

## CHAPTER 10

# LINE OPERATIONS AND SAFETY

### INTRODUCTION

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 (SE), handle, secure, and service aircraft. You must also be aware of the related safety precautions to reduce personal injury, aircraft and equipment damage, and prevent a loss of operational readiness due to ground accidents. This chapter outlines some of these crucial factors.

### OPERATING EQUIPMENT AROUND AIRCRAFT

**LEARNING OBJECTIVE:** Identify the proper procedures for operating ground support equipment near or around aircraft, the safety precautions and hazards involved, and support equipment color identification.

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 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 miles per hour.
- 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 (SE)

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 SE 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, FOD) when introduced to the wrong system, can ruin an aircraft, 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 or when they shouldn't be.
- 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 that 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, hanger bays, parking ramps, taxiways, and runways. Most support equipment (SE) 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/exhaust and front/rear pintels for attaching tow bars, are painted red.

*Q10-1. What is the maximum aircraft towing speed?*

*Q10-2. What color is support equipment painted?*

## **AIR OPERATIONS ABOARD A CARRIER**

**LEARNING OBJECTIVE:** Recognize aircraft handling activities to include signaling, spotting, launching, landing, securing, and general safety precautions on board aircraft carriers (CVs/CVNs).

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 (fig. 10-1). Personnel who work on the flight deck must also wear long sleeve jerseys and trousers, flight deck shoes, an inflatable life preserver outfitted with distress light marker, sea dye marker, and a secured whistle (fig. 10-2). All personnel assigned flight quarters stations on or above the hangar deck level must wear this uniform as described in table 10-1. Notice the different colors identifying different assignments or jobs.

## **PLANE-HANDLING CREWS**

The V-1 division is responsible for handling aircraft on the flight deck, and the V-3 division is charged with this responsibility for 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

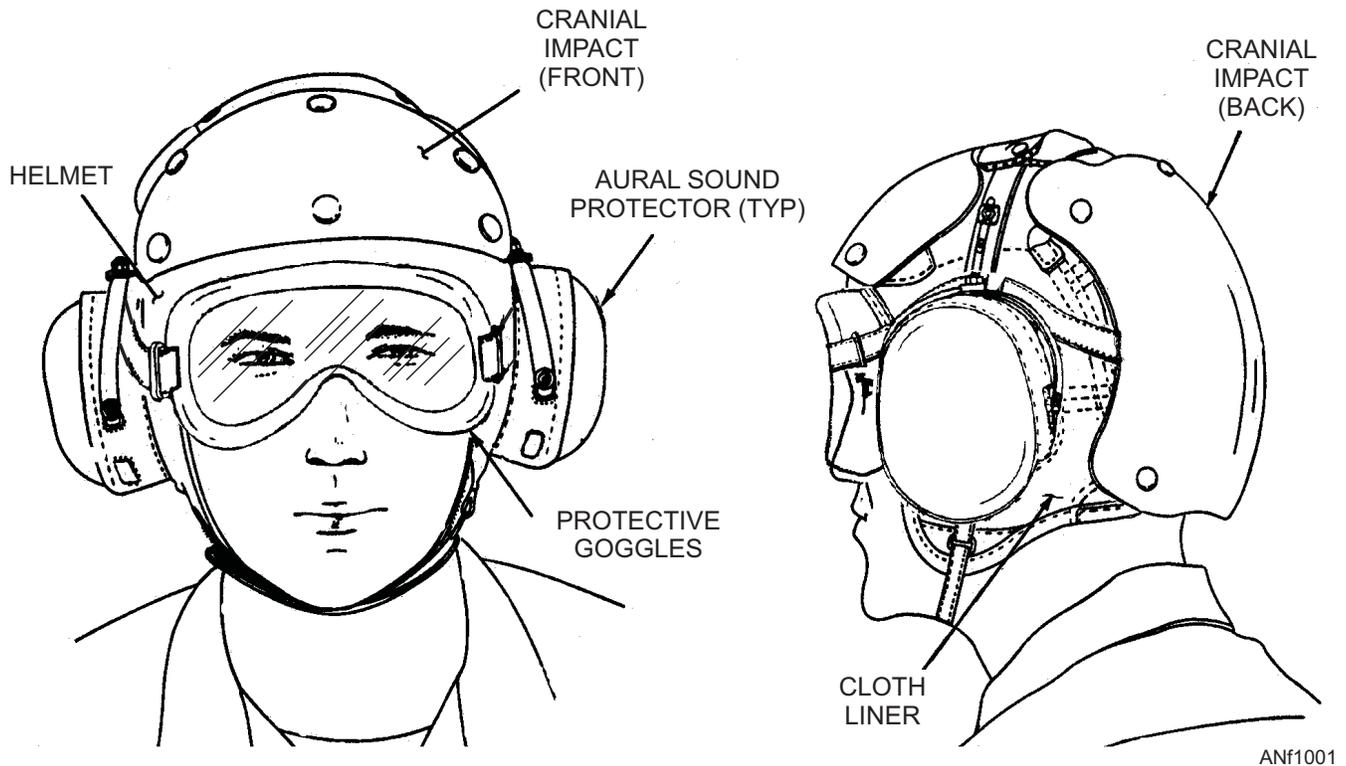


Figure 10-1.—Cranial helmet assembly.

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 cockpit 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.

## 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

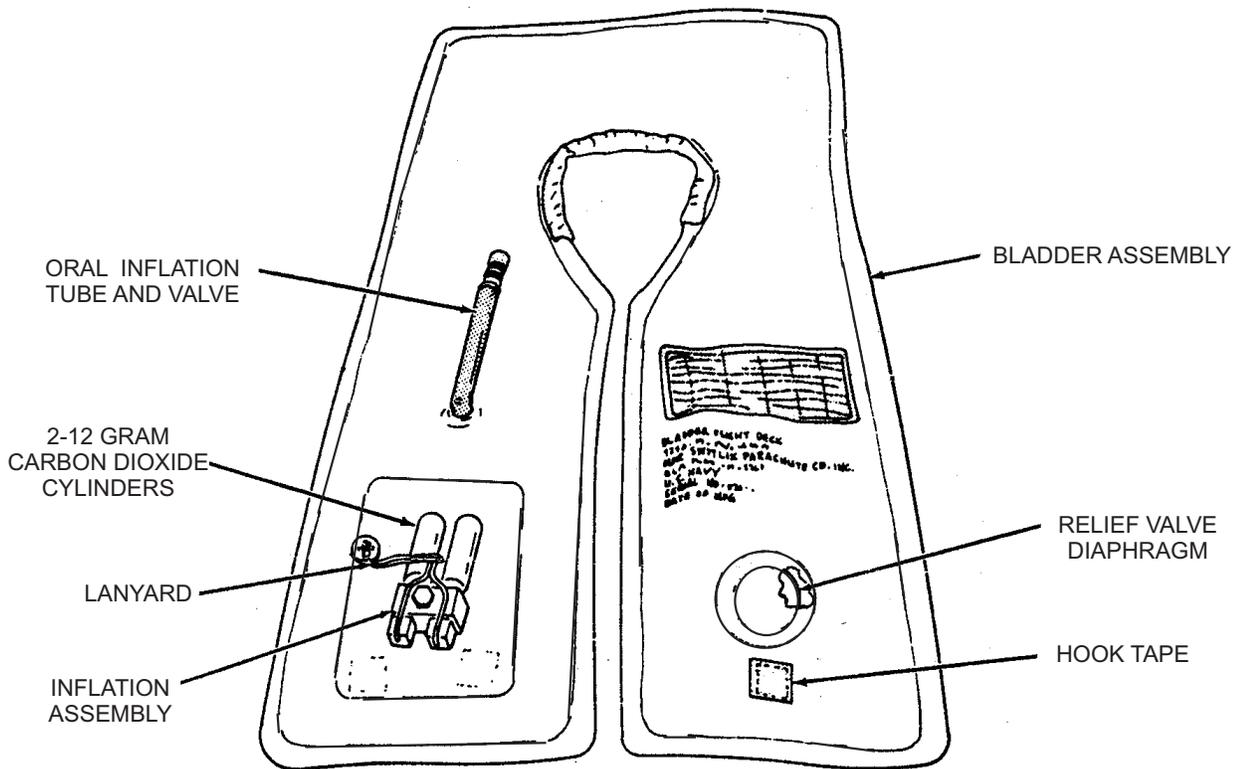
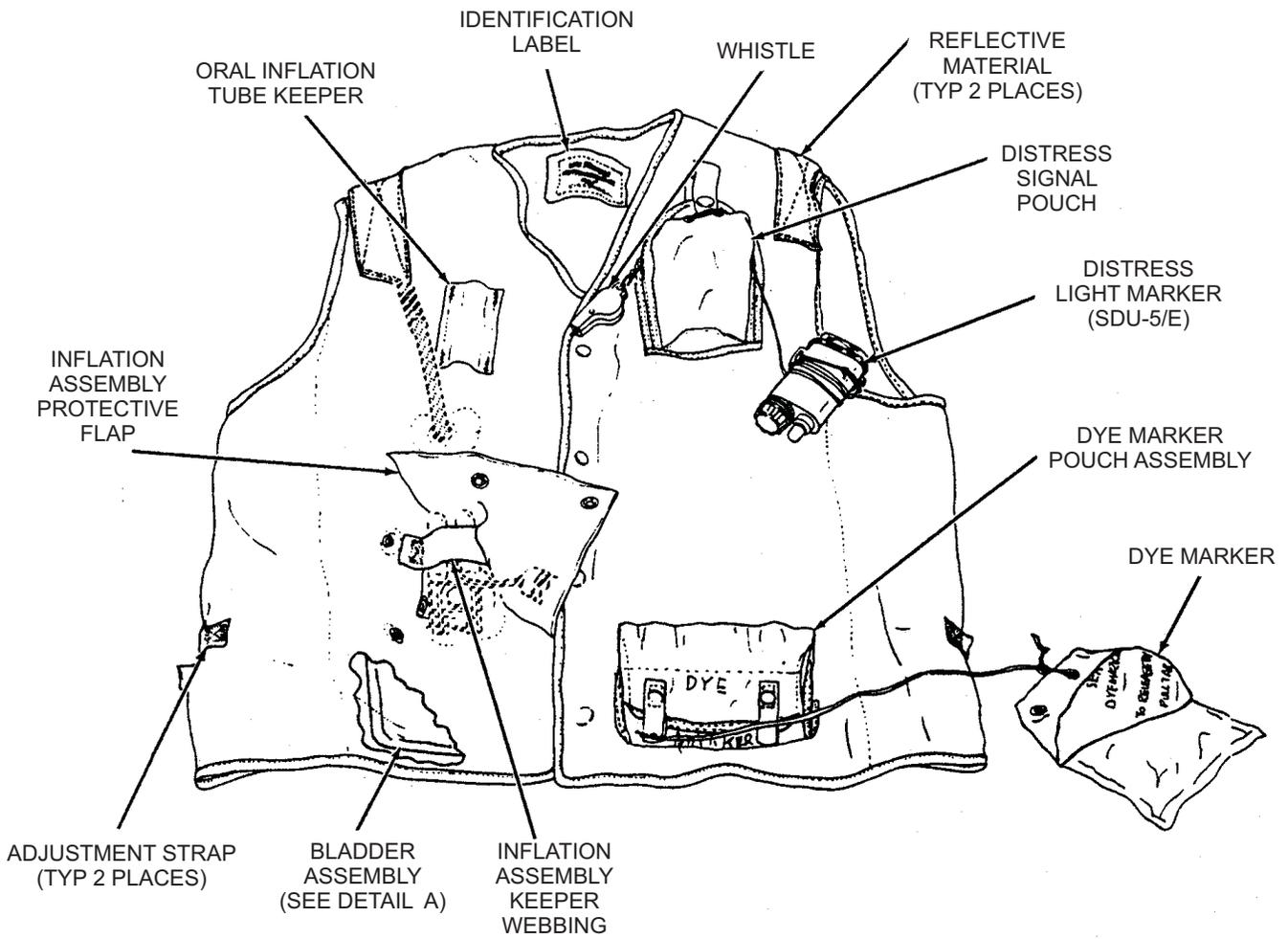


Figure 10-2.—Mk 1 inflatable life preserver.

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**Table 10-1.—Authorized Flight Quarters Clothing**

Aircraft handling crew and chock men	Blue	Blue	Crew number
Aircraft handling officers and plane directors	Yellow	Yellow	Billet title—crew number
Arresting gear crew	Green	Green	A
Aviation fuels crew	Purple	Purple	F
Cargo handling personnel	White	Green	"SUPPLY"/"POSTAL" as appropriate
Catapult and arresting gear officers	Green	Yellow	Billet title
Catapult crew	Green	Green	C
Catapult safety observer (ICCS)	Green	(Note 4)	Billet title
Crash and salvage crews	Red	Red	Crash/Salvage
Elevator operators	White	Blue	E
Explosive ordnance disposal (EOD)	Red	Red	"EOD" in black
GSE troubleshooter	Green	Green	"GSE"
Helicopter LSE	Red	Green	H
Helicopter plane captain	Red	Brown	H
Hook runner	Green	Green	A
Landing signal officer	None	White	LSO
Leading petty officers:			
Line	Green	Brown	Squadron designator and "Line CPO"
Maintenance	Green	Green	Squadron designator plus "Maint. CPO"
Quality assurance	Brown	White	Squadron designator and "QA"
Squadron plane inspector	Green	White	Black and white checkerboard pattern and squadron designator
LOX crew	White	White	LOX
Maintenance crews	Green	Green	Black stripe and squadron designator
Medical	White	White	Red cross
Messengers and telephone talkers	White	Blue	T
Ordnance	Red	Red	3-inch black stripe and squadron designator/ships billet title
Photographers	Green	Green	P
Plane captains	Brown	Brown	Squadron designator
Safety	White	White	"SAFETY"
Supply VERTREP coordinator	White	Green	"SUPPLY COORDINATOR"
Tractor driver	Blue	Blue	Tractor
Tractor King	Blue	(Note 5)	TK
Transfer officer	White	White	"TRANSFER OFFICER"

NOTE

1. Only officers charged with the actual control or direction of aircraft movements on the flight or hanger decks shall wear yellow jerseys. Officers in charge of a detail such as aviation fuels, ordnance, and maintenance shall wear a helmet and jersey corresponding in color to that of their respective detail, with their billet title on the jersey and flotation vest.
2. Helmets for the following personnel shall be marked with three reflective international orange stripes, 1-inch wide, evenly spaced, running fore and aft:
  - a. All air department officers.
  - b. Air department chief petty officers and leading petty officers.
  - c. EOD team members.
  - d. All ordnance officers and gunners.
  - e. Ordnance handling officer and air gunner.
3. Helmets for all other personnel shall be marked with a 6-inch square (or equivalent) of white reflective tape on the back shell and a 3-inch by 6-inch (or equivalent) of white reflective tape on the front shell. Landing signal officers are not required to wear helmets or sound attenuators when engaged in aircraft control.
4. New requirement for ICCS is green jersey and yellow vest.
5. Yellow jersey/blue flotation vest.

arresting gear, 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. Since most aircraft are jets, they are catapulted. Aircraft are spotted as to type, mission, and what catapult is to be used to ensure an even, continuous flow to the catapults. 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 foreign object damage (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 respots 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, move or respot aircraft as required, and manage all aircraft securing equipment. Once complete, the first launch aircraft are started.

<p style="text-align: center;"><b>DANGER</b></p> <p style="text-align: center;">Beware of jet blast, props, and rotors.</p>
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## 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 take 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 primary flight control (PRI-FLY), which gives the catapult officer the signal to launch, flight deck control for the movement of all aircraft, and the bridge that gives permission to commence the launch.

**NOTE:** Primary flight control (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 preformed, 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 sequence of time

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, alternating between the catapults (2, 3, or 4), is continued 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) 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:

1. The stanchions are all the way down.
2. The removable coamings are stored.
3. 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 landing signal officer (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 the aircraft is in the proper position, the LSO gives the pilot (propeller-type aircraft) 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 Fresnel Lens Optical Landing System (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 taxis 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 taxis the aircraft to a position so the nose of the aircraft is pointed over the side, and then stops the aircraft.

The director then 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 (fig. 10-3) 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, which include ramp plates and deck cables.

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.

*Q10-3. What division is responsible for handling aircraft on the flight deck?*

*Q10-4. What is the purpose of a "FOD walkdown"?*

*Q10-5. What is the alternating red and white striped line that runs the length of the flight deck called?*

*Q10-6. What is the purpose of a barricade?*

## **AIRCRAFT HANDLING SIGNALS**

**LEARNING OBJECTIVE:** Recognize aircraft handling signals aboard ship.

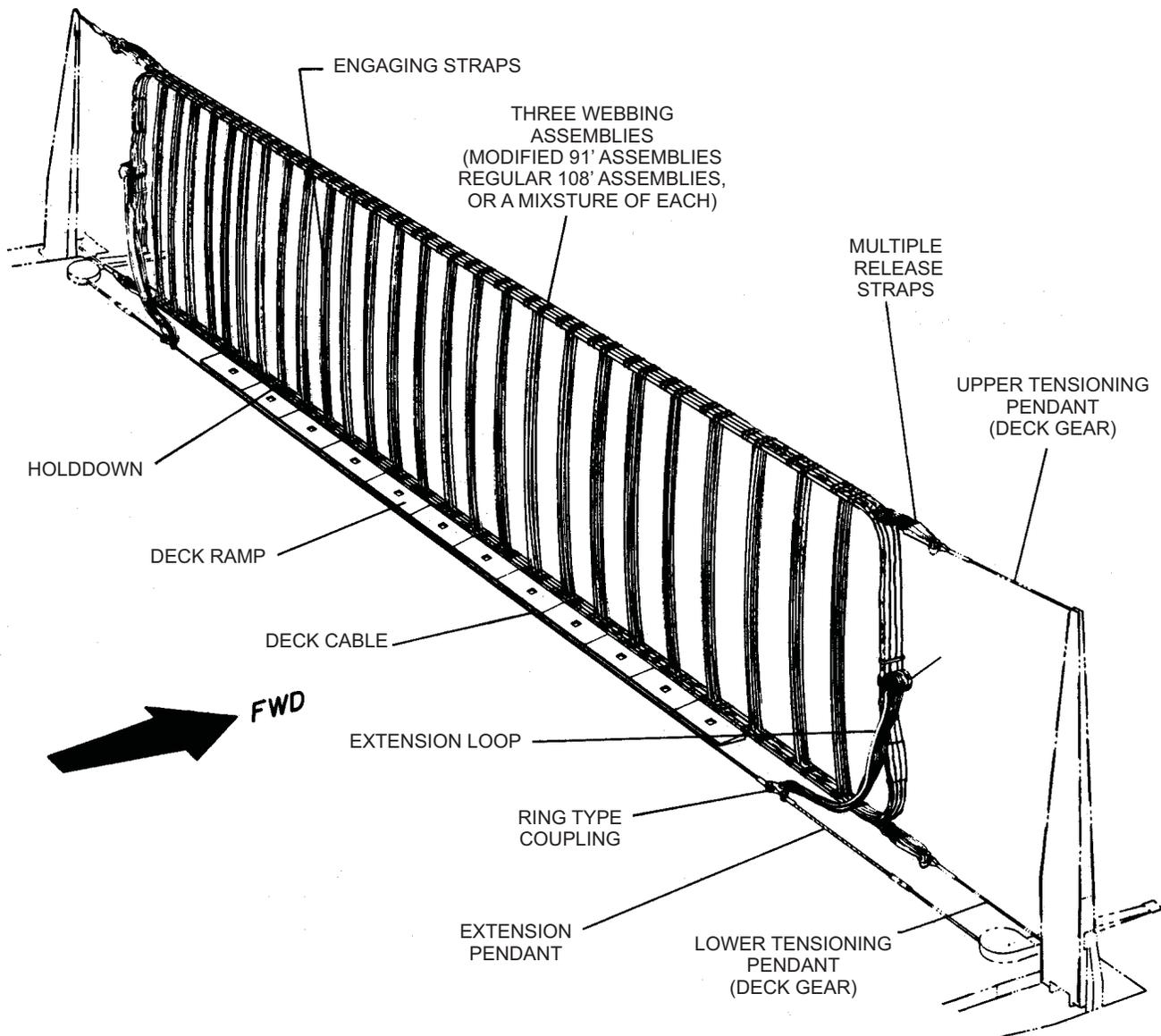


Figure 10-3.—Typical barricade in the ready position.

The aircraft-handling signals discussed in this section (fig. 10-4) 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.

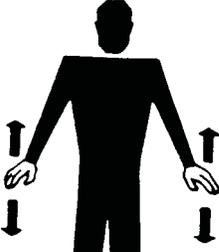
**NOTE:** The "emergency stop" signal is mandatory. All other director hand signals are advisory when directing aircraft.

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).

SIGNAL	DAY	NIGHT	REMARKS
<p>①</p>  <p>AFFIRMATIVE (ALL CLEAR)</p>	Hand raised, thumb up.	Same as day signal with addition of wands.	Conforms to ICAO signal.
<p>②</p>  <p>NEGATIVE (NOT CLEAR)</p>	Arm held out, hand below waist level, thumb turned downwards.	Same as day signal with addition of wands.	
<p>③</p>  <p>PROCEED TO NEXT MARSHALER</p>	Right or left arm Down, other arm moved across the body and extended to indicate direction to next marshal.	Same as day signal with addition of wands.	Conforms to ICAO signal.
<p>④</p>  <p>THIS WAY</p>	Arms above head in vertical position with palms facing inward.	Same as day signal with addition of wands.	Conforms to ICAO signal.

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Figure 10-4.—General aircraft-handling signals (sheet 1).

SIGNAL	DAY	NIGHT	REMARKS
<p>⑤</p>  <p>SLOW DOWN</p>	<p>Arms down with palms towards ground, then moved up and down several times.</p>	<p>Same as day signal with addition of wands.</p>	<p>Conforms to ICAO signal.</p>
<p>⑥</p>  <p>TURN TO LEFT</p>	<p>Extend right arm horizontally, left arm is repeatedly moved upward. Speed of arm movement indicating rate of turn.</p>	<p>Same as day signal with addition of wands</p>	<p>1. Clench fist (day), or down-turned wand (night), means for pilot to lock indicated brake.</p> <p>2. Also used for spot turns airborne aircraft. Conforms to ICAO signal.</p>
<p>⑦</p>  <p>TURN TO RIGHT</p>	<p>Extend left arm horizontally, right arm is repeatedly moved upward. Speed of arm movement indicating rate of turn.</p>	<p>Same as day signal with addition of wands</p>	<p>1. Clench fist (day), or down-turned wand (night), means for pilot to lock indicated brake.</p> <p>2. Also used for spot turns airborne aircraft. Conforms to ICAO signal.</p>
<p>⑧</p>  <p>MOVE AHEAD</p>	<p>Arm extended from body and held horizontal to shoulders with hands up-raised and above eye level, palms facing backwards. Execute beckoning arm motion angled backward. Rapidity indicates speed desired of aircraft.</p>	<p>Same as day signal with addition of wands</p>	

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Figure 10-4.—General aircraft-handling signals (sheet 2).

SIGNAL	DAY	NIGHT	REMARKS
<p>9</p>  <p>STOP</p>	<p>Arms crossed above the head, palms facing forward.</p>	<p>Same as day signal with addition of wands.</p>	
<p>10</p>  <p>BRAKES</p>	<p>ON - Arms above head, open palms and fingers raised with palms toward aircraft, then fist closed.</p> <p>OFF - Reverse of above.</p>	<p>ON - Arms above head, then wands crossed.</p> <p>OFF - Crossed wands, then uncrossed.</p>	
<p>11</p>  <p>MOVE BACK (ALSO USED TO PULL BACK AIRCRAFT UTILIZING ARRESTING WIRE)</p>	<p>Arms by sides, palms facing forward, swept forward and upward repeatedly to shoulder height.</p>	<p>Same as day signal with addition of wands.</p>	<p>Conforms to ICAO signal.</p>
<p>12</p>  <p>URNS WHILE BACKING (TAIL TO LEFT)</p>	<p>Point right arm down and left arm brought from overhead, vertical position to horizontal position repeating left arm movement.</p>	<p>Same as day signal with addition of wands</p>	<p>Conforms to ICAO signal.</p>

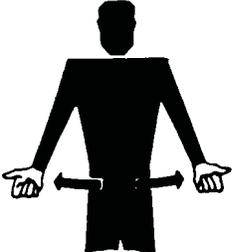
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Figure 10-4.—General aircraft-handling signals (sheet 3).

SIGNAL	DAY	NIGHT	REMARKS
<p>⑬</p>  <p>⑬ TURNS WHILE BACKING (TAIL TO RIGHT)</p>	<p>Point left arm down and right arm brought from overhead, vertical position to horizontal forward position, repeating right arm movement.</p>	<p>Same as day signal with addition of wands.</p>	<p>Conforms to ICAO signal.</p>
<p>⑭</p>  <p>⑭ CLEARANCE FOR PER- SONNEL TO APPROACH AIRCRAFT</p>	<p>A beckoning motion with right hand at eye level.</p>		
<p>⑮</p>  <p>⑮ PERSONNEL APPROACHING THE AIRCRAFT</p>	<p>Left hand raised vertically overhead, palm towards aircraft. The other hand indicates to personnel concerned and gestures towards aircraft.</p>	<p>Same as day signal with addition of wands.</p>	
<p>⑯</p>  <p>⑯ INSERT CHOCKS</p>	<p>Arms down, fists closed, thumbs extended inwards, swing arms from extended position inwards.</p>	<p>Same as day signal with addition of wands.</p>	<p>Conforms to ICAO signal.</p>

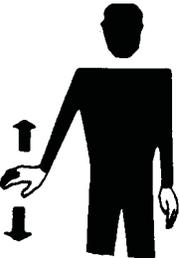
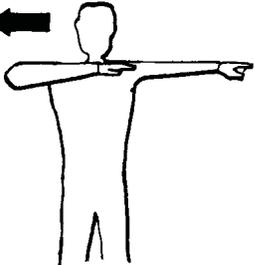
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Figure 10-4.—General aircraft-handling signals (sheet 4).

SIGNAL	DAY	NIGHT	REMARKS
<p>①7</p>  <p>REMOVE CHOCKS</p>	<p>Arms down, fists closed, thumbs extended outwards, swing arms outwards.</p>	<p>Same as day signal with addition of wands.</p>	<p>Conforms to ICAO signal.</p>
<p>①8</p>  <p>INSTALL DOWN LOCKS/ UNDERCARRIAGE PINS</p>	<p>With arms above head, the right hand clasps left forearm and the left fist is clenched.</p>	<p>Similar to the day signal except the right wand is placed against left forearm. The wand in the left hand is held vertical.</p>	
<p>①9</p>  <p>REMOVE DOWN LOCKS/ UNDERCARRIAGE PINS</p>	<p>With arms and hands in "install down locks" position, the right hand unclasps the left forearm.</p>	<p>Similar to the day signal except with the addition of wands.</p>	
<p>②0</p>  <p>CONNECT GROUND ELECTRICAL POWER SUPPLY</p>	<p>Hands above head, left fist partially clenched, right hand moved in direction of left hand with first two fingers extended and inserted into circle made by fingers of the left hand.</p>	<p>Same as day signal with addition of wands.</p>	<p>Same signal for air start unit except using two fingers (day).</p>

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Figure 10-4.—General aircraft-handling signals (sheet 5).

SIGNAL	DAY	NIGHT	REMARKS
<p>(21)</p>  <p>DISCONNECT GROUND ELECTRIC POWER SUPPLY</p>	<p>Hands above head, left fist partially clenched, right hand moved away from the left hand, withdrawing first two fingers from circle made by fingers of the left hand.</p>	<p>Same as day signal with addition of wands.</p>	<p>Same signal for air start unit except using two fingers (day).</p>
<p>(22)</p>  <p>START ENGINE(S)</p>	<p>Left hand overhead with appropriate number of fingers extended, to indicate the number of the engine to be started, and circular motion of right hand at head level.</p>	<p>Similar to the day signal except that the wand in the left hand will be flashed to indicate the engine to be started.</p>	<p>Conforms to ICAO signal.</p>
<p>(23)</p>  <p>SLOW DOWN ENGINE(S) ON INDICATED SIDE</p>	<p>Arms down with palms toward ground, then either right or left arm waved up and down indicating that left or right side engines respectively should be slowed down.</p>	<p>Same as day signal with addition of wands.</p>	<p>Conforms to ICAO signal.</p>
<p>(24)</p>  <p>CUT ENGINE(S)</p>	<p>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.</p>	<p>Same as day signal with addition of wands.</p>	

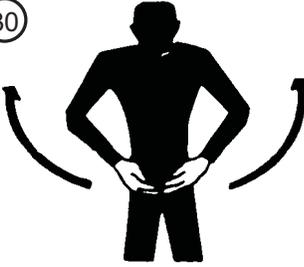
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Figure 10-4.—General aircraft-handling signals (sheet 6).

SIGNAL	DAY	NIGHT	REMARKS
<p>(25)</p>  <p>LOCK TAIL WHEEL</p>	<p>Hands together overhead, opened from the wrists in a V , then closed suddenly.</p>	<p>Same as day signal with addition of wands.</p>	
<p>(26)</p>  <p>UNLOCK TAIL WHEEL</p>	<p>Hands overhead, palms together, then hands opened from the wrists to for a V, wrists remaining together.</p>	<p>Same as day signal with addition of wands.</p>	
<p>(27)</p>  <p>FOLD WINGS/ HELICOPTER BLADES</p>	<p>Arms straight out at sides, then swept forward and hugged around shoulders.</p>	<p>Same as day signal with addition of wands</p>	
<p>(28)</p>  <p>SPREAD WINGS/ HELICOPTER BLADES</p>	<p>Arms hugged around shoulders, the swept straight out to the sides.</p>	<p>Same as day signal with addition of wands</p>	

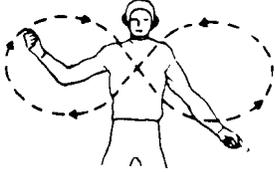
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Figure 10-4.—General aircraft-handling signals (sheet 7).

SIGNAL	DAY	NIGHT	REMARKS
<p>(29)</p>  <p>LOCK WINGS/ HELICOPTER BLADES</p>	<p>Hit right elbow with palm of left hand.</p>	<p>Same as day signal with addition of wands.</p>	
<p>(30)</p>  <p>OPEN WEAPONS BAY(S) DOOR(S)</p>	<p>Body bent forward at the waist, hands held with fingertips touching in front of body and elbows bent at approximately 45°, then arms swing downward and outward.</p>	<p>Same as day signal with addition of wands.</p>	
<p>(31)</p>  <p>CLOSE WEAPON BAY(S) DOOR(S)</p>	<p>Body bent forward at the waist and arms extended horizontally, then arms swing downward and inward until fingertips touch in front of the body with elbows bent at approximately 45°.</p>	<p>Same as day signal with addition of wands</p>	
<p>(32)</p>  <p>TAKE OFF</p>	<p>Director conceals left hand and makes circular motion of right hand over head in horizontal plane ending in a throwing motion of arm towards direction of takeoff.</p>	<p>Same as day signal with addition of wands</p>	

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Figure 10-4.—General aircraft-handling signals (sheet 8).

SIGNAL	DAY	NIGHT	REMARKS
<p>33</p>  <p>FIRE</p>	<p>Describes large figure eight with one hand and point to the fire area with the other hand.</p>	<p>Same, except with wands.</p>	<p>Signal is meant for information only. Pilot should be given a cut engine or continuous turnup signal, as appropriate.</p>
<p>34</p>  <p>ENGAGE NOSEGEAR STEERING</p>	<p>Point to nose with index finger while indicating direction of turn with other index finger.</p>	<p>Same as day signal with addition of wands.</p>	
<p>35</p>  <p>DISENGAGE NOSEGEAR STEERING</p>	<p>Point to nose with index finger, lateral wave with open palm of other hand at shoulder height.</p>	<p>Same as day signal with addition of wands.</p>	
<p>36</p>  <p>LOWER WING FLAPS</p>	<p>Hands in front, palms together horizontally then opened from the wrist crocodile-mouth fashion.</p>	<p>Same as day signal with addition of wands.</p>	

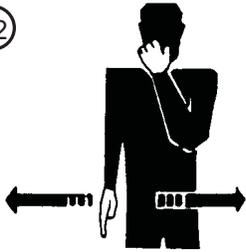
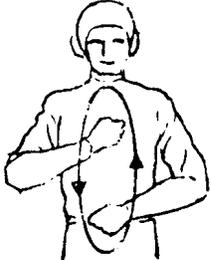
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Figure 10-4.—General aircraft-handling signals (sheet 9).

SIGNAL	DAY	NIGHT	REMARKS
<p>(37)</p>  <p>RAISE WING FLAPS</p>	<p>Hands in front vertically, with palms open from the wrists, then suddenly closed.</p>	<p>Same as day signal with addition of wands.</p>	
<p>(38)</p>  <p>DOWN HOOK</p>	<p>Right fist , thumb extended downward, lowered suddenly to meet horizontal palm of left hand.</p>	<p>Same as day signal with addition of wands.</p>	
<p>(39)</p>  <p>UP HOOK</p>	<p>Right fist , thumb extended upward, raised suddenly to meet horizontal palm of left hand.</p>	<p>Same as day signal with addition of wands.</p>	
<p>(40)</p>  <p>OPEN AIR BRAKES</p>	<p>Hands in front, palms together horizontally. Then opened from the wrists crocodile-mouth fashion.</p>	<p>Same as day signal with addition of wands.</p>	

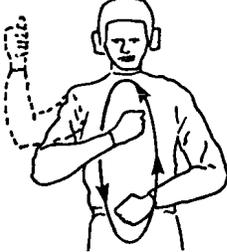
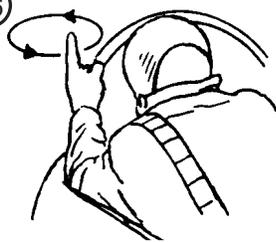
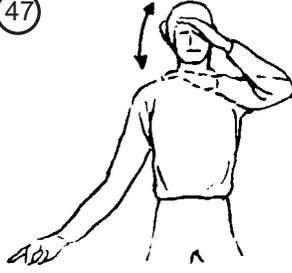
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Figure 10-4.—General aircraft-handling signals (sheet 10).

SIGNAL	DAY	NIGHT	REMARKS
<p>41</p>  <p>CLOSE AIR BRAKES</p>	<p>Hands in front horizontally, with palms open from the wrists, then suddenly closed.</p>	<p>Same as day signal with addition of wands.</p>	
<p>42</p>  <p>TILLER BAR/STEERING ARM IN PLACE</p>	<p>Hold nose with left hand, right hand moving horizontally at waist level.</p> <p>a. Affirmative signal immediately following means: MAN IS TENDING BAR.</p> <p>b. A negative signal immediately following means: NO ONE TENDING BAR.</p>	<p>Same as day signal with addition of wands.</p>	
<p>43</p>  <p>REMOVE TIEDOWNS (director)</p>	<p>To tiedown crew: Makes wiping motion down left arm with right hand.</p>	<p>Same as day signal with addition of wands.</p>	
<p>44</p>  <p>INSTALL TIEDOWNS (director)</p>	<p>To tiedown crew: Rotates hands in a circle perpendicular to and in front of his body.</p>	<p>Same as day signal with addition of wands.</p>	

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Figure 10-4.—General aircraft-handling signals (sheet 11).

SIGNAL	DAY	NIGHT	REMARKS
<p>45</p>  <p>TIEDOWNS IN PLACE (director)</p>	<p>Same signal as "install tiedown," followed by thumbs up.</p>	<p>Same as day except with wands.</p>	
<p>46</p>  <p>ENGINE RUNUP (pilot)</p>	<p>Moves forefinger in a circular motion in view of director to indicate that he is ready to run up engines.</p>	<p>Makes circular motion with hand held light.</p>	<p>Director responds with same signal (wand at night) to indicate "clear to run up."</p>
<p>47</p>  <p>HOT BRAKES</p>	<p>Makes rapid fanning motion with one hand in front of face and points to wheel with other hand.</p>	<p>Same as day except with wands.</p>	
<p>48</p> <p>BRAKE FAILURE (tailhook equipped aircraft) (pilot)</p>	<p>Pilot drops tailhook and turns on external lights as an emergency signal to the director and deck crew.</p>	<p>Same as day.</p>	<p>Pilot also informs tower via radio.</p>

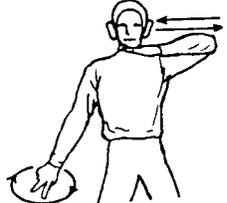
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Figure 10-4.—General aircraft-handling signals (sheet 12).

SIGNAL	DAY	NIGHT	REMARKS
<p>(49)</p>  <p>LIGHTS</p>	<p>Points to eyes with two fingers to signal "lights on."</p>	<p>Flashing wands.</p>	<p>When lights are already on, same signal is used to signal "lights off."</p>
<p>(50)</p>  <p>I HAVE COMMAND</p>	<p>Hold one hand open, motionless and high above head, with palm forward.</p>	<p>Same as day except with wands.</p>	
<p>(51)</p>  <p>OPEN COWL FLAPS</p>	<p>Hold hands against side of head; then open hands by moving thumbs forward and outward.</p>	<p>Same as day except with wands.</p>	
<p>(52)</p> <p>CONNECT/DISCONNECT AIR STARTING UNIT</p>			<p>Same as connect/disconnect ground "electrical power supply." except using one finger (day). (See signals 20 and 21.)</p>

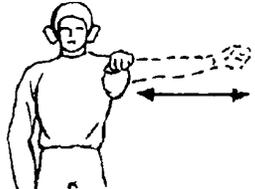
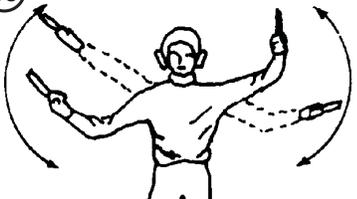
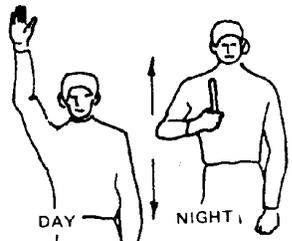
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Figure 10-4.—General aircraft-handling signals (sheet 13).

SIGNAL	DAY	NIGHT	REMARKS
<p>53</p>  <p>START AIRCRAFT AUXILIARY POWER UNIT</p>	<p>Points to power unit exhaust with left hand index finger; moves right hand in horizontal circle, index and middle finger pointing downward.</p>	<p>Same as day except with wands.</p>	
<p>54</p>  <p>STOP AIRCRAFT AUXILIARY POWER UNIT</p>	<p>Makes "throat cutting" action with left hand; moves right hand in horizontal circle, index and middle fingers pointing downward.</p>	<p>Same as day except with wands.</p>	
<p>55</p>  <p>GROUND REFUELING ALL TANKS, NO EXTERNAL POWER (ground crewman)</p>	<p>Extends arm in front of body and makes a wide circular wiping motion; then brings thumb to mouth as if drinking from a glass.</p>	<p>Same except with wand held vertically.</p>	<p>Pilot extends air refueling probe and sets switches for fueling all tanks.</p>
<p>56</p>  <p>GROUND REFUELING, IN- TERNAL TANKS ONLY, NO EXTERNAL POWER (ground crewman)</p>	<p>Makes a circular motion as if rubbing stomach with palm of hand; then brings thumb to mouth as if drinking from a glass.</p>	<p>Same as day except with wands.</p>	<p>Pilot extends air refueling probe and sets switches for fueling internal tanks only.</p>

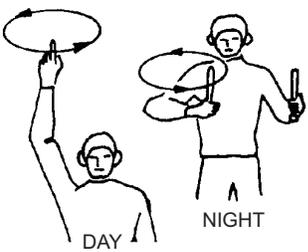
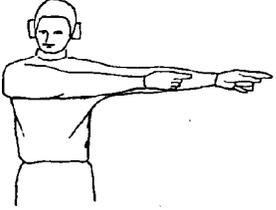
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Figure 10-4.—General aircraft-handling signals (sheet 14).

SIGNAL	DAY	NIGHT	REMARKS
<p>(57)</p>  <p>EXTEND/RETRACT AIR REFUELING PROBE OR RAM AIR TURBINE</p>	<p>TO EXTEND: Extend arm straight ahead, fist clenched; swing arm 90° to side. Use left or right arm according to location of probe.</p> <p>TO RETRACT: Use the reverse of the EXTEND signal</p>	<p>Same as day except with wand.</p>	<p>Pilot actuates probe on signal.</p>
<p>(58)</p>  <p>NEED AIRCRAFT STARTING UNIT</p>	<p>Extend arms out from body (curved upwards) and rotate arms in a clockwise/ counterclockwise motion.</p>	<p>Same as day except with wands.</p>	
<p>(59)</p>  <p>FUEL DISCHARGE DURING START</p>	<p>Left arm raised above shoulder with number of fingers extended to indicate affected engine; right hand describes a pendulum motion between waist and knees.</p>	<p>Similar to day signal except that wand in left hand will be flashed to indicate the number of the affected engine.</p>	<p>Signal is for information only; pilot should be given cut engine or continuous turnup signal, as appropriate.</p>
<p>(60)</p>  <p>AIR WATER INJECTION (AV-8)</p>	<p>Give FINAL TURNUP signal. Chapter 4 (No. 9). Wait 2 or 3 seconds while pilot turns up military rated thrust and checks instruments. Then, hold open hand toward pilot, fingers extended vertically.</p>	<p>Same except hold GREEN wand vertically and move up and down.</p>	<p>Day - Pilot acknowledges by salute.</p> <p>Night - Pilot acknowledges by turning on light to steady dim.</p>

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Figure 10-4.—General aircraft-handling signals (sheet 15).

SIGNAL	DAY	NIGHT	REMARKS
<p>61</p>  <p>DAY NIGHT</p> <p>ENGINE THRUST CHECK (AV-8)</p>	<p>Extend arm overhead, forefinger pointing up. Hesitate, then rotate hand rapidly in a horizontal circle.</p>	<p>Hold RED and GREEN wands at chest level, rotating the green wand in a horizontal circle.</p>	<p>Signal is optional, given at request of pilot. Also can be used for deck launch.</p>
<p>62</p>  <p>VTO (AV-8)</p>	<p>Arms extended horizontally sideways beckoning upwards, with palms turned up.</p>	<p>Same as day signal with addition of wands.</p>	
<p>63</p>  <p>PASS CONTROL</p>	<p>With both arms shoulder height, point in direction of person receiving control.</p>	<p>Same as day except point amber wand.</p>	<p>Used by U.S. Navy personnel. Not a NATO signal.</p>
<p>64</p>  <p>COD RAMP: OPEN/CLOSE</p>	<p>One hand held in hold, the other finger and thumb extended but not touching; then bring fingers and thumb together several times. Pilot will respond with same signal.</p>	<p>Two wands used in same manner.</p>	<p>Ramps shall not come down until deck crew acknowledges pilot signal.</p>

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Figure 10-4.—General aircraft-handling signals (sheet 16).

During night operations, the plane director uses two lighted taxi guidance wands (fig. 10-5) 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 10-2 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 10-4.

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*.

*Q10-7. What hand signal is mandatory when directing fixed-wing aircraft?*

*Q10-8. When taxiing aircraft, directors are usually stationed at what intervals of distance along the flight deck?*

## SECURING AIRCRAFT ABOARD CARRIERS

**LEARNING OBJECTIVE:** Recognize the importance of securing aircraft and support equipment, the weather conditions that affect securing arrangements, and the aircraft handling accessories required.

In general, securing aircraft and mobile support equipment is relative on all naval aviation ships. CV/(N) 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 (SE) aboard carriers cannot be overstressed. It is of the utmost importance that they are secured in a manner that prevents fore and aft and athwartship (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. Aircraft are parked 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

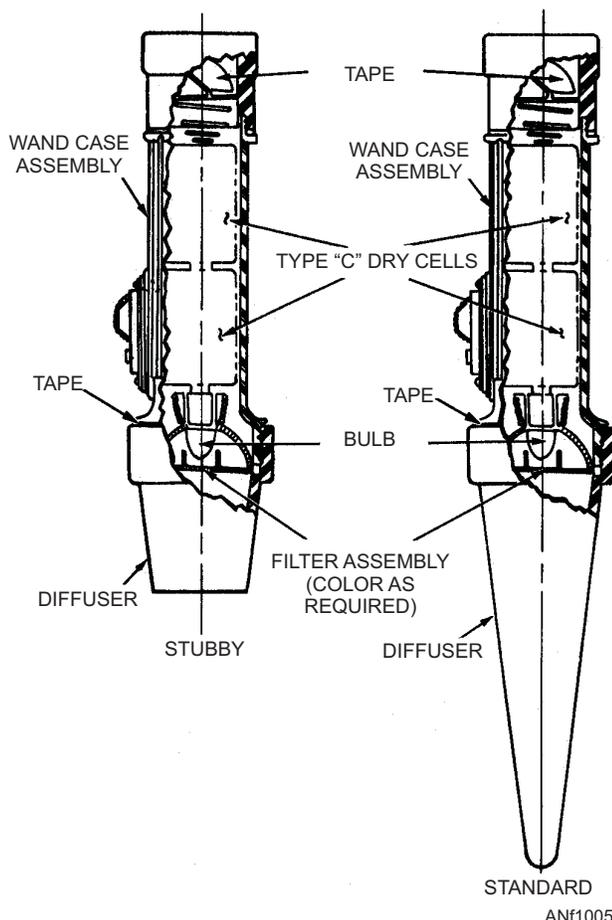


Figure 10-5.—Taxi guidance wand.

**Table 10-2.—Taxi Signal Wand Identification**

PERSONNEL	COLOR	NO	TYPE*
Aviation Fuels Checker	Amber	1	Stubby
Catapult Hookup Petty Officer	White	1	Stubby
Catapult Safety Observer (ICCS)	Red	1	Standard
	Green	1	Standard
Flight Deck Officer and Aircraft Directors	Amber	2	Standard
Hook Runner	Red	1	Stubby
Launching and Arresting Gear Officer/Helicopter LSE/LSO	Red	1	Standard
	Green	1	Standard
Ordnance Arming Crew	Red	1	Stubby Banded**
Ordnance Arming/Safety Supervisor	Red	2	Standard Banded***
Plane Captain	Blue	2	Standard
Squadron Aircraft Inspector	Blue	1	Stubby
<p>* 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.</p> <p>** One 3/4 inch band on the cone (plastic electrician's tape is recommended).</p> <p>*** Two 3/4 inch bands spaced equidistant on the cone (plastic electrician's tape is recommended).</p>			

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 eye). 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 cockpit covers, and tie-downs needed other than 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 10-6 shows the heavy weather tie-down arrangement for an aircraft.

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 athwartship 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 maintenance manual.

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, any leakage, or hazardous conditions. Extreme caution is necessary when you handle aircraft in heavy weather.

### 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, gear, and equipment for snow and ice removal are often used:

1. Mobile equipment removal—some aircraft tow tractors may be fitted with snowplow blades or with rattan or wire rotary brushes.
2. Manual removal—conventional methods include brooms, crowbars, shovels, wooden mallets,

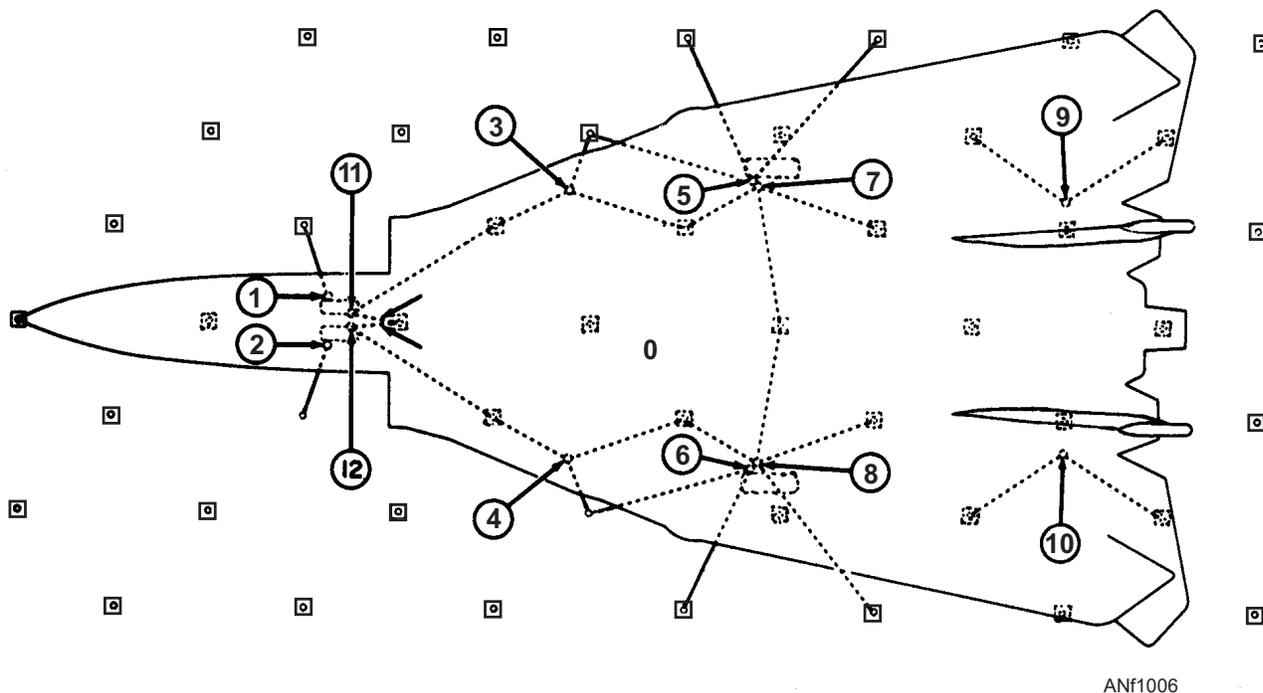


Figure 10-6.—Heavy weather aircraft tie-down.

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.

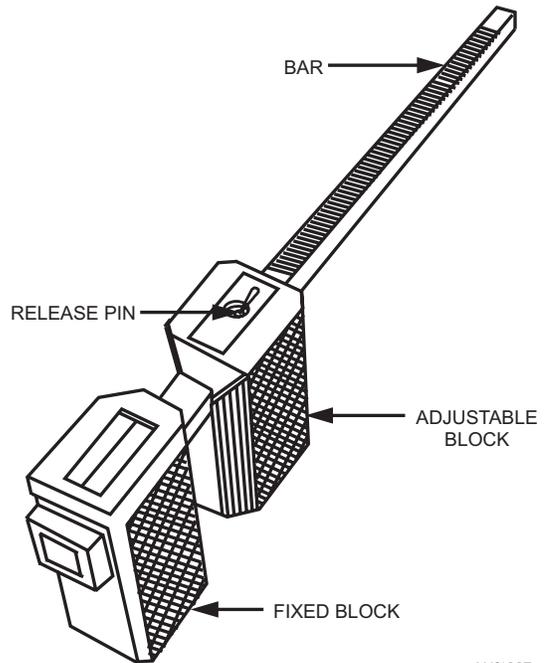
Use normal deck procedures in cold weather, but considerably more time is required because of the excessive hazards involved. Use battens on control surfaces. Jury struts and cockpit covers are recommended. Tie-down the controls inside the aircraft to eliminate the chance of movement of outer control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

**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.

**AIRCRAFT-HANDLING ACCESSORIES**

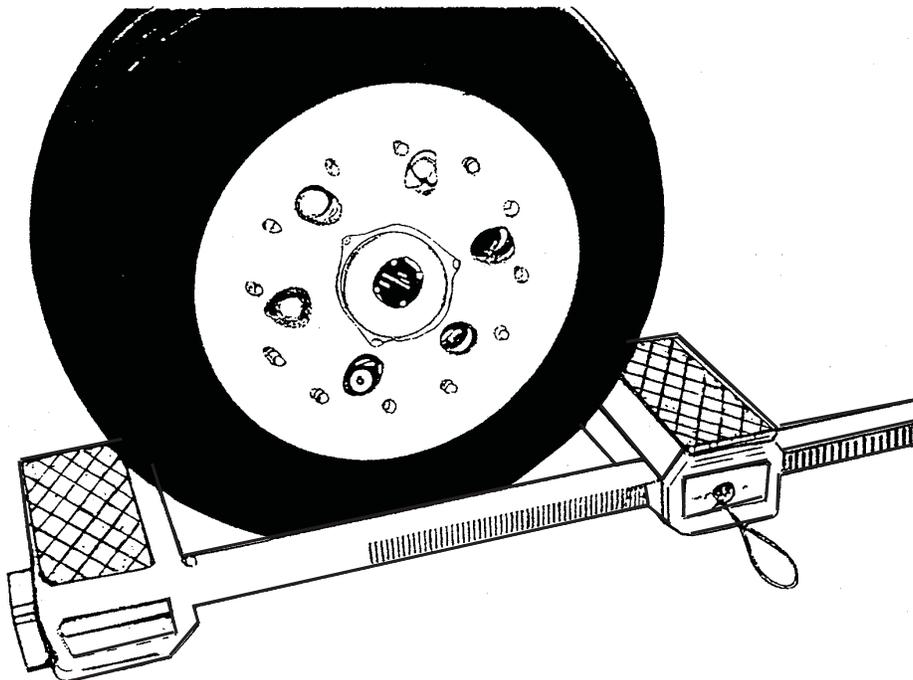
In addition to self-powered equipment, several important handling accessories are required for safe and efficient handling of aircraft. These accessories are discussed in the following text.



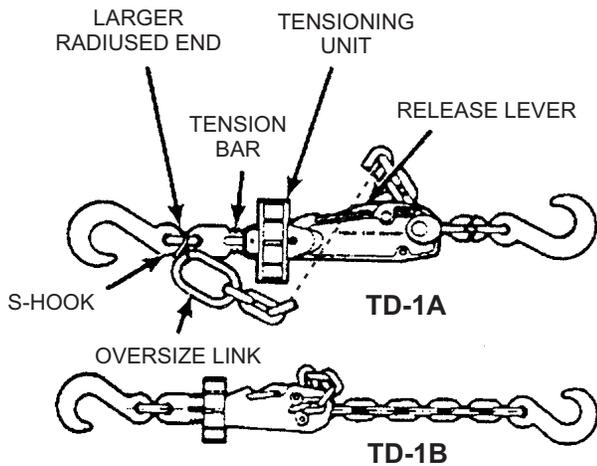
ANF1007  
Figure 10-7.—NWC-4/5 universal wheel chock.

**Aircraft Wheel Chocks**

Several types of aircraft wheel chocks are used by the Navy. Of these, the NWC-4/NWC-5 polyurethane universal wheel chock (fig. 10-7) 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. Fig. 10-8 shows a wheel chock installed.



Anf1008  
Figure 10-8.—NWC-4/5 universal wheel chock installed.



ANf1009

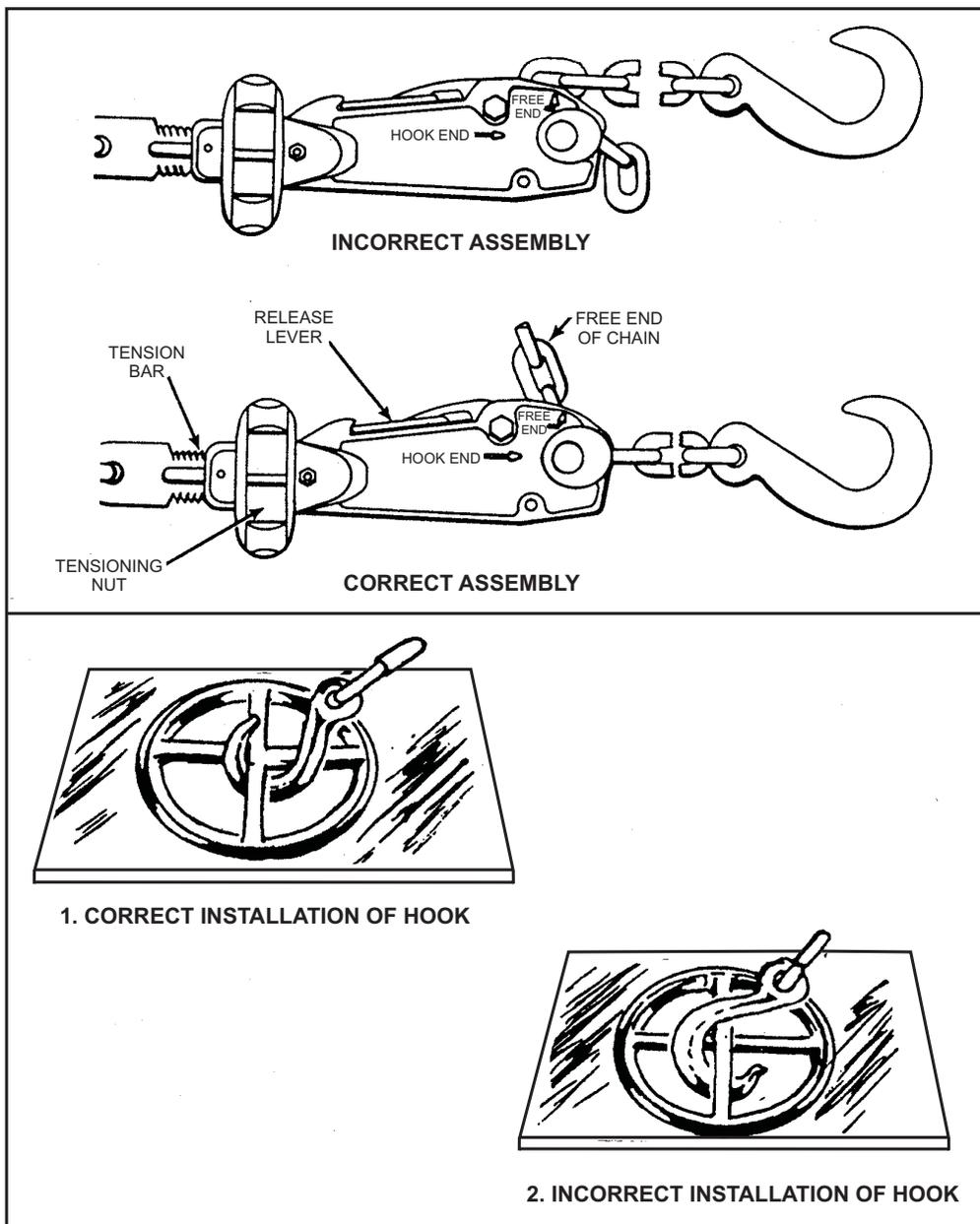
Figure 10-9.—TD-1A and TD-1B chain-type tie-down assemblies.

### TD-1A and TD-1B Tie-Down Assemblies

The quick-release TD-1A and TD-1B tie-down chain assemblies (fig. 10-9) 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, each with a hook at one end. Figure 10-10 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.

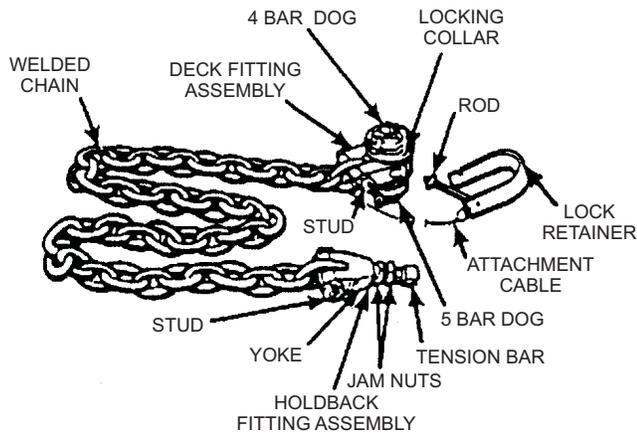
### A/B Tie-Down Assembly

This tie-down is called the (Aero) full-power tie-down assembly (fig. 10-11). It is commonly called



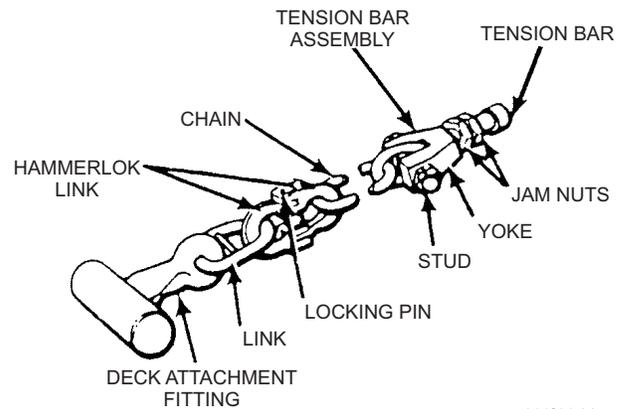
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Figure 10-10.—Close-up showing proper installation of the TD-1A assembly.



ANf1011

Figure 10-11.—Aero full power tie-down assembly.



ANf1012

Figure 10-12.—MXU-657/W aircraft restraint.

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 it.

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 10-12. Otherwise, it is identical.

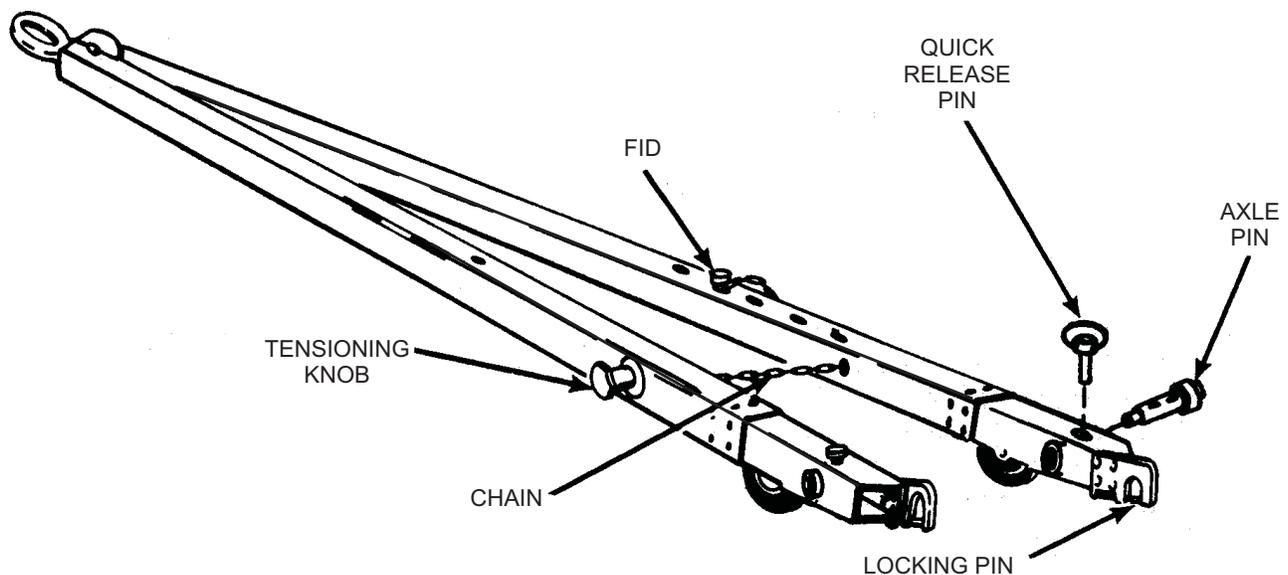
Special high-strength deck fittings are installed aboard ships and at shore stations in designated engine

run-up areas. Specific A/B tie-down instructions for each type of aircraft are contained in the specific maintenance instruction manual (MIM).

### 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.

The universal aircraft tow bar, Model ALBAR (Adjustable Length Towbar) (fig. 10-13) 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



ANF1013

Figure 10-13.—ALBAR universal aircraft tow bar.

landing gear tow rings (fig. 10-14), and it can be configured to accommodate different aircraft.

### 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.

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

*Q10-9. What is used to block aircraft main landing gear and support equipment wheels?*

*Q10-10. Detailed procedures for securing a specific aircraft can be found in what publication?*

*Q10-11. When the ship is not at flight quarters, who is responsible for maintaining aircraft security or integrity watches?*

*Q10-12. What is the purpose of an ALBAR?*

### GENERAL FLIGHT DECK SAFETY PRECAUTIONS

**LEARNING OBJECTIVE:** Identify the safety precaution to be followed while handling aircraft aboard a carrier and the persons responsible for safety.

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, 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:

1. 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.

2. The deck is considered *foul* any time unauthorized personnel are in or around aircraft parked in the safe-parking area aft of the island.

3. While flight operations are being conducted, no personnel except those authorized and required may be in the catwalks, guntubs, on the flight deck, in the catapult or arresting gear engine rooms, or PLAT/lens room without the express permission of the air officer.

4. Personnel should never stand or otherwise block entrances to the island structure or exits leading off the catwalks.

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

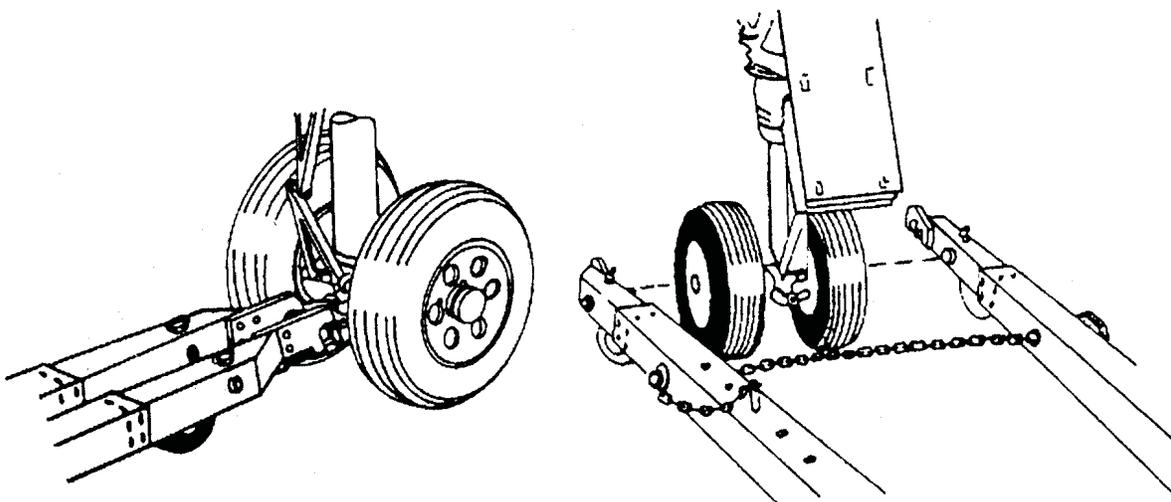


Figure 10-14.—Tow bar attachment.

ANf1014

6. 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.

7. 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.

8. No director should give signals to a pilot who is being controlled by another director EXCEPT in an attempt to avert an accident.

9. 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.

10. 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.

11. Use the proper tow bar for the aircraft that is being moved.

12. Use wing and tail walkers in all movements.

13. 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.

14. Never move an aircraft when there is doubt as to clearance.

15. Watch for unexpected ship movement that may have a bearing on aircraft being moved.

16. 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.

17. Make sure the elevator is in the full up or down position before you move an aircraft on or off it.

18. 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.

19. Handling of other equipment around aircraft should always be performed with utmost care.

20. Unlock the nose or tail wheel (if applicable) before you move an aircraft.

21. Be particularly careful when you move a jet that has been started. Ensure that all personnel are clear of the intake and jet blast.

22. Stay clear of the launching and landing areas unless you are part of that operation.

23. Stay alert when you are working around aircraft. There is never room for carelessness, daydreaming, or skylarking on the flight deck.

24. Keep constant vigilance for coworkers. This helps to avoid accidents.

25. Ensure that aircraft wheel chocks and tie-down chains are always used whenever an aircraft is not being moved.

26. 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.
- Wear safety shoes.

27. Be alert for slick deck areas. Clean spillage from the deck as soon as possible.

28. 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.

29. 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 cockpit area.

**30. Beware of jet blast, props, and rotors.**

*Q10-13. Who is ultimately responsible for safety?*

*Q10-14. When an aircraft is being towed with inoperative brakes, should the cockpit be manned?*

**AIRCRAFT HANDLING  
OPERATIONS ASHORE**

**LEARNING OBJECTIVE:** Recognize aircraft handling operations ashore, including spotting, securing, and operating vehicles on flight lines and around aircraft. Identify the hazards associated with working around aircraft.

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 (CO<sub>2</sub>)..... 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 cockpit. While this provides more effective control when the aircraft is taxied, it also limits the radius of turns. When an aircraft equipped with cockpit 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:

1. 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.
2. 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.
3. If the aircraft is equipped with a tail wheel, unlock the tail wheel before the aircraft is moved.
4. Ensure that the landing gear safety lockpins or down locks are installed before the aircraft is towed.
5. 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.

*Q10-15. On air stations ashore, what is the area called where a particular group of aircraft is spotted or parked?*

*Q10-16. What is the purpose of color coding flight line fire extinguishers?*

*Q10-17. Why should sufficient slack be left in manila line when used for securing aircraft?*

## HELICOPTER HANDLING

**LEARNING OBJECTIVE:** Recognize helicopter handling signals, activities, securing procedures, and general safety precautions.

Helicopters are used on CV/(N)/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.

**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.

An example of a helicopter tie-down configuration is given in figure 10-15. Always consult the applicable MIMs "General Information and Servicing" section for detailed securing instructions for a specific type of helicopter.

## HAND SIGNALS

Hand signals shown in figure 10-16 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:** Helicopter hand signals "wave-off" and "hold" are mandatory; all others are advisory in nature when directing aircraft.

## HELICOPTER FLIGHT OPERATIONS

Carrier flight decks and air station runways or taxiways have marked helicopter landing areas that are controlled by Pry-Fly (afloat) and the control tower (ashore) for helicopter takeoff and landings. See figures 10-17 and 10-18.

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 perimeters or hurling pieces of debris. Because of this hazard, flight deck personnel should be kept to the minimum needed for the operation.

### 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.

Once the proper commands (table 10-3) are given to the flight deck officer and the flight deck lighting has been activated from Pry-Fly (table 10-4), the LSE supervises and is responsible for, but not limited to, the following:

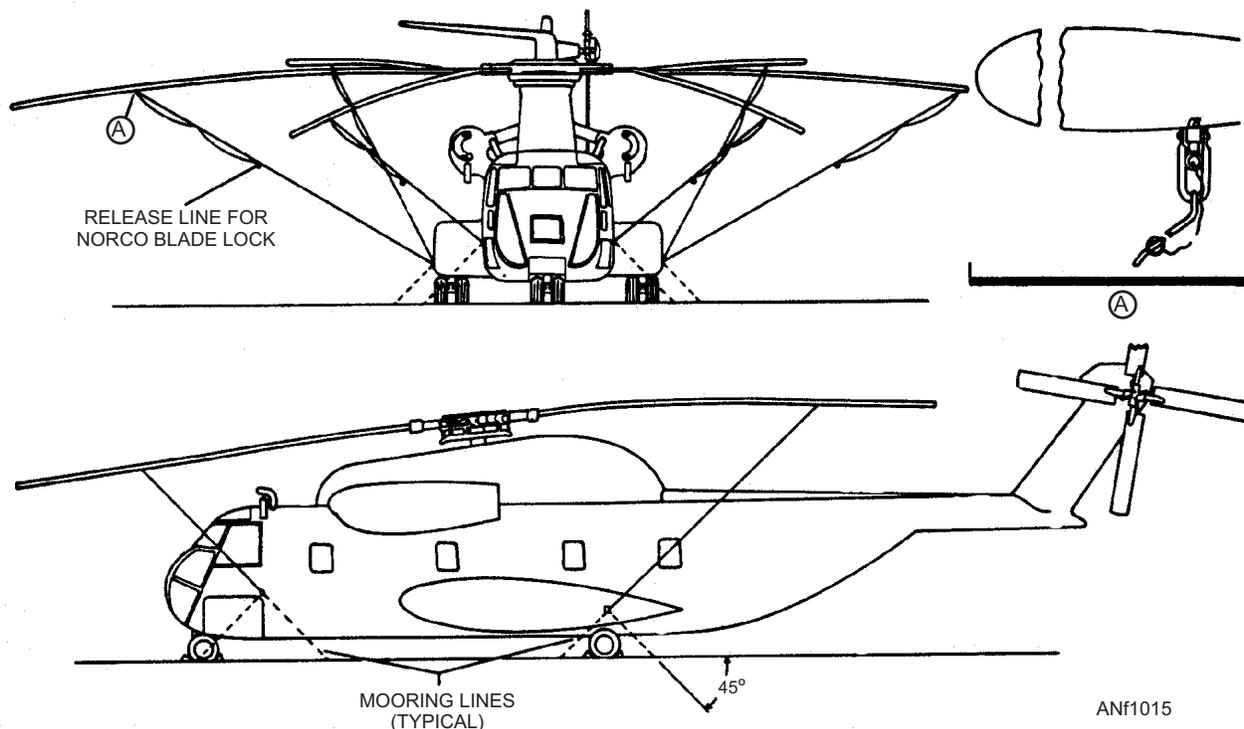
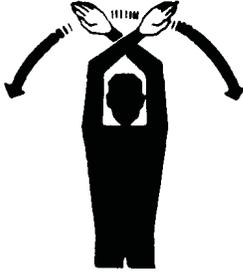


Figure 10-15.—Tie-down configuration (CH-53A/D).

SIGNAL	DAY	NIGHT	REMARKS
<p>①</p>  <p>LANDING DIRECTION</p>	<p>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.</p>	<p>Same as day signal with addition of wands.</p>	
<p>②</p>  <p>MOVE UPWARD</p>	<p>Arms extended horizontally sideways beckoning upwards, with palms turned up. Speed of movement indicates rate of ascent.</p>	<p>Same as day signal with addition of wands.</p>	<p>Conforms to ICAO signal.</p>
<p>③</p>  <p>HOVER</p>	<p>Arms extended horizontally sideways, palms downward.</p>	<p>Same as day signal with addition of wands.</p>	<p>Conforms to ICAO signal.</p>
<p>④</p>  <p>MOVE DOWNWARD</p>	<p>Arms extended horizontally sideways beckoning downwards, with palms turned down. Speed of movement indicates rate of descent.</p>	<p>Same as day signal with addition of wands.</p>	<p>Conforms to ICAO signal.</p>

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Figure 10-16.—Helicopter hand signals (page 1 of 11).

SIGNAL	DAY	NIGHT	REMARKS
<p>⑤</p>  <p>MOVE TO LEFT</p>	<p>Right arm extended horizontally sideways in direction of movement and other arm swung over the head in same direction, in a repeating movement.</p>	<p>Same as day signal with addition of wands.</p>	
<p>⑥</p>  <p>MOVE TO RIGHT</p>	<p>Left arm extended horizontally sideways in direction of movement and other arm swung over the head in the same direction, in a repeating movement.</p>	<p>Same as day signal with addition of wands.</p>	
<p>⑦</p>  <p>LOWER WHEELS</p>	<p>When aircraft approaches director with landing gear retracted, marshaller gives signal by side view of a cranking circular motion of the hands.</p>	<p>Same as day signal with addition of wands.</p>	
<p>⑧</p>  <p>WAVE OFF</p>	<p>Waving of arms over the head.</p>	<p>Same as day signal with addition of wands.</p>	<p>Signal is mandatory.</p>

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Figure 10-16.—Helicopter hand signals (page 2 of 11).

SIGNAL	DAY	NIGHT	REMARKS
<p>⑨</p>  <p>LAND</p>	<p>Arms crossed and extended downwards in front of the body.</p>	<p>Same as day signal with addition of wands.</p>	<p>Conforms to ICAO signal.</p>
<p>⑩</p>  <p>DROOP STOPS OUT</p>	<p>When rotor starts to “run down” marshaller stