CHAPTER 11

LINE OPERATIONS AND SAFETY

One of the busiest, most important, and dangerous divisions in a squadron is the line division. Upon reporting to a squadron, no matter your rate or paygrade, you may be assigned to the line division. As an Airman, or third class petty officer, you may become a plane captain. A plane captain has many responsibilities in flight operations and the day-to-day maintenance and upkeep of modern aircraft. You will be required to operate support equipment and handle, secure, and service aircraft. You must also be aware of the related safety precautions to reduce personal injury, avoid aircraft and equipment damage, and prevent a loss of operational readiness due to ground accidents. This chapter outlines some of these crucial responsibilities.

LEARNING OBJECTIVES

When you have completed this chapter, you will be able to do the following:

1. Describe the proper procedures for operating ground support equipment near or around aircraft, the safety precautions and hazards involved, and support equipment color identification.
2. Recognize fixed wing aircraft handling procedures to include signaling, spotting, launching, landing, securing, and general safety precautions on board aircraft carriers.
3. Define aircraft handling signals aboard ship, to include those for fixed and rotary winged aircraft.
4. Explain securing procedures of aircraft and support equipment aboard ship, during normal and heavy weather conditions.
5. Identify aircraft-handling accessories.
6. Identify the safety precautions to be followed while handling aircraft aboard a carrier and the persons responsible for safety.
7. Recognize aircraft handling operations ashore, including spotting, securing, and operating vehicles on flight lines and around aircraft.
8. State the hazards associated with working around aircraft.
9. Describe helicopter securing procedures and safety precautions.

OPERATING EQUIPMENT AROUND AIRCRAFT

When mobile equipment is used around aircraft, certain operating techniques, handling procedures, and safety precautions are followed to reduce the number of accidents, to prevent damage to aircraft and equipment, and to ensure the safety of personnel. The following operating techniques and handling procedures should be followed:

Vehicles should not pass under any part of a parked aircraft. Where such passing is absolutely necessary, the vehicle must come to a complete stop and, before proceeding, a visual check must be made to ensure that sufficient clearance exists.

Vehicles carrying passengers must stop only at the boarding entrance and clear of aircraft while loading or unloading passengers.

Riding on fenders, hoods, running boards, or any place not intended for passengers is strictly prohibited.
Personnel involved in the towing of aircraft must be alert and exercise extreme care.

Tractor drivers must always maintain a safe distance from parked aircraft and be on the alert for movements of other aircraft.

Motorized vehicles used to service aircraft or those used near aircraft must be driven or parked adjacent to aircraft so that inadvertent movement of the vehicle will not result in a collision.

When aircraft are serviced, all refueling vehicles should be parked forward of the aircraft and parallel to the wing. The refueling vehicle should be parked at a point as distant from the aircraft as the length of hose permits, and preferably to the windward (upwind) side of the aircraft.

If it is necessary to park near a parked aircraft, the hand brake of a motorized vehicle must be set and the ignition turned off. If the service being rendered requires running the motor, the motorized vehicle must be manned.

The speed limit for operating vehicles on airfields in the vicinity of aircraft and hangars (50 feet) is 5 miles per hour (mph).

On runways, taxiways, parking areas, ramps, and work areas, the speed limit is 10 mph.

When aircraft are towed, the towing speed should never be faster than the slowest person can walk or exceed 5 mph.

Sudden starts and stops must be avoided. Extreme caution must be exercised when an aircraft is towed over unprepared surfaces or into or through a congested area.

**Hazards of Support Equipment**

Tow tractors, electrical power units, hydraulic jennys, jet aircraft start units, air conditioners, nitrogen carts, work stands, jacks, floodlight carts, and utility vehicles are mostly big, heavy, clumsy, noisy, and dangerous. You should always be aware of the following support equipment hazards.

- Smoking or having an open flame around or near aircraft and fueling equipment is strictly prohibited.
- Never operate support equipment that you are not licensed and qualified to operate.
- High voltage can zap you and aircraft electric systems without warning.
- High pressure air or hydraulics can blow up hoses, equipment, aircraft systems, or personnel.
- Contamination, (water, dirt, grease, oil, trash, foreign object damage (FOD)), when introduced to the wrong system, can ruin an aircraft or support equipment, or injure personnel.
- Unfamiliar controls on support equipment can cause you to go in directions you didn't intend.
- Cables and hoses hooked up to aircraft incorrectly may cause damage.
- Avoid breathing fuel vapors and noxious gases that can make you sick or kill you.
- Defective, nonstandard, or jury-rigged hoses, cables, plugs, and devices can kill you or damage an aircraft.
- Avoid loud noises by wearing appropriate hearing protection.
- Driver's seats that restrict visibility can cause you to run over people, equipment, or aircraft.
- Crankcases and radiators ruin an engine when they run dry.
- Jacks or work stands that collapse because of neglect or improper use can spoil your day.
Color Markings of Equipment

All handling and servicing equipment used around aircraft have standard colors and markings. This is necessary so that the equipment and markings can be seen easily by pilots taking off, landing, or taxiing in aircraft, or by tower operators. These colors and markings identify the equipment as being authorized for use around aircraft on flight decks, hangar bays, parking ramps, taxiways, and runways. Most support equipment is painted yellow and/or white with reflective tape strips on the corners. The front and rear bumpers are painted with alternate black and yellow stripes at a 45-degree angle. Danger areas, such as intakes/exhausts and front/rear pintels for attaching tow bars, are painted red.

FIXED WING AIRCRAFT HANDLING

The combined efforts of officers and crewmen are necessary to conduct effective air operations on an aircraft carrier. There are those who have prepared the plans, briefed the pilots, plotted the weather, and fueled and armed the aircraft. There are others who assist in launching and landing the aircraft. After the aircraft have returned, there are still others who check the results, debrief with the pilots, interpret the photographic findings, and refuel and rearm in preparation for the next flight. The efficient and coordinated efforts of all persons concerned are of vital importance to the success of the operation.

As part of this team, personnel whose duties require them to work on the flight deck must wear the proper flight deck uniform. All personnel must wear a cranial impact helmet with liner, goggles, and sound attenuators (Figure 11-1). Personnel who work on the flight deck must also wear a long sleeve jerseys and trousers, flight deck shoes, an inflatable life preserver outfitted with distress light marker and sea dye marker, and a secured whistle (Figure 11-2). All personnel assigned flight quarters stations on or above the hangar deck level must wear this uniform as described in Table 11-1. Notice the different colors identifying different assignments or jobs.

Figure 11-1 — Cranial helmet assembly.

Figure 11-2 — MK 1 inflatable life preserver.
Plane-Handling Crews

The V-1 division is responsible for handling aircraft on the flight deck, and the V-3 division is responsible on the hangar deck. The personnel, other than plane directors, assigned to handling crews are usually Airmen from these divisions.

A complete handling crew normally consists of a director, crew leader, one safety man, and six to ten Airmen. The director is usually an ABH, and is the only petty officer in the crew. He is responsible for the crew and directs them in the movement of aircraft.

The crew leader acts as the director's assistant, and is in charge of the crew in the absence of the director.

Crew members are stationed near the wing tips on the opposite side of the aircraft and act as wing walkers. One crew member is referred to as the safety man. It is his/her duty to keep the director informed about the safety of the aircraft and to prevent accidental damage and personal injury.

Two of the crew members serve as chockmen. They tend the chocks, removing them and chocking the aircraft when the director gives the signal.

When aircraft are moved on the hangar deck, directors must make sure they do not hit bulkheads, hangar deck fixtures, support equipment, or other aircraft. The handling crew safety men are in the best position to prevent collisions of this sort.

It is the plane director's responsibility to keep the crew thoroughly informed about safety precautions for handling aircraft. Each crew member must know his/her responsibility as an individual and as a member of the plane-handling crew. A good plane director must be able to obtain maximum efficiency from his/her crew.

When aircraft are being moved on the flight deck or hangar bay by handling crews, verbal orders (with or without radio headsets), hand signals, and whistles are used in giving directions. You must remember that the noise level on an operating carrier during landing and launching operations is very high. All verbal orders must be given in a loud and clear manner. Indistinct directions or orders may lead to costly accidents. When a high noise level can cause misunderstanding, the plane director must make sure that directions are understood by some form of return signal from his crewmen.

In most cases the aircraft crew station is manned during a move. This person acts as a brake rider, and only qualified personnel are allowed to perform this task. When moving an aircraft by pushing, handling crews must know the proper positions for pushing to prevent damage to the aircraft. Crews must also know the correct use of handling equipment and the proper use of aircraft securing equipment.
<table>
<thead>
<tr>
<th>PERSONNEL (NOTE 9)</th>
<th>HELMET</th>
<th>JERSEY/ FLOATATION VEST</th>
<th>SYMBOLS, FRONT AND BACK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aircraft handling crew and chock men</td>
<td>Blue</td>
<td>Blue</td>
<td>Crew number</td>
</tr>
<tr>
<td>Aircraft handling officers and plane directors</td>
<td>Yellow</td>
<td>Yellow</td>
<td>Billet title — crew number</td>
</tr>
<tr>
<td>Arresting gear crew</td>
<td>Green</td>
<td>Green</td>
<td>A</td>
</tr>
<tr>
<td>Aviation fuel crew</td>
<td>Purple</td>
<td>Purple</td>
<td></td>
</tr>
<tr>
<td>Cargo handling personnel</td>
<td>White</td>
<td>Green</td>
<td>“Supply”/“POSTAL” as appropriate</td>
</tr>
<tr>
<td>Catapult and arresting gear officers</td>
<td>Green</td>
<td>Yellow</td>
<td>Billet title</td>
</tr>
<tr>
<td>Catapult crew</td>
<td>Green</td>
<td>Green</td>
<td>C</td>
</tr>
<tr>
<td>Catapult/AG QA</td>
<td>Green</td>
<td>White</td>
<td>ALRE QA</td>
</tr>
<tr>
<td>Catapult safety observer (ICCS)</td>
<td>Green</td>
<td>(Note 6)</td>
<td>Billet title</td>
</tr>
<tr>
<td>Catapult Steam Watch</td>
<td>None</td>
<td>Green/white</td>
<td>CAT STEAM WATCH</td>
</tr>
<tr>
<td>Crash and salvage crews</td>
<td>Red</td>
<td>Red</td>
<td>Crash/Salvage</td>
</tr>
<tr>
<td>Elevator operators</td>
<td>White</td>
<td>Blue</td>
<td>E</td>
</tr>
<tr>
<td>Explosive ordnance disposal</td>
<td>Red</td>
<td>Red</td>
<td>“EOD” in black</td>
</tr>
<tr>
<td>GSE troubleshooter</td>
<td>Green</td>
<td>Green</td>
<td>“GSE”</td>
</tr>
<tr>
<td>Helicopter LSE</td>
<td>Red</td>
<td>Green</td>
<td>H</td>
</tr>
<tr>
<td>Helicopter plane captain</td>
<td>Red</td>
<td>Brown</td>
<td>H</td>
</tr>
<tr>
<td>Hook runner</td>
<td>Green</td>
<td>Green</td>
<td>A</td>
</tr>
<tr>
<td>IW watch</td>
<td>White</td>
<td>White</td>
<td>IW stenciled on the back of the vest</td>
</tr>
<tr>
<td>JBD safety observer</td>
<td>Green</td>
<td>Green/White</td>
<td>JBD Safety</td>
</tr>
<tr>
<td>Landing signal officer</td>
<td>None</td>
<td>White</td>
<td>LSO</td>
</tr>
<tr>
<td>Leading petty officers:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Line</td>
<td>Green</td>
<td>Brown</td>
<td>Squadron designator and “Line CPO”</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Green</td>
<td>Green</td>
<td>Squadron designator plus “Maint. CPO”</td>
</tr>
<tr>
<td>Quality assurance</td>
<td>Brown</td>
<td>White</td>
<td>Squadron designator and “QA”</td>
</tr>
<tr>
<td>Squadron plane inspector</td>
<td>Green</td>
<td>White</td>
<td>Black and white checkerboard pattern and squadron designator</td>
</tr>
<tr>
<td>LOX crew</td>
<td>White</td>
<td>White</td>
<td>LOX</td>
</tr>
<tr>
<td>Maintenance crews</td>
<td>Green</td>
<td>Green</td>
<td>Black stripe and squadron designator</td>
</tr>
<tr>
<td>Medical</td>
<td>White</td>
<td>White</td>
<td>Red Cross</td>
</tr>
<tr>
<td>Messengers and telephone talkers</td>
<td>White</td>
<td>Blue</td>
<td>T</td>
</tr>
<tr>
<td>Ordnance</td>
<td>Red</td>
<td>Red</td>
<td>3-inch black stripe and squadron designator/ship’s billet title</td>
</tr>
<tr>
<td>Ordnance CAG Arm/De-arm</td>
<td>Red/Red</td>
<td>Red/Red</td>
<td>3-inch black stripe and the letters “CA” in 6-inch white reflective material</td>
</tr>
</tbody>
</table>
Launching Procedure

As soon as the flight requirements for a launch are known, the aircraft handling officer holds a briefing, which is attended by key flight deck personnel, including flight directors, spotters, catapult and arresting gear personnel, and crash and salvage personnel. Specific launch procedures and sequences are given, the disposition of aircraft that go down is determined, and the directors and spotters are informed about their specific part in the operation. After the briefing, directors inform their crews of the details of the launch, and the aircraft are spotted on the flight deck.

Details of the recovery are included in the next launch briefing, and crews must always be aware that the need for a ready deck could arise at any time because of an emergency situation. Aircraft are spotted as to type, mission, and what catapult is to be used to ensure an even, continuous flow to the catapults. Since most aircraft are jets, they are catapulted. Conventional (reciprocating and turboprop) aircraft can be either catapulted or deck launched. The search and rescue helicopter is normally the first aircraft launched and the last to be recovered.

Flight quarters are usually sounded 1 to 2 hours before the launch time. The flight deck becomes very active. All Air Department personnel engage in a FOD walkdown. The walkdown finds things (nuts, bolts, safety wire, and general trash) that could be sucked into an aircraft's engine or blown by exhaust that could cause serious damage or injury. Plane captains single up on aircraft tie-down chains. Arming crews load aircraft with the appropriate armament. Fueling crews check aircraft for loads. Catapult and arresting gear crews check their machinery and equipment. Plane-handling crews make last minute resspots and check tow tractors and other plane-handling equipment. Crash and salvage (C/S) is manned 24 hours a day. They break out the equipment the day the vessel gets under way with aircraft aboard. The only requirement of the crash and salvage crew thereafter is to inventory and check out the gear.

Approximately 30 minutes before launch time, flight crews perform their final checks to start the engines upon the signal from primary fly control (PRI-FLY). Flight deck control coordinates ground crews to provide the aircraft with air conditioning, electrical power, engine start high-pressure air, to move or respot aircraft as required, and to manage all aircraft securing equipment. Once complete, the first launch aircraft are started.

Directing Taxiing Aircraft

During flight operations, the speed with which aircraft can be launched and recovered depends largely upon the efficiency of the plane directors. When launching, aircraft must be moved out of the spotting area and positioned on a catapult or takeoff spot, often coming within inches of the flight deck or other aircraft. Under these conditions, mistakes prove costly. When an aircraft lands, it must be released from the arresting gear, moved forward, and spotted to make room for the next aircraft landing.

Three important rules for you to remember in directing taxiing aircraft are as follows:

1. Make sure the pilot can see the signals. The standard position for the director is slightly ahead of the aircraft and in line with the left wing tip, but the position may have to be adjusted aboard a carrier. A foolproof test is "if you can see the pilot's eyes, the pilot can see your signals."

2. The person being signaled must know and understand the signals and use them in a precise manner. Indistinct signals or poor execution of signals will lead to casualties.
3. When taxiing an aircraft, you must use extreme caution to prevent personnel from being caught in the jet blast exhaust and being severely burned or blown overboard. Other aircraft and/or support equipment could suffer a similar fate.

As the carrier turns into the wind, you must have coordination between PRI-FLY, which gives the catapult officer the signal to launch, flight deck control, which oversees the movement of all aircraft, and the bridge, which gives permission to commence the launch.

NOTE
PRI-FLY has control for all flight deck lighting, landing spot lighting, flight deck floodlights, the stabilized glide slope indicator (SGSI), and the flight deck rotary beacon.

When the flight deck is readied (equipment, lighting, personnel, etc.) and all final checks are performed, the proper signals and communications are given for launch by primary flight control. Then, the catapult officer launches an aircraft from the catapult, then another, giving only sufficient time for the first aircraft to clear the bow of the ship. As the catapult officer launches an aircraft, the directors move another aircraft into the launch position. The intervals between aircraft being launched is predetermined and reflects case 1, 2, or 3 launch. Normally, intervals are as close as 30 seconds or within a safe launch sequence. This procedure is continued, alternating between the catapults (2, 3, or 4) until all jet aircraft are airborne. Conventional aircraft may be catapulted or deck launched, depending on the operational situation. In this manner, an entire deckload of aircraft can be launched in a matter of minutes.

**Landing Procedure**

Landing aircraft on a carrier is one of the most dangerous operations performed. All hands not involved in landing operations are ordered to clear the flight deck, catwalks, and guntubs. Personnel whose duties require that they be in exposed places must keep alert and watch incoming aircraft so they can get clear in case of an abnormal or emergency landing.

**WARNING**
Personnel should not turn their backs on landing aircraft or aircraft taxiing out of the arresting gear.

Before the aircraft landing, the flight deck aft is checked by the arresting gear officer to ensure the following:

- Catapult gear is clear of the landing area.
- The shuttle is retracted and the cover is in place on the No. 3 catapult.
- Sheaves are up in the aircraft area.
- The Fresnel Lens Optical Landing System (FLOLS) is turned on, or the manually operated visual landing system (MOVLAS) is rigged in its place.
- The barricade hatch is clear, and a tractor is hooked to the stored barricade if it is needed.
- The green rotating beacon at the aft end of the island is turned on.
- The aircraft are clear of the fouled deck line.
- The arresting gear crews are manned and ready.
- The landing signal officer’s (LSO’s) platform is manned and ready.
- The gear is set for the first aircraft. (The recovery officer then calls, "Gear manned and ready; need a green light from the PRI-FLY.")

**NOTE**

Aircraft carriers with an angled deck elevator also have to be checked for the following items.

- The stanchions are all the way down.
- The removable coamings are stored.
- The aircraft elevators are up and in the locked position.

The ship is then turned into the wind, and the air officer switches the aft rotating beacon from red to green, giving the pilot the signal to begin landing operations.

The aircraft enters a standard traffic pattern for the landing approach. The LSO stationed portside aft on the flight deck monitors or directs the pilot in the final approach. By using various signals or radio voice communications, the LSO corrects any discrepancy in the aircraft's speed, altitude, and attitude. If it is a propeller-driven aircraft, once in the proper position, the LSO gives the pilot a "cut." The "cut" signal can be a hand signal, a light signal, a radio transmission, or a combination of any two of these signals. The pilot then flies the aircraft onto the deck. If, on approaching the flight deck, the aircraft is not in the proper position, the pilot is given a "wave-off" by the LSO. This means that the pilot must again enter the traffic pattern and make a new approach.

The FLOLS is a major improvement in carrier aviation. This system places the major control of the aircraft in the hands of one person (the pilot) instead of two. It also gives the pilot quicker, more certain awareness of errors in his/her approach.

Using the FLOLS, the aircraft enters a standard traffic pattern for the landing approach. The FLOLS provides continuous glide path information to the pilot. Propeller-type aircraft are given a "cut" signal by light or voice radio by the LSO. The pilot must maintain correct airspeed and line up the center line of the landing area.

If the aircraft is not on the glide path or the deck is foul, the LSO flashes the WAVE-OFF light located on the FLOLS. The wave-off is mandatory, and the pilot must again enter the traffic pattern and make a new approach.

If a jet aircraft makes a good approach and the deck is clear, no signal is given by the LSO. The aircraft continues on the glide path with power on until it contacts the deck and comes to a complete stop. If the aircraft is not arrested, it continues toward the end of the angled deck. The pilot must again enter the traffic pattern for another approach. (This is referred to as a "bolter.")

After an aircraft has engaged a cross-deck pendant (cable) and comes to a complete stop, the gear puller, a director assigned to direct aircraft from the landing area, gives the signal to either raise the hook or to pull the aircraft backwards. This allows the gear puller to have sufficient slack on the cross-deck pendant so he can safely raise the tailhook. In the event the tailhook cannot be raised, the crash and salvage crew may either free the cable or manually raise the hook. The hook runner acts as a safety check and displays the emergency hold signal directed to the arresting gear console operator.

When the aircraft is free of the cross-deck pendant, the director taxies the aircraft clear of the landing area; the deck is then readied for another landing. An alternating red and white striped line that runs the length of the flight deck, known as the *foul line or safe parking line*, separates this area from the rest of the deck. The fly one director then taxies the aircraft to a position so the nose of the aircraft is pointed over the side, and stops the aircraft.
The director ensures that the area directly in front of the aircraft is clear of personnel and of other aircraft. He/she then turns the aircraft over to the ordnance crew for disarming. He/she displays a hold signal to the pilot with one hand and points to the ordnance director with the other. Once the disarming is accomplished, the V-1 director then directs the aircraft for parking or to be spotted.

**Spotting Aircraft**

Most carriers have a basic spotting order. This spotting order varies from carrier to carrier to suit the flight-deck layout. After the aircraft is spotted, chocked, and secured, the plane captain takes over from the pilot. The plane captain stays with the aircraft until it is parked in its final spot.

Certain aircraft must be spotted in a specific location to permit servicing, loading of ammunition, starting, fueling, maintenance, and so forth. For certain large aircraft, the spotting location must not interfere with the movement of other aircraft or launching or recovery operations. This process is repeated until all aircraft have landed.

After all aircraft have landed, the flight deck is respotted by the handling crews for the next launch. Tow tractors are used to move the aircraft around the flight deck when taxiing cannot be done. When the refueling, servicing, rearming, or any minor maintenance is completed, the carrier is again ready to launch aircraft. The entire procedure from launch to landing and respotting takes about 90 minutes.

**Emergency Recovery Equipment**

Barricades (*Figure 11-3*) are that part of the emergency recovery equipment used for the emergency arrestment (stopping) of an aircraft that cannot make a normal (pendant) arrested landing. Barricades are used when aircraft have battle damage, tailhook failure, or some other mechanical failure. The barricade has expandable nylon webbing that is stretched across the flight deck between port and starboard stanchions.

*Figure 11-3 — Aircraft barricade.*
During the aircraft arrestment, when the aircraft contacts the barricade, the wings engage the nylon webbing, which transmits the arresting force to the barricade engine below deck and stops the aircraft safely.

The V-1 division works in conjunction with the V-2 division in the initial preparations of the barricade. They set down the deck plates and ensure that they are locked in place, pull out the webbing, and direct all hands in this process.

**AIRCRAFT HANDLING SIGNALS**

The aircraft-handling signals discussed in this section ([Figure 11-4](#)) are used by all aviation branches of the United States Armed Forces.

You, the beginner, must first learn (memorize) these signals thoroughly. Then, you must practice these signals to ensure precise execution. If you drop one arm to indicate application of a brake on a turn, snap the arm out briskly. If you stretch your arms out in rendering a signal, open them wide. When practical, keep the hands well separated. It is better to exaggerate a signal than to make it in such a manner that it may be misinterpreted.

Aboard carriers, the "emergency stop" signal is used more frequently than on shore stations. You must remember that this signal is meant for emergencies only. Do not use it as a routine stop signal. It is sometimes necessary for the director to give a "come ahead slowly" signal in close quarters. The director should execute this signal by alternately giving the standard "come ahead" signal with slow movement of the arms, followed by the stop signal.

**NOTE**

The "emergency stop" signal is mandatory. All other director hand signals are advisory when directing aircraft.
During night operations, the plane director uses two lighted taxi guidance wands (Figure 11-5) in giving handling signals.

During night flight operations, only the prescribed signal wands may be used, and then only by authorized personnel. The wands are different colors and/or shapes for the personnel designated to use them. The different colors and/or shapes of the cones on the wands are a safety factor. The colors/shapes prevent personnel from misinterpreting a signal that could cause damage to the aircraft or injury to personnel. Table 11-2 lists the personnel authorized to use wands by wand color, the number of wands, and the type. Other personnel that are involved in night flight operations must use a standard flashlight with a red filter.

Wands are used at night in the same way that hands are used for day signaling. Night signals that differ from day signals are also shown in Figure 11-4.

In operations requiring taxiing of aircraft, directors are usually stationed at intervals of 50 to 100 feet along the flight deck. The director must be in a position that will give the pilot an unobstructed view of the signals. The usual stance of an experienced director ready to take over control of an aircraft is with one arm high overhead and palm inward. This not only aids the pilot in recognizing the director, but it also puts the director in a position to render practically any taxi signal with a minimum of movement. The director retains control of the aircraft only while it is in his control area. He then passes control to the next director in line on the deck. For more information on aircraft hand signals refer to NAVAIR-00-80T-113, Aircraft Signals NATOPS Manual.

Figure 11-5 — Taxi guidance wand.
## Table 11-2 — Taxi Signal Wand Identification

<table>
<thead>
<tr>
<th>PERSONNEL</th>
<th>COLOR</th>
<th>NO</th>
<th>TYPE*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aviation Fuels Checker</td>
<td>Amber</td>
<td>1</td>
<td>Stubby</td>
</tr>
<tr>
<td>Catapult Hookup Petty Officer</td>
<td>White</td>
<td>1</td>
<td>Stubby</td>
</tr>
<tr>
<td>Catapult Safety Observer (ICCS)</td>
<td>Red</td>
<td>1</td>
<td>Standard</td>
</tr>
<tr>
<td></td>
<td>Green</td>
<td>1</td>
<td>Standard</td>
</tr>
<tr>
<td>Flight Deck Officer and Aircraft Directors</td>
<td>Amber</td>
<td>2</td>
<td>Standard</td>
</tr>
<tr>
<td>Hook Runner</td>
<td>Red</td>
<td>1</td>
<td>Stubby</td>
</tr>
<tr>
<td>Launching and Arresting Gear Officer/Helicopter LSE/LSO</td>
<td>Red</td>
<td>1</td>
<td>Standard</td>
</tr>
<tr>
<td></td>
<td>Green</td>
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<td>Standard</td>
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<td>Ordnance Arming Crew</td>
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<td></td>
<td></td>
<td></td>
<td>Banded**</td>
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<tr>
<td>Ordnance Arming/Safety Supervisor</td>
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<td>2</td>
<td>Standard</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Banded***</td>
</tr>
<tr>
<td>Plane Captain</td>
<td>Blue</td>
<td>2</td>
<td>Standard</td>
</tr>
<tr>
<td>Squadron Aircraft Inspector</td>
<td>Blue</td>
<td>1</td>
<td>Stubby</td>
</tr>
</tbody>
</table>

* Standard and stubby denote cone shape. Standard denotes full length cones; stubby is a modified cone providing 3 inches of lighted cone. Any suitable battery and switch housing is authorized if cone is brightly lighted. All signal wands/flashlights must be equipped with heat-shrinkable sleeving to prevent possible cone separation.

** One 3/4 inch band on the cone (plastic electrician's tape is recommended).

*** Two 3/4 inch bands spaced equidistant on the cone (plastic electrician's tape is recommended).

### SECURING AIRCRAFT ABOARD CARRIERS

In general, methods for securing aircraft and mobile support equipment are specific to particular naval aviation ships. CVN carriers embark mostly fixed-wing jet, turboprop, and helicopter aircraft. LHD, LHA, LPH, and LPD class amphibious assault ships embark vertical short takeoff and landing (V/STOL) aircraft, such as the V-22 Osprey, AV-8 Harrier, and a variety of helicopters. This section does not differentiate between the different types of ships.

The importance of properly securing and handling aircraft and mobile support equipment aboard carriers cannot be overstressed. It is of the utmost importance that they are secured in a manner that prevents fore and aft and athwart ship (side to side) movement. The reasons for this are threefold:

1. The pitch and roll of the ship, caused by heavy seas.
2. The list of the ship, caused by maneuvering, particularly when making high-speed turns.
3. The parking of aircraft on the flight and hangar decks with a minimum of clearance between them.
Adjustable chock assemblies are used to block the main landing gear of all aircraft and wheels on support equipment. The chocks should be in position at all times when the aircraft is not being moved and support equipment is not being driven. They should be removed only upon command from a plane director. Both ends of the chock should be snugly against the wheel with the adjustable end toward the rear of the plane. This ensures easy removal when engines are turning up and the wheel is set hard against the forward end of the chock.

### NOTE
You should exercise caution when using wheel chocks. If aircraft chocks are not loosened during fueling operations, they will be close to impossible to remove after the aircraft is fueled because of the added weight. The opposite occurs when the aircraft is defueled; chocks must then be tightened.

Fittings are provided on all aircraft for attaching tie-downs. These fittings are usually located on each of the landing gear struts. On some aircraft additional fittings may be found on the fuselage. In all circumstances, tie-down chains are attached to each of these points when the aircraft is being secured.

Tie-down assemblies are used to secure aircraft and support equipment aboard carriers. These assemblies are equipped with attachments for deck fittings (pad eyes). Deck fittings are provided on both the flight and hangar decks for securing aircraft. Methods of securing aircraft or support equipment and the quantity of tie-down assemblies will vary, depending upon the type of aircraft, equipment, scheduled operations, and weather conditions.

### Normal Weather Conditions
In general, the following procedures apply when securing aircraft under normal conditions:

1. Plane captains of landing aircraft stand by with tie-downs on the flight deck in a designated area. They join their aircraft as they are being parked. If an aircraft is moved to the hangar bay below, its plane captain should board the elevator with it if he can do so safely.

2. Aircraft-handling crews stand by in a designated area during recoveries and act as chockmen while aircraft are being taxied and parked. They put on the initial tie-downs and are assisted by the plane captain when possible.

3. When the aircraft reaches the final spot, the director will signal the pilot of the aircraft to lower its tailhook. This automatically straightens the nosewheel to center. Some aircraft must have the nosewheel aligned to center manually.

4. The plane captain connects the ground wire and installs wing fold jury struts, parking harness and batten boards, engine and crew station covers, and any tie-downs needed in addition to the initial tie-downs put on by the aircraft-handling crews.

Detailed procedures for securing a specific aircraft are found in the maintenance instruction manual (MIM) for that aircraft.

### Heavy Weather Procedures
The procedure for securing aircraft during heavy weather differs very little from that used in normal weather. The main difference is that more tie-downs are used. All flight control surfaces are secured with battens, and controls inside the aircraft are secured. Figure 11-6 shows the tie-down arrangement for an F/A-18, depending on the size of the aircraft the number of chains for heavy
weather requirements will vary. For more information, refer to specific aircraft Maintenance Instruction Manual (MIM).

When extremely heavy weather is anticipated, as many aircraft as possible are spotted on the hangar deck. The remainder are spotted in the fly 2 (center) and fly 3 (aft) areas of the flight deck. Avoid securing aircraft athwart ship and in the heavy weather spot. Aircraft remaining on the flight deck should be spotted inboard along either side of the center line of the deck. Leave a clear area around the perimeter of the flight deck. If possible, spread the wings on the aircraft that are spotted on the flight deck. For special instructions on securing an individual aircraft, refer to the aircraft's specific MIM.

When the ship is not at flight quarters or during heavy weather conditions, the Air Department is required to maintain a security/integrity watch on the flight deck and hangar deck to ensure that each aircraft remains properly secured. The watch must be especially alert for loose or broken jury struts, tie-downs, battens, chocks, engine intake/exhaust and canopy covers, for any leakage, or for hazardous conditions. Extreme caution is necessary when you handle aircraft in heavy weather.

**CAUTION**

In severe cold weather environments, do not lock the canopies of aircraft parked in the landing area. Canopies will freeze "closed" and prevent brake rider protection.

**Cold Weather Procedures**

Handling aircraft during cold weather operations is extremely difficult. Keep as many aircraft on the hangar deck as is possible during extremely cold weather. Keep the flight deck clear of ice and snow. The following methods for snow and ice removal are often used:

- Mobile equipment removal—some aircraft tow tractors may be fitted with snowplow blades or with rattan or wire rotary brushes.
• Manual removal—conventional methods include brooms, crowbars, shovels, wooden mallets, and scrapers. Use compressed air to blow snow from pockets. Use firemain water at 100 psi and steam lances for undercutting ice. Use deck scrapers and auxiliary hot-air heaters to clear flight-deck equipment, such as wires, sheaves, arresting gear, and elevators, of ice.

Normal deck procedures are used in cold weather, but considerably more time is required because of the excessive hazards involved. Use battens on control surfaces. Jury struts and flight station covers are recommended. Tie down the controls inside the aircraft to eliminate the chance of movement of outer control surfaces. Aircraft on ice or snow should always be moved slowly. Avoid using the brakes as much as possible when turning aircraft.

**AIRCRAFT-HANDLING ACCESSORIES**

In addition to self-powered equipment, several important handling accessories are required for safe and efficient handling of aircraft. These accessories are discussed in the following text.

**Aircraft Wheel Chocks**

Several types of aircraft wheel chocks are used by the Navy. Of these, the NWC-4/5 polyurethane universal wheel chock (*Figure 11-7*) is the most common, particularly aboard aircraft carriers. On shore stations you will find two polyurethane or wooden blocks joined by nylon or manila line with different lengths to accommodate different aircraft wheels sizes. *Figure 11-8* shows a wheel chock installed.

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*Figure 11-7 — NWC-4/5 universal wheel chock.*

*Figure 11-8 — NWC-4/5 universal wheel chock installed.*

*Figure 11-9 — TD-1A and TD-1B chain-type tie-down assemblies.*
TD-1A and TD-1B Tie-Down Assemblies

The quick-release TD-1A and TD-1B tie-down chain assemblies (Figure 11-9) are now used almost exclusively aboard ship and ashore. These assemblies consist of a locking and release mechanism, tension bar, adjustable tension nut, and a chain with a hook at one end. Figure 11-10 shows a close-up of the proper installation. Both assemblies are available in two different lengths, 9 foot and 14 foot, and are fully adjustable from a foot and a half to full extension.

A/B Tie-Down Assembly

This tie-down is called the Aero full-power tie-down assembly (Figure 11-11). It is commonly called the A/B (afterburner) tie-down. It consists of a deck attachment fitting, a safety lock retainer, a chain, and a coupler that fits the aircraft holdback fitting.

This assembly has a working load of 30,000 pounds. It weighs about 102 pounds and has no adjustments to lengthen or shorten it. It can be modified by joining two tie-downs together with a dummy link for aircraft requiring more length.

A newer version of the A/B tie-down, called the MXU-657/W aircraft restraint, has a different deck attachment fitting, and is shown in Figure 11-12. Otherwise, it is identical.

Special high-strength deck fittings are installed aboard ships and at shore stations in designated engine run-up areas. Specific A/B tie-down instructions for each type of aircraft are contained in the specific MIM.

Figure 11-10 — Close-up showing proper installation of the TD-1A assembly.

Figure 11-11 — Aero full power tie-down assembly.

Figure 11-12 — MXU-657/W aircraft restraint.
Aircraft Tow Bars

Two general classes of tow bars are used in naval aviation—those adaptable to only one type of aircraft and those adaptable to more than one type.

⚠️ CAUTION ⚠️

Before you attempt to tow an aircraft, be sure that the tow bar tensioning chain is under maximum tension when the axle pins are used. When using the tow hooks, ensure the locking pins are closed.

The universal aircraft tow bar, Model Adjustable Length Towbar (ALBAR) (*Figure 11-13*) is the type of tow bar most commonly used by the Navy today. It is available in four different models and lengths. It is used to tow and position aircraft weighing up to 90,000 pounds. The ALBAR is designed for towing aircraft that have nose or tailwheel axle holes, or fuselage or landing gear tow rings (*Figure 11-14*), and it can be configured to accommodate different aircraft.

![Figure 11-13 — Adjustable length towbar.](image)

![Figure 11-14 — Tow bar attachment.](image)

For more information on handling accessories, refer to NAVAIR 00-80T-96, *Support Equipment Common, Basic Handling and Safety Manual*, or the "General Information and Servicing" section of the MIM for any given aircraft.
GENERAL FLIGHT DECK SAFETY PRECAUTIONS

The ship's commanding officer is responsible at all times for the safety of embarked aircraft and personnel. The commanding officer or officer in charge of the aircraft squadron/detachment and the pilots of individual aircraft are directly responsible for the safety of assigned aircraft and personnel. Ultimately, however, safety is the responsibility of all hands.

Nearly all aircraft-handling accidents/incidents or personal injury/death are the result of poor training and supervision, lack of awareness, and/or disregard of handling instructions.

Some of the safety precautions that could prevent dangerous and costly accidents during flight operations aboard carriers are as follows:

- Never operate or allow personnel under your supervision to operate any machinery or equipment when not thoroughly checked out and qualified on all safety and operating instructions.
- The deck is considered foul any time unauthorized personnel are in or around aircraft parked in the safe-parking area aft of the island.
- While flight operations are being conducted, no personnel except those authorized and required may be in the catwalks, in the guntubs, on the flight deck, in the catapult or arresting gear engine rooms, or in the pilot's landing aid television (PLAT) lens room without the express permission of the air officer.
- Personnel should never stand or otherwise block entrances to the island structure or exits leading off the catwalks.
- Personnel should not turn their backs on aircraft landing or taxiing out of the arresting gear.
- While taxiing aircraft out of the arresting gear, directors must be aware of the activities of the hook runner, tiller-bar man, and the wing walkers.
- While directing aircraft, the director must be in plain view of the pilot at all times. If the pilot loses sight of his director, he must STOP immediately.
- No director should give signals to a pilot who is being controlled by another director EXCEPT in an attempt to avert an accident.
- Never allow yourself to become complacent to the point of permitting unsafe conditions to exist. Complacency is one of the major causes of aircraft accidents/incidents in handling aircraft.
- Make sure that the brakes are manned before you move an aircraft.

NOTE

If an aircraft with inoperative brakes is to be respotted, the cockpit must NOT be manned, and the chockmen must be in position to chock the main wheels instantly when ordered.

- Use the proper tow bar for the aircraft that is being moved.
- Use wing and tail walkers in all movements.
- Use chockmen at all times in case the aircraft is to be stopped without brakes or in the instance where brakes fail. Use chockmen when you back an aircraft to the deck-edge spots.
- Never move an aircraft when there is doubt as to clearance.
- Watch for unexpected ship movement that may have a bearing on aircraft being moved.
- Be extremely cautious when you handle aircraft on and off of elevators. There is always the danger of losing one over the side because they are at the extreme edge of the deck.
- Make sure the elevator is in the full up or down position before you move an aircraft on or off it.
- Because of the small confines of the hangar deck, it is of the utmost importance that aircraft be moved with extreme caution. Ensure that hydraulic brake fluid pressure is available and is sufficient to safely accomplish the handling operation.
- Handling of other equipment around aircraft should always be performed with utmost care.
- Unlock the nose or tail wheel (if applicable) before you move an aircraft.
- Be particularly careful when you move a jet that has been started. Ensure that all personnel are clear of the intake and jet blast.
- Stay clear of the launching and landing areas unless you are part of that operation.
- Stay alert when you are working around aircraft. There is never room for carelessness, daydreaming, or skylarking on the flight deck.
- Keep constant vigilance for coworkers. This helps to avoid accidents.
- Ensure that aircraft wheel chocks and tie-down chains are always used whenever an aircraft is not being moved.
- Always wear articles of flight-deck clothing in the following manner:
  - Helmets on and buckled, goggles down over eyes.
  - Flight-deck jerseys on with sleeves rolled down.
  - Life vest on and fastened.
  - Safety shoes on.
- Be alert for slick deck areas. Clean spillage from the deck as soon as possible.
- Aircraft with wings folded are not to be spotted, towed, or taxied immediately behind a jet blast deflector when another aircraft is at high-power turnup on the catapult.
- You must strictly observe all safety precautions when working around aircraft equipped with an ejection seat. Accidental actuation of the firing mechanism can result in death or serious injury to anyone in the crew station area.
- Beware of jet blast, props, and rotors.

**AIRCRAFT HANDLING OPERATIONS ASHORE**

The methods and procedures for handling aircraft ashore are similar to those afloat. When an air wing or squadron is shore based, it operates on air stations that have paved spotting areas. The area where a particular group of aircraft is spotted or parked is referred to as "the line." Aircraft are spotted on the line for servicing, loading, maintenance, and checking for operational readiness. It is the responsibility of the personnel assigned to the line crew to direct and spot the aircraft.

The line is spotted following the flight schedule instructions. Aircraft must be spotted for engine turnup, taxiing, or towing without endangering other aircraft on the line.

In directing an aircraft that is taxiing from the line, the director should remain in control of the aircraft until it is clear of other aircraft or obstructions in the spotting area. Incoming aircraft should be met at the edge of the spotting area and directed to the appropriate spot.
Transient aircraft often require assistance in taxiing from the runway to the spotting area. An appropriate vehicle that has the words “follow me” displayed in large letters is used. The vehicle meets the aircraft at the end of the runway or an intersection to the runway and leads it to the spotting area or flight line.

Personnel assigned to flight line duty should prepare for possible emergencies by becoming thoroughly familiar with the various types of fire-fighting equipment available on the line. They must know their location and capabilities and ensure, by frequent inspection, that they are always ready for use.

The use of standard color-coded fire extinguishers promotes greater safety and lessens the chances of error, confusion, or inaction in time of emergency. Coding distinguishes flight-line fire extinguishers from building fire equipment.

The type of extinguisher, together with the class of fire it extinguishes, must be painted on a 6-inch color band. The letters are black and at least 1 inch in height.

The 6-inch band around the top of the extinguisher should be painted as follows:

- Carbon Dioxide (CO2) ....... Yellow
- AFFF Type ......................... Silver or white
- Purple K Powder ............... Purple
- Halon ............................... Fluorescent yellow

Carts for handling the 50-pound extinguisher bottles should be painted the same color as the extinguisher band. The containers or holders for the other fire extinguishers located on the line may also be painted the same color as the extinguisher band.

### Multiengine Aircraft Handling

Because each type of multiengine aircraft requires slightly different handling procedures, this discussion is limited to general handling procedures. Specific handling procedures for specific aircraft may be found in the "General Information and Servicing" section of the MIM.

Many multiengine aircraft have a means of steering the nosewheel from the crew station. While this provides more effective control when the aircraft is taxied, it also limits the radius of turns. When an aircraft equipped with crew station steering is being directed, allow sufficient space as a turn is being made. The nosewheel steering system should be disengaged, if possible, when an aircraft is towed by the nosewheel.

Special towing equipment is provided for each type of multiengine aircraft. This consists of a nosewheel towing and steering bar for forward towing and a main gear tow bar or adapter for aft towing. The nosewheel bar is used to steer the aircraft when towing it from aft.

Large aircraft should be towed slowly and carefully. Sudden starts, stops, and turns must be avoided. When an aircraft is towed, the brakes should be engaged only in an emergency. If a quick stop is necessary, the brakes of the tractor and aircraft should be applied at the same time (the aircraft move director coordinates this action by blowing a whistle).

In addition to the above handling instructions, the following safety precautions should be observed:

- During towing operations, have a qualified operator in the pilot’s seat to operate the brakes when necessary. Ensure that there is sufficient hydraulic pressure for brake operation.
- When aircraft are moved in close spaces, a taxi director and sufficient walkers should be placed to provide centralized control and to ensure clearance of obstructions.
- If the aircraft is equipped with a tail wheel, unlock the tail wheel before the aircraft is moved.
• Ensure that the landing gear safety lockpins or down locks are installed before the aircraft is towed.

• Do not turn the nosewheel beyond the nosewheel turn limits. Structural damage will result.

Securing Aircraft Ashore

The parking areas on air stations are usually equipped with tie-down pad eyes, which are sunk into the surface of the concrete aprons on the "line." One end of the tie-down chains or securing line assemblies are attached to the aircraft tie-down fittings, and the other end is secured to the pad eyes and properly adjusted.

⚠ CAUTION ⚠
When you are securing aircraft with manila line, leave sufficient slack for shrinkage that occurs when the line becomes wet.

NOTE
Most aircraft are equipped with their own special securing accessory equipment, such as intake, exhaust, canopy, and external flight instrument covers, propeller or rotor blade restraints and tie-downs, flight control and landing gear lock pins, etc.

The fundamental rules for securing aircraft ashore are as follows:
1. Direct or locate the aircraft to a protected spot.
2. Park the aircraft into the wind if possible.
3. Place chocks both in front of and behind each main landing gear wheel.
4. Ground the aircraft.
5. Place all controls in neutral position and lock or secure.
6. Tie the aircraft down.
7. Install the protective covers.
8. Secure propellers and rotor blades as required.
9. Ensure brakes are set.

⚠ CAUTION ⚠
Do not install intake or exhaust engine covers when the engine is hot.

When high winds threaten, move the aircraft inside the hangar if possible. If not, ensure tie-downs or lines and anchorages are doubled and control surfaces are secured with battens.

Multiengine aircraft are usually tied down at six points. These points are the landing gear, the tail, and each wing. Detailed information concerning securing a particular aircraft may be found in the "General Information and Servicing" section of the MIM.
HELI OPTER HANDLING

Helicopters are used on CVN/LHD/LHA/LPH/LPD type vessels. They are also used on destroyers, fast frigates, replenishing ships, cruisers, and, of course, shore stations. There are areas that differ between handling fixed-wing aircraft and helicopters. Unique flight characteristics and aircraft operation require special handling procedures.

Helicopter Tie-Down and Securing Procedures

With the exception of the main rotor blade tie-downs, helicopter tie-downs and securing procedures are similar to those for conventional fixed-wing aircraft.

Tie-downs for the main rotor blades are used to prevent damage that might be caused by gusty and turbulent wind conditions when the blades are in a spread position. This type of tie-down usually consists of a canvas boot with an attached length of manila line; however, some helicopter rotor blades have special fittings and attachment accessories to accomplish this task.

The canvas boot is placed over the tip of the rotor blade, and the boot line is then secured either to a deck fitting or to an aircraft fitting on the helicopter itself.

An example of a helicopter tie-down configuration is given in Figure 11-15. Always consult the applicable MIM's "General Information and Servicing" section for detailed securing instructions for a specific type of helicopter.

**NOTE**

Rotor blade securing lines should be taut enough to hold the blades without applying excessive bending force. Check lines for security and shrinkage when wet, and readjust lines when required.

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Figure 11-15 — Helicopter tie-down configuration.
Hand Signals

Hand signals shown in Figure 11-16 are used when helicopters are directed. As you can see, they differ greatly from fixed-wing aircraft. The director, called a Landing Signalman Enlisted (LSE), is normally stationed on a 45-degree bearing to the portside of the helicopter if the pilot in control is in the left seat, and to the starboard side if the pilot in control is in the right seat. When you are acting as LSE, you should position yourself upwind of the area in which the helicopter is to be launched and in a similar position for a landing.

NOTE

The helicopter hand signals "wave-off" and "hold" are mandatory; all others are advisory in nature when directing aircraft.

CAUTION

Aircraft engines, auxiliary power plant starts, blade spread/fold, and rotor engagement must not be accomplished in wind conditions exceeding the individual aircraft's NATOPS limitations.

LANDING DIRECTION

DAY

Marshaler stands with arms raised vertically above head and facing toward the point where the aircraft is to land. The arms are lowered repeatedly from a vertical to a horizontal position, stopping finally in the horizontal position.

NIGHT

Same as day signal with addition of wands.

Figure 11-16 — Helicopter hand signals.
Helicopter Flight Operations

Carrier flight decks and air station runways or taxiways have marked helicopter landing areas that are controlled by PRI-FLY (afloat) and the control tower (ashore) for helicopter takeoff and landings. See Figures 11-17 and 11-18.

The LSE, under the supervision of the air officer, is responsible for visually signaling to the helicopter, thus assisting the pilot in making a safe takeoff and/or landing on the ship. He or she is responsible for directing the pilot to the desired deck spot and for ensuring general safety conditions of the flight deck, to include control of the flight deck crew.

Flight deck operations with rotors engaged are particularly hazardous to personnel. The tail rotor of some helicopters revolves in a vertical plane fairly close to the deck. In addition, the possibility always exists that the main rotor blades may strike the deck during engagement or disengagement of the rotor system due to the wind being out of parameters or hurling pieces of debris. Because of this hazard, flight deck personnel should be kept to the minimum needed for the operation.

Once the proper commands (Table 11-3) are given to the flight deck officer and the flight deck lighting has been activated from PRI-FLY (Table 11-4), the LSE supervises and is responsible for the following:

- Launch and recovery operations.
- Chocks and tie-downs (as required).
- Fire bottle and guard (posted).
- Auxiliary power plant start/shut down.
- Clearances around the aircraft.
- Rotor blade spread/fold.
- Engine start/shut down.
- Rotor engagement/disengagement.
- The movement of all personnel around the aircraft when loading or unloading troops, cargo, or fueling.
- All other activities around the launch or landing area.
- External material condition and security of the aircraft.

For detailed information on shipboard V/STOL aircraft operating procedures, you should refer to the Naval Warfare Publication Shipboard V/STOL Aircraft Operating Procedures, NWP-63-1; the LHD/LHA/LPH/LPD NATOPS Manual, NAVAIR 00-80T-106; and the Shipboard Helicopter Operating Procedures, NWP-42, latest revision.
Figure 11-18 — Air station helipad identification and perimeter markings.
### Table 11-3 — Flight Deck Commands

<table>
<thead>
<tr>
<th>EVOLUTION</th>
<th>COMMAND</th>
<th>DISPLAY</th>
<th>MEANING (HELO)</th>
<th>MEANING (AV-8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Prepare to start engines</td>
<td>Check chocks, chains, tie-downs, fire bottles, and all loose gear about the flight deck. Helmets buckled, goggles down, start APP/GTS on LSE/director signal.</td>
<td>Red signal in flight deck area</td>
<td>Verify starting wind limitations chocks and tie-downs in place. Boots removed and stowed. Secure all loose gear. Man fire extinguishers.</td>
<td>Intake blanks clear GTS wind limits met, chocks, tie-downs in place, loose gear secured. Man fire extinguishers.</td>
</tr>
<tr>
<td>2. Start engines</td>
<td>Start engines</td>
<td>Red signal in flight deck area</td>
<td>Authority for responsible flight deck personnel to signal for starting engines. Ship not ready for flight operations.</td>
<td></td>
</tr>
<tr>
<td>3. Engage/disengage rotors</td>
<td>Stand clear of rotors (20 second pause) - engage/disengage rotors</td>
<td>Amber signal in flight deck area</td>
<td>Ship is ready for the pilot to engage rotors. Authority for responsible flight deck personnel to signal for engaging rotors when the immediate area is cleared. Ship not ready for flight operations.</td>
<td>Squadron personnel conduct poststart checks (i.e., controls) clear exhaust areas.</td>
</tr>
<tr>
<td>4. Removal of tie-downs</td>
<td>Remove all tie-downs</td>
<td>Not applicable</td>
<td>Remove tie-downs from aircraft and show to pilot. LSE points to tie-downs and shows one finger to the pilot for each tie-down removed.</td>
<td></td>
</tr>
<tr>
<td>5. Launch</td>
<td>Launch aircraft</td>
<td>Green signal in flight deck area</td>
<td>Ship is ready in all respects for flight operation. Authority for responsible flight deck personnel to launch aircraft when pilot is ready and tie-downs and chocks have been removed.</td>
<td></td>
</tr>
<tr>
<td>6. Aircraft approaching aircraft, spot ____</td>
<td>Standby to recover aircraft, spot ____</td>
<td>Red signal in flight deck area</td>
<td>Prepare designated landing area to land aircraft. Ship not ready to recover aircraft.</td>
<td></td>
</tr>
<tr>
<td>7. Recover</td>
<td>Land aircraft</td>
<td>Green signal in flight deck area</td>
<td>Ship is ready in all respects to land aircraft.</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** Flight deck rotating beacon signals are for Pri-Fly control of flight deck operations only. These lights are not to be interpreted by pilots as clearance/denial for any evolution.
Table 11-4 —Deck Status Lights/Rotating Beacon Signals for Helicopter Operations

<table>
<thead>
<tr>
<th>EVOLUTION</th>
<th>DECK STATUS LIGHTS/ROTATING BEACON SIGNAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start Engines</td>
<td>Red</td>
</tr>
<tr>
<td>Engage Rotors</td>
<td>Amber</td>
</tr>
<tr>
<td>Launch</td>
<td>Green</td>
</tr>
<tr>
<td>Recovery</td>
<td>Green</td>
</tr>
<tr>
<td>Disengage Rotors</td>
<td>Amber</td>
</tr>
<tr>
<td>Shut Down</td>
<td>Red</td>
</tr>
</tbody>
</table>

HELICOPTER SAFETY PRECAUTIONS

During aircraft operations afloat or ashore, the following helicopter safety precautions should be observed:

- Do not approach or depart a helicopter without direction from the LSE.
- Do not approach or depart a helicopter while the rotors are being engaged or disengaged.
- Helicopters should not be taxied on the flight deck.
- Helicopters should not be towed or pushed while the rotors are engaged.
- Helicopters should not be launched or recovered and rotors should not engage or disengage while the ship is in a turn or the wind is out of parameters.
- A helicopter should not be flown over any other aircraft during takeoff and landing.
- Never approach a tail rotor type helicopter from the rear while the rotors are turning.
- Personnel required to be in the area of operating helicopters should exercise extreme caution and observe the signals or directions from the aircraft director.
End of Chapter 11
Line Operations and Safety

Review Questions
11-1. When aircraft are towed, the towing speed should never be faster than the slowest person can walk or exceed......mph.

   A. 2  
   B. 5  
   C. 7  
   D. 10

11-2. What colors are most support equipment painted?

   A. Blue and/or white with reflective tape strips on the side.  
   B. Yellow and/or red with reflective tape strips on the corners.  
   C. Yellow and/or white with reflective tape strips on the corners.  
   D. White and/or blue with reflective tape strips on the side.

11-3. What color flight deck jersey does the arresting gear crew wear?

   A. Blue  
   B. Green  
   C. Red  
   D. Yellow

11-4. What color flight deck jersey does the Liquid Oxygen (LOX) crew wear?

   A. Blue  
   B. Green  
   C. Red  
   D. White

11-5. What color flight deck jersey does the aircraft handling crew and chock men wear?

   A. Blue  
   B. Green  
   C. Red  
   D. White

11-6. What color flight deck jersey do ordnance personnel wear?

   A. Blue  
   B. Green  
   C. Red  
   D. White
11-7. How many hours before the launch is flight quarters usually sounded?

A. 1 to 2  
B. 2 to 3  
C. 4 to 5  
D. 5 to 6

11-8. How many minutes before launch time do flight crews perform their final checks to start the engines upon the signal from primary fly control (PRI-FLY)?

A. 15  
B. 20  
C. 25  
D. 30

11-9. Which of the following is part of the emergency recovery equipment used for the emergency arrestment (stopping) of an aircraft that cannot make a normal (pendant) arrested landing?

A. Arresting hook  
B. Barricade  
C. Catwalks  
D. Number 3 wire

11-10. What is the meaning of the following day time aircraft hand signal: arms above head in vertical position with palms facing inward?

A. Affirmative (all clear)  
B. Negative (not clear)  
C. Proceed to next marshaler  
D. This way

11-11. What is the meaning of the following day time aircraft hand signal: arms down, fists closed, thumbs extended inwards, swing arms from extended position inwards?

A. Affirmative (all clear)  
B. Insert chocks  
C. Install down locks  
D. Remove chocks

11-12. What is the meaning of the following day time aircraft hand signal: either arm and hand level with shoulder, hand moving across the throat, palm down; hand is moved sideways, arm remaining bent, other arm pointing to engine?

A. Cut engine  
B. Disconnect ground electric power  
C. Slow down engine  
D. Start ground electric power
11-13. What is the meaning of the following day time aircraft hand signal: describe large figure eight with one hand and point to the area with the other hand?

A. Cut engine  
B. Disconnect ground electric power  
C. Fire  
D. Engage nosegear steering

11-14. What is the meaning of the following day time helicopter hand signal: arms extended horizontally sideways, palms downward?

A. Hover  
B. Move downward  
C. Move upward  
D. Move to left

11-15. What is the meaning of the following day time helicopter hand signal: waving arms over the head?

A. Land  
B. Lower wheels  
C. Remove blade tiedowns  
D. Wave off

11-16. During cold weather procedures jury struts and crew station covers are ......

A. Mandatory.  
B. Optional.  
C. Necessary.  
D. Recommended.

11-17. What is designed for towing aircraft that have nose or tailwheel axle holes?

A. ALBAR  
B. TD-1A  
C. TD-1B  
D. Wheel chock

11-18. What is used to tie down aircraft aboard ship?

A. ALBAR  
B. TD-1A/B  
C. TD-22C  
D. Wheel chock
11-19. Which of the following is a true statement if an aircraft with inoperative brakes is to be respotted?

A. The crew station must be manned.
B. The crew station must NOT be manned.
C. The move crew will have double the personnel.
D. The move crew will have triple the personnel.

11-20. What color is the 6-inch band around the top of a fire extinguisher that signifies it is Halon?

A. Purple
B. Fluorescent yellow
C. Silver
D. Yellow

11-21. What color is the 6-inch band around the top of a fire extinguisher that signifies it is AFFF?

A. Purple
B. Fluorescent yellow
C. Silver
D. Yellow

11-22. What color is the 6-inch band around the top of a fire extinguisher that signifies it is CO₂?

A. Purple
B. Fluorescent yellow
C. Silver
D. Yellow

11-23. What color light/rotating beacon signal is used to signify recovery?

A. Amber
B. Blue
C. Green
D. Red

11-24. What color light/rotating beacon signal is used to signify start engines?

A. Amber
B. Blue
C. Green
D. Red

11-25. Who should you get direction from before approaching or departing a helicopter?

A. Blue shirt
B. Landing Signals Enlisted (LSE)
C. Landing Signals Officer (LSO)
D. Yellow shirt
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