

MAY 11 2007

CHAPTER 5 - SHIP STABILITY AND FLOODING CONTROL

SECTION 1 - REQUIRED INFORMATION

- Ref: (a) OPNAVINST 3120.32 Standard Organization and Regulations of the U.S. Navy (SORM)  
(b) NTTP 3-20.31, (series) Surface Ship Survivability  
(c) NSTM Chapter 079, V1, Stability and Buoyancy  
(d) Ship's Damage Control Book  
(e) OPNAV P-03C-01-89, U.S. Navy Cold Weather Handbook for Surface Ships

5100 REQUIRED CHAPTER TAB.

- a. TAB A, Strip Ship Bill
- b. TAB B, Jettison Bill
- b. TAB C, Modified Zebra Bill

MAY 11 2007

c.

(THIS PAGE INTENTIONALLY LEFT BLANK)

**MAY 11 2007**

## SECTION 2 - Required and Available Stability

5200 STABILITY.

a. Every crewmember should be confident in the ship's ability to survive severe weather conditions and massive amounts of damage in moderate sea conditions. For the ship to have its required stability and reserve buoyancy both before and after damage, the following limitations must be observed:

- (1) The limiting drafts specified in reference (d), section II (a), are not submerged before damage.
- (2) There are no excessive or unusual topside weights or deck loads, such as icing.
- (3) The liquid and dry cargo loading instructions contained in reference (d), section II (a), and Damage Control Diagram 1 (Liquid Loading Diagram) are followed.
- (4) A proper degree of watertight integrity is maintained. (Watertight fittings are effectively maintained and personnel are adequately trained to set the required material condition.)

b. The DCA shall determine the ship's stability and complete a draft report at least daily and following any major alteration to the ship's loading. If the liquid and dry cargo loading instructions are followed, only the drafts, trim, and displacement need to be determined. If these instructions are not followed, the DCA must also calculate the position of the center of gravity (KG) and Metacentric Height (GM). All values shall be compared to the acceptable limits prescribed in the reference (d), Section II (a).

5201 PROCEDURES AFTER DAMAGE.

a. Reference (d), section II (a), provides detailed instructions and procedures to be followed in the event of damage. The following is a generic sequence of events:

- (1) Isolate the flooding
  - (a) Set flooding boundaries

MAY 11 2007

- (b) Electrically isolate affected space(s)
- (c) Mechanically isolate affected space(s)

(2) Determine impact of flooding and prioritize de-watering efforts

(a) De-water spaces colored pink on the Flooding Effects Diagram.

(b) De-water spaces which have the greatest Free Surface Effect first.

(c) Use locally prepared stability data cards, if applicable, to assess impact of flooding. May wish to mention the Flooding Casualty Control Software as a means to evaluate stability and assess the impact of flooding.

(3) Evaluate Critical Stability

NOTE: Stability is critical when immediate improvement is necessary to avoid loss of the ship. Stability should be considered critical if any or all of the following conditions exist:

(a) Small or negative metacentric height

1. The ship is lopy, with a slow erratic roll period and a tendency to hang at the end of the roll.

2. The ship has a tendency to list at the same angle to either side.

3. The ship has a list that cannot be accounted for by off-center weight.

(b) Approach or exceed floodable length

1. The extent of flooding approaches or exceeds the maximum amount of flooding tabulated in reference (d), section II (a).

(c) List exceeds danger angle

1. Generally, the ship lists to a static heel more than the danger angle (varies with ship class, consult references (b), (c), and (d)).

**MAY 11 2007**

(d) Heavy winds and seas combined with flooding damage

1. Heavy winds and rough seas are prevailing or are anticipated.

(4) If Stability is Critical (see table 1).

(a) If freeboard is adequate, completely fill those compartments which will improve stability when flooded solid. (Yellow or green compartments on the Flooding Effects Diagram.)

(b) Eliminate free surface effect by de-watering or filling partially flooded compartments. (See Flooding Effects Diagram).

(c) Strike down solid weights, such as ammunition, from upper deck handling rooms to magazines. (See Jettison Bill).

(d) Ballast tanks according to the ship's Liquid Loading Instruction.

(e) Favor stability in the handling and maneuvering of the ship. Limit speed and rudder angle to reduce dynamic forces.

(f) If the ship has a small or negative metacentric height or is approaching or exceeds floodable length conditions, jettison topside weights per Chapter 5 TAB B. This is difficult but urgent. Concentrate on heavy items and plan ahead considering the effect of removing various items.

MAY 11 2007

Critical Thumb Rule	Actions to be Taken
Negative GM	<u>FLB</u> , Eliminate FSE/FCE, Shift Weight Down, Add Weight Low, Remove Weight High (Symmetrically)
Flooding Exceeds Floodable Length	<u>FLB</u> , De-Water, Shore Holes and Bulkheads
List to the Danger Angle	<u>FLB</u> , Determine Cause of List, Correct for - GM, Correct for Off-Center Weight
Damage with Bad Weather	<u>FLB</u> , Maneuver Ship Out of Weather, Repair Damage

Table 1

NOTE: FLB - Flooding Boundary

## (5) Determine and Eliminate unusual List

## (a) List caused by off-center flooding only:

(1) Counter-balance on the high side to reduce the list. Add only that amount that would correct for one-half the list, evaluate the effect of this action and then proceed to correct the list.

## (b) List caused by negative metacentric height only:

MAY 11 2007

(1) DO NOT add weight to the high side to correct for this list. Take action to lower the ship's center of gravity by ballasting low tanks symmetrically, jettisoning topside weight symmetrically, shifting low weight symmetrically, and at all times suppressing free surface effect.

(c) List caused by a combination of off-center loading and negative metacentric height:

(1) First, take all corrective actions listed above to restore positive GM. Second, correct for off-center flooding.

5202 EFFECTS OF FIRE FIGHTING WATER.

a. Fire Fighting water has the same affect on the ship as an equivalent amount of flooding water for any given space, hence, the use of fire fighting water within the ship must used judiciously, particularly if:

(1) Stability is already in jeopardy.

(2) The fire fighting water is being used high in the ship.

(3) Filling the space partially with water negatively contributes to stability.

b. When fire-fighting water is used, it must also be removed. Note: A single 1 1/2 hose can add over 2 tons of water in five minutes to a space. Four hoses working for 30 minutes can add 50 tons to the ship.

MAY 11 2007

5203 PREVENTION.

When in a high threat environment the CO may set Modified Zebra using CHAPTER 5, TAB C.



**MAY 11 2007**

TAB A - STRIP SHIP BILL

See reference (a)

MAY 11 2007

TAB B - JETTISON BILL

See references (a) and (d).

COMNAVAIRFORINST 5400.27D

**MAY 11 2007**

TAB C - MODIFIED ZEBRA BILL

Ship provide insert.

MAY 11 2007

(THIS PAGE INTENTIONALLY LEFT BLANK)