks life rafts and/or sells you the new flares. We recommend that you do not buy new flares unless the vendor takes back the expired flares for disposal.



Figure 3 Watertight flare storage box with welding gloves and our recommended 4 SOLAS rocket parachute flares, 4 SOLAS handheld flares, and two SOLAS smokes. A container for expired flares is also shown.