Chapter 1: Introduction and Aim of Work 1.1 Introduction In the midst of a vast expanse of the ocean, ships navigate in a delicate balance between strength and vulnerability. While these majestic vessels conquer the waves, they remain constantly threatened by the risks they may encounter. In the dynamic and unpredictable open sea environment, ships are continuously exposed to potential dangers that can jeopardize their safety and stability. From adverse weather conditions to mechanical failures, the maritime industry faces diverse challenges that require robust strategies to control damages. This is where the crucial practice of ship damage control comes into play. Ship damage control is an essential aspect of maritime operations aimed at minimizing the impact of various types of damages that a ship may incur, whether resulting from accidents, collisions, fires, floods, or other emergencies. Fig. 1.1 Damage due to gunfire. Damage control is the art of mitigating disaster severity. It involves a rapid and decisive response to breaches in the ship's structure, flooding, and countless other risks. It requires discipline and commitment to keep the ship afloat, ensuring the safety of passengers and crew, and keeping the journey afloat despite all adversities. This discipline includes a wide range of skills and knowledge. Imagine surgeons working on giants of steel, combating water ingress with doors and watertight pumps, and halting the flow of fire using firefighting teams and hose systems. Damage control personnel become temporary stability engineers, summoning solutions from metals, woods, and basic tools to repair the massive wounds in the ship's structure. In the context of damage control, specialized teams are trained to handle emergency situations, and ships are equipped with specific systems and gear to prevent accidents and respond to them effectively when they occur. These systems include watertight pumps, protective doors, and firefighting systems, along with crew training to use these equipment efficiently. Overall, damage control is considered a vital part of ship safety management, contributing to enhancing a ship's ability to adapt to changing maritime challenges and ensuring the safety of passengers and crew on board. 1.2 Historical incidents emphasizing the need for effective damage control measures “At the Battle of Midway the carrier Yorktown was badly hit and damaged in the first attack. Her damage was more than what had doomed some of the Japanese carriers, but she had no explosions from fuel and bombs and within an hour and forty minutes she was underway at over 20 knots and could recover and relaunch her planes. When the second attack came in her fires were out and she was steaming so the Japanese planes thought she was one of the undamaged carriers and attacked her again. This attack doomed her, but the damage control efforts after the first attack were incredible. The later American carriers could purge the aircraft fueling systems with inert gas and did much better than the Japanese carriers in this respect. Their damage control was very good. I think no Essex class carriers were sunk in action, though some were badly damaged.” Fig. 1.2 USS franklin damage “Because the USN made damage control one of it’s top priories in crew training and organization. Other navies had different priorities. Crews do what they’re trained to do. In the USN, every time a ship is lost, a board of inquiry was convened to figure out why, and what could have been done differently to save her. If the ship was damaged and saved, they figured out what was done right and what could have been done better. Learning from it’s successes and failures was incorporated into the training and standing orders going forward; it’s something the USN does better than pretty much any other Navy. Every navy is “by the book” to some degree or another; the main differentiation in the USN

