NC Division of Marine Fisheries

Small Vessel Flooding Control

rev. 02-2024

- https://www.youtube.com/watch?v=j9_TalckMmk&t=81s

Objectives

1. Identify major causes of flooding and how to avoid them

2. Name 4 important tools in a damage control (DC) kit

3. List the 3 ways to reduce flooding

4. Demonstrate skills in DC trailer

Are you prepared?

- The best way to prevent a sinking boat is by being a prudent Captain.
- Before departing port, always check your weather forecast and sea/swell forecast.
- If you are ocean bound, slowly approach your inlet and observe the tide and wind direction. Are they fighting one another? Can you define a safe departure to sea?
- Are my plugs in? Has my engine been serviced? Do I have an EPIRB? Are my batteries charged? Does the boat have sufficient fuel? Does my radio work? (radio check) Have I notified others of my trip and when I expect to be back?
- Do I have emergency equipment (PFD, DC Kit, First Aid bag, EPIRB and all certified coast guard safety materials)

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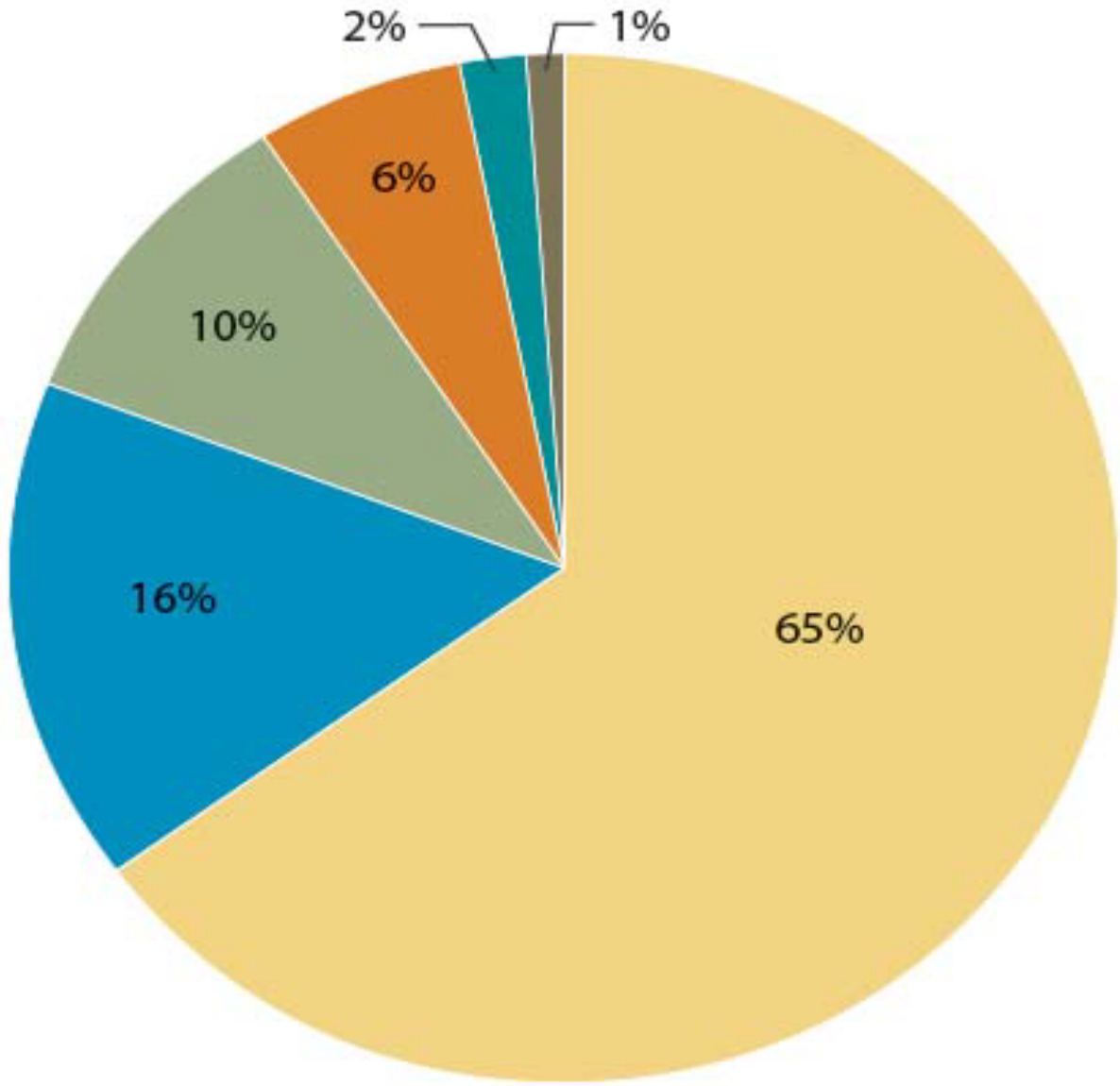
Causes of Flooding (Source: Boat USA, USCG)



Equipment Failure: 65% (wear & tear 80%, mechanical/electrical 19%, manufacturer defects 1%)

Collisions: 16% (striking submerged objects 59%, collisions with objects 19%, collisions with other boats 15%, wakes 4%, groundings 3%)

Acts of Nature: 10% (wind 31%, hurricanes/storms/tornados 28%, flooding 17%, ice/freeze 16%, snow accumulation 7%, lightning 1%)

Fire/Explosion: 6%

Water Damage: 2% (partial sinkings, waves)

Vandalism/Theft: 1%

How to Minimize Chances of Flooding Scenarios

1. Good housekeeping
2. Close all hatches, plugs, etc.
3. Know how your vessel handles and be alert to changes in handling
4. Minimize free surface effect (water, fish, fuel)
5. Beware of following seas
6. Do not correct listing problems using trim or moving weight on boat if you do not know the cause
7. Know how much weight your boat can handle and adjust depending on weather
8. Always monitor weather and water conditions

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Gallons per minute trivia

- How many gallons of water per minute will enter a 1" hole that is 1" deep?
  - 20 gallons per minute
- 2" hole at 1" deep?
  - 79 gpm
- 3" hole at 2" deep?
  - 250 gpm
- 4" hole at 4" deep?
  - 628 gpm

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Flooding Rates for Round Openings (gallons per minute)

	1" Hole	1.5"	2"	2.5"	3"	3.5"	4"	6"
1" Deep	20	44	79	123	177	241	314	707
2" Deep	28	62	111	174	250	340	444	1000
3" Deep	34	77	136	213	306	417	544	1,224
4" Deep	39	88	157	245	353	481	628	1,414
5" Deep	44	99	176	274	395	538	702	1,581
6" Deep	48	108	192	301	433	589	770	1,731
7" Deep	52	117	208	325	468	636	831	1,870
8" Deep	56	125	222	347	500	680	889	1,999
9" Deep	59	133	236	368	530	722	942	2,121
10" Deep	62	140	248	388	559	761	993	2,235

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Types of Hull Breaches

1. Structural Breaches:
   - Grounding
   - Collisions
   - Hull failure from delamination, broken stringers, or poor design

2. Equipment Failures Below the Waterline:
   - Deck drains
   - Pumps
   - Seacocks
   - Scuppers
   - Stuffing Boxes
   - Through hull fittings
   - Water intakes for engines, generators, or bait wells

Signs of Flooding or Leakage

- Every gallon of seawater weighs 8.5 pounds
- Vessel becomes sluggish
- Vessel is harder to steer
- Vessel begins to list
- Vessel behaves differently

Assess the Damage

1. Alert crew & be sure they are ready to abandon ship if necessary
2. Don PFDs
3. Is it a small leak or a flooding situation?
4. Do you have any pumps? If so, can they keep up with the flooding?
5. Make MAYDAY or PAN-PAN calls as needed
6. Begin damage control

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How to make a May Day call

- **Turn on your VHF radio, and make sure you are on station #16**
- **Say the name of the vessel or NC number and call Mayday clearly 3 full times**
- **Look at your chart plotter and give the coast guard your position**
- **Report the nature of your emergency and all relevant info (are you adrift? Can you safely anchor? Can you predict which way you are drifting? Are any other vessels nearby?)**
- **What kind of assistance do you need? Is it urgent? Do you feel lives are in danger? How much time do you have?**

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Stop the Flooding

- Time is of the essence
- Stop forward motion of the vessel (if appropriate)
- Shift weight to elevate the leak if you can do so safely
- Turn off any electrical items that may cause a shock hazard
- Use the items in your kit to stop or minimize leakage or flooding
- Use items in combinations such as cloth or neoprene wrapped around wedges or plugs, worm clamps around rubber material, etc.
- Consider beaching or grounding the vessel if you are near land or a shallow area

Three Main Ways to Stop Flooding

1. **PLUG!**
   - Use ANYTHING
   - Much easier if you have DC kit ready to go
2. **CLOSE!**
   - Hatches, door, scuppers
3. **PUMP!**
   - Dewatering pumps > bilge pumps
   - P-5 Coast Guard pump = 240gpm

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Damage Control (DC) Kit

- Every vessel should have a DC kit
- Stored in an easily accessed area
- Crew should be familiar with the kit and how to use each item

Damage Control (DC) Kit

- Wedges
  - Soft wood that swells when wet
- Rubber Plugs
- Rubber/Neoprene Strips
  - Cloth, gaskets, old wetsuits
- Rope
- Rags, clothes, towels
- Scrap Hose
- Putty
- Plastic, nylon, canvas
- Get creative! Tennis balls, plastic bags, balls of duct tape, water bottles, shoes – Anything to decrease water flow helps

Plugs and Patches

Review

1. How can we minimize the chances of a flooding event happening?

2. What is PCP?

3. What is the main objective in using a DC kit?

4. Name 4 components in a DC Kit

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Flooding Control Practice

Occasionally the USCG Flood Training Trailer will be available for DMF employees

This hands-on training allows you to practice with many different plugs and patches in a non-emergency environment

All employees who operate marine vessels are encouraged to participate in this training

Questions?

Practice your flooding and damage control drills

Assess and control the situation

PCP!

Be prepared to abandon ship