



# MARINE FLARES

This factsheet covers marine flares, a type of pyrotechnic device that can be used by recreational and commercial vessels as a visual distress signal. These devices are often required to be kept onboard under Coast Guard regulations, but due to the limited shelf life and infrequent use there are large numbers of expired devices that are difficult to dispose of properly. This factsheet addresses hazards and disposal issues, alternatives, and policy recommendations.

## DEFINITIONS

**Visual Distress Signal (VDS):** a device intended to attract attention in a boating emergency, and to help pinpoint the boater's exact location. VDS should be displayed only when immediate or potential danger exists.

**Pyrotechnic VDS ("marine flares"):** a VDS that uses a chemical reaction to produce a brilliant light or colorful smoke. Primary ingredients may include strontium nitrate (which provides the color—it burns with a bright red or orange-red flame), potassium perchlorate or potassium nitrate (as powerful oxidizer, which makes the strontium burn rapidly), and/or an energetic fuel such as magnesium (which burns very brightly) or aluminum is added to give the extra energy needed for a fast combustion.

**Electronic VDS:** battery-operated VDS (see picture example)

## DISPOSAL ISSUES AND HAZARDS

There are a very large number of marine flares in circulation, and consequently a large number of expired flares in need of proper disposal. According to the US Coast Guard, there are more than 10 million registered vessels in the Coastal States and Great Lakes, many of which are required to carry VDS, with some specifically required to carry the pyrotechnic variety (see regulations sidebar). With a combined carriage requirement of more than 30 million current flares- not including expired flares that boaters also carry- and as handheld flares are commonly sold in four packs, the number is probably closer to 40 million flares in circulation at any given time.

Because they have a relatively short shelf life of 36-42 months under Coast Guard rules, and may not be discharged in a non-emergency situation, the vast majority will expire unused.

Marine flares contain strong oxidizers that can pose significant risks to human health and the environment, with potassium perchlorate being of most concern. A Rhode Island Department of Health study found that a single improperly disposed of flare can contaminate up to 240,000 gallons in a drinking water source with perchlorates. Strontium nitrate and strontium peroxide are listed on the EPA's Toxic Substance Control Act Inventory List, potassium nitrate and potassium perchlorate are known irritants, and other ingredients, such as strontium nitrate, may also have an adverse impact on water quality.

## DISPOSAL

Due to the lack of disposal options many boaters just store them indefinitely, or throw them overboard, or in the trash. Marinas or other boat storage facilities often get stuck with illegally dumped boat owners' expired flares due to lack of disposal options. Several factors contribute to the disposal difficulties:

- They are classified as hazardous waste in many states, and illegal to dispose of in the trash and thus must be taken to an approved hazardous waste collection site. However appropriate sites are not available in many areas.
- They are regulated as explosives, so safe and legal handling requires extensive expertise.
- Some HHW programs will accept marine flares, but many do not. This may be due to cost, permitting restrictions, or other limitations. (In some areas local/regional fire or law enforcement authorities will manage them.)
- It is not legal to intentionally discharge them when not an emergency (but many boaters probably do so as a way to dispose of expired devices, which has resulted in significant problem with the wasted resources of unneeded emergency responses)
- For end disposal- according to a US Coast Guard report from 2014, there are only two facilities nationwide that are EPA approved and can safely incinerate and destroy expired flares.
- For Commercial vessels there is no record keeping required to document their disposal practices.



## COST

Proper disposal is costly.

- Storage prior to disposal requires expensive equipment. Storage requirements may vary based on local fire marshal rules, but typically expired flares must be stored in an ATF-approved class 4 magazine (see 27 CFR 555.11) SEE PICTURE
- Transportation is expensive. The US Department of Transportation (DOT) defines aerial and marine flares as explosives, Hazard Class 1.2 Explosives (with a projection hazard) for aerial flares, and Hazard Class 1.4 Explosives (with no significant blast hazard) for other varieties. To comply with DOT regulations it may be necessary to sort flares into different categories, though a special permit is available through US DOT that provides an exemption to this requirement. A 2014 report quantified transportation costs in the \$2000- \$4000 range per load
- Disposal costs: Contractor costs for incineration runs from \$3.00 to \$6.00 per unit – this does not include collection, storage, or transportation.
- Total disposal costs can be \$25 to \$50 per unit, significantly more than the purchase price.



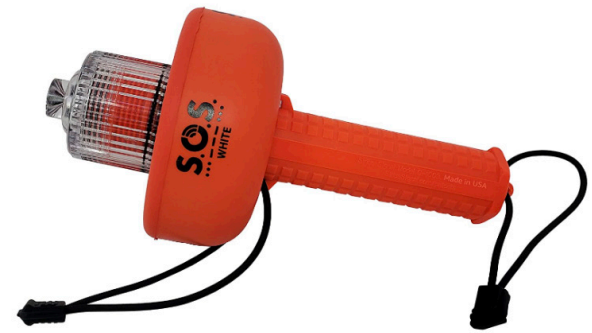
### U.S. COAST GUARD (USCG) REQUIREMENTS, (33 CFR PART 175 SUBPART C):

Boaters are required to carry Visual Distress Signals (VDS) if they are or will be operating on U.S. coastal water, the Great Lakes, territorial seas, as well as those waters that directly connect, up to a point where the waterway is less than 2 miles wide.

- Recreational boats 16 feet and over must carry a minimum of either: option 1) three day and three night pyrotechnic devices, option 2) one daytime non-pyrotechnic device (black square and black circle pattern on an orange flag) and one nighttime non-pyrotechnic device (SOS pattern flashing light in either ALL WHITE or, the NEW REVISED (2019) 2 COLOR (red-orange/cyan flashing light) or option 3) a combination of option 1) and option 2).
- Recreational boats less than 16 feet need only carry night visual distress signals when operating from sunset to sunrise.
- Commercial fishing boats, fishing charters, ferries, and other types of documented vessels may be required to carry pyrotechnic devices including handheld flares, aerial rocket flares, parachute flares, and smoke signal. They may be required to carry up to 12 flares, depending on vessel type and area of operation.

## ALTERNATIVES AND POLICY RECOMMENDATIONS

Because of the problems detailed above, NAHMMA believes that the best and most cost-effective option is to phase out the pyrotechnic VDS, for all applications that allow LED-based signals under Coast Guard rules.



### NAHMMA ADVOCATES:

- Ending the sale of marine flares, to remove the threat of fire on boats due to their use, prevent toxins from entering the environment, and reduce the difficulties boaters encounter when seeking a proper disposal option.
- Robust promotion of the safer, USCG approved battery-operated VDS. These are LED based, and are now widely available. They do not expire or need to be replaced. There is no risk of being burned by them, they can float and still produce light, and can be used many times. They are required to last at least 20 hours, but many will last much longer. (Note that they operate through the use of regular batteries which must be checked and replaced regularly according to the manufacturer's instructions or after the unit has been used.)
- Supporting collection and disposal of existing marine flares. This would entail providing convenient disposal locations, proper storage prior to shipping, and disposal at an EPA-permitted incinerator. A bounty on expired flares is one tool that could be used to enhance collection.
- Consider an extended producer responsibility (EPR) approach while a ban is phased in. This would focus on: 1) educating consumers on to the hazards of pyrotechnic marine flares and the availability of safer alternatives; 2) increasing convenient collection of pyrotechnic marine flares; and 3) providing funding for safe collection and end-of-life management for all types of VDS. Funding and collection should continue after the ban is in place. The program would include manufacturers of LED-based signals, with differing costs based on end of life management costs.



### A 2014 US Coast Guard/Worcester Polytechnic Institute report, "Disposal of Pyrotechnic Visual Distress Signals", concludes with a four part recommendation:

- Motivating boaters to bring expired flares to local collection sites
  - Storing flares safely at those sites
  - Transporting them legally and economically to EPA-approved incinerators
  - Disposal via incineration
- More info at: [web.wpi.edu/Pubs/E-project/Available/E-project-121714-192922/unrestricted/USCG\\_Final\\_Report.pdf](http://web.wpi.edu/Pubs/E-project/Available/E-project-121714-192922/unrestricted/USCG_Final_Report.pdf)