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is it's willingness to re-write the book on the fly. The USN (and the US military in general) also has a very strong tradition of empowering lower-level NCOs and even junior enlisted to exercise independent judgement and take personal initiative in an emergency (at least compared to other navies). Most other militaries have a more top-down organization that emphasizes obedience to authority and centralized control over individual initiative. A mid-grade petty officer in the USN often has more authority and autonomy than a junior officer in other navies. The IJN, by comparison, was downright hostile to personal initiative and independent thought." 1.3 Selections from reports on actions of ship damage control "... undoubtedly would have sunk after the first torpedo struck had she not been beached quickly. The remarkable, persistent, and skillful efforts of her entire crew not only saved her, but also most of her cargo, sorely needed at that time.... the inflexible determination of her personnel .. the key to her ultimate survival and return to service." "From the engine room the water entered the shaft alley through a leaky door and through unpacked glands around electric cable, and when the shaft alley was flooded, the water entered the after magazines through an electric cable hole in the deck of the handling rooms." "The ship sank because of deficiencies in watertight integrity, by virtue of the lack of watertight bulkheads on the second deck, and failure of boundaries and fittings elsewhere which should have been watertight but were not." "The ice machine room (on a heavy cruiser) flooded to a depth of about one foot through a door which was improperly dogged, and through an unblanked cable hole." "The performance of the ship in sustaining and successfully combating such extensive damage is gratifying to say the least. The success of damage-control measures indicates thorough preparation both in material readiness and training of personnel." 1.4 Goals of damage control The primary goal of ship damage control is to avoid collisions using any possible means. Damage can occur to the structure, engines, fans, or rudder if the vessel collides with objects such as tree trunks, rocks, docks, or another ship. Damage control is "the action taken to minimize the adverse outcomes of something to the lowest possible extent when it is impossible to completely avoid those adverse outcomes." The three basic Goals of shipboard damage control are: 1. PREVENTION. 2. MINIMIZATION. 3. RESTORATION. 1.4.1 Prevention means to take all practical preliminary measures, such as maintaining watertight and fumetight integrity, providing reserve buoyancy and stability, removing fire hazards, and maintaining and distributing emergency equipment before damage occurs. 1.4.2 Minimization is to minimize and localize damage by taking measures to control flooding, preserve stability and buoyancy, combat fire, and provide first-aid treatment to injured personnel. 1.4.3 Restoration requires regaining a safe margin of stability and buoyancy. The primary duty of the damage control organization is to control damage.Damage control objectives are attained by taking necessary action to do the following: ● Preserve Stability ● Preserve watertight integrity (buoyancy). ● Control list and trim ● Maintain effective segregation of the vital systems ● Prevent, isolate, combat, extinguish and remove the effects of fire. ● Detect, confine, and remove the effects of nuclear, biological, and/or ● chemical attack. ● Assist in the care of injured personnel. ● Make rapid repairs to structures and equipments. So The goals of damage control in maritime operations encompass a comprehensive set of elements, as mentioned with embrace technological advancements. By recognizing these diverse objectives and working towards their achievement, the maritime industry can enhance its resilience, maintain operational safety, and fulfill its

commitment to safety, environmental sustainability, and public trust. 1.5 Responsibilities of the ship's crew to achieve the main goal All members of the ship’s company shouldrealize the importance of their responsibilities.You should think of damage control as anoffensive as well as a defensive action upon whichyour ship’s ability to inflict damage on the enemymay depend. Damage control not only is concernedwith battle damage but also nonbattle damage.This includes damage from fire, collision,grounding, weather, and explosion. Damagecontrol action may be necessary in port as well asat sea and may involve the use of personnel andfacilities from an undamaged ship.Damage control requires a detailed knowledgeof the ship’s construction, characteristics, com-partmentation, and stability, and of apparatusplaced on board to prevent or control damage.Basically, control of damage depends upon theability and the initiative of personnel to takeprompt corrective action, using readily availablematerial. Having a thorough knowledge of theship will enable personnel to take the necessarycorrective action. In summary, the goals of ship damage control are not static; they must evolve to address the dynamic nature of maritime challenges. By implementing the aforementioned recommendations and remaining vigilant in the pursuit of safety and sustainability, the maritime industry can proactively navigate the complexities of the open sea, ensuring the well-being of crews, the protection of valuable assets, and the preservation of our oceans for future generations. Prioritizing and advancing these goals will undoubtedly contribute to a safer, more resilient, and sustainable maritime environment. 1.6 General Preparatory Measures to Restart Flooding Before Damage It has been wisely said that 90 percent of the work of damage control- the important part is accomplished before damage and only about 10 percent after the ship has been hit.Most preparatory work consists of measures taken to toughen the ship to resist flooding. An important first step is for all personnel concerned with damage control to learn what features have been designed into their ship to enable it to resist flooding. The most significant of these features is the extent and type of vessel subdivision. The subdivision or the vessel will determine the extent and type of flooding that can occur and type of corrective measures needed after damage. Certain material preparations are vital in toughening the ship to resist flooding. They include: ● maintaining watertight integrity of the ship's subdivision ● properly setting material conditions of closure ● properly classifying closures and fittings, and ● providing adequate and well-distributed operable damage control equipment So this is the General Preparatory Measures to Restart Flooding Before Damage and make sure you are ready for it. 1.7 Damage-Control Education and Training Accumulating war experience emphasizes that the entire ship's company must be thoroughly educated in damage-control principles and methods, and must be properly trained to act in accordance with them. Action reports continue to illustrate that a ship can be lost because personnel outside of the main damage-control organization fail to employ proper damage-control methods and procedures. All hands, from the Commanding Officer down, must be made thoroughly conversant with all phases of damage control which apply to their own ship. In the ensuing discussion an arbitrary distinction will be made between educational and training activities for purposes of clarity. Educational activities will include such matters as the understanding of damage-control principles, the constructions and facilities of own ship, damage-control measures, and the damage-control organization of own ship. Training activities, on the other hand, will refer to actual damage-control drills. 1.7.1 Programs on a Routine Schedule The

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objectives of education and training cannot be attained unless carefully prepared plans are carried out. Regularly scheduled educational and training programs are necessary. These should be provided for officers and men; for departmental, divisional, and war cruising groups, and for battle station personnel. The programs should be adapted to "in port" and "at sea" (war cruising) operating periods. The damage control officer is responsible for the planning and conduct of this training. He should see that educational and training activities are represented in the ship's daily schedules in accordance with the executive officer's orders. It is recognized that there never will be enough training time during a ship's day for the many activities considered essential and desirable by responsible officers who are trying to bring the ship to its best fighting condition. It is extremely important, therefore, that the most efficient possible use be made of any time available for damage-control education and training. On at least one large ship all gunnery training is scheduled in the morning. The afternoon is given over to damage-control activities. Some similar arrangement can and should be made on every ship. In addition to regularly designated periods, the damage control officer and his assistants can utilize "dead" time throughout any 24 hour day to as great an extent as energy and ingenuity permit. An efficient educational and training program will schedule activities for individuals and groups required to be at certain places during specified periods of time for purposes of readiness only. Further, there are likely to be "gaps" in any ship's daily program. Educational or training activities for personnel who otherwise would be standing by can be provided during these intervals. Attention is invited specifically to the following possibilities: 1. During general quarters, dawn or dusk alerts, target practices, and similar "all hands" evolutions. (For battle station groups, repair parties, etc.) 2. During war cruising condition watches. (For individuals on watches at inactive stations.) 1.7.2 Interest in the program. In planning and carrying through educational and training programs every opportunity should be embraced to arouse widespread interest in them throughout the ship's company. A healthy competitive spirit should be fostered between shipboard groups. War damage reports should be discussed freely. Questions and suggestions from all personnel should be welcomed. General questions concerning damage control should be included in examinations for promotion given to various ratings. Any other measures which tend to promote interest in the damage-control program should be put into effect. 1.7.3 Selection and training of instructors. Successful educational and training programs call for an adequate supply of good instructors. A valuable source of instructional ability exists among the ship's officers and key petty officers. Most instructors will come from the engineering and hull departments, but all departments should provide qualified personnel as required. Fig. 1.3 realism in training. instructors should improve their techniques through study of NavPers 16103, Manual for Navy Instructors. They should be detailed to concentrate upon one or a limited number of subjects. Responsible officers should encourage and assist the instructors in preparing for and conducting their classes and drills. Personnel selected as instructors are thus given opportunity to exercise certain qualities of leadership which might otherwise lie dormant. Inevitably, a conscientious instructor learns more than his pupils. Furthermore, the instructor's fitness for increased responsibilities may be demonstrated by his ability to educate and train others. The requirements of a rapidly expanding Navy demand that officers and men become ready for promotion or advancement, and become proficient in supervising less experienced personnel as rapidly as possible. Acting as instructors in

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damage control is one means to this end.

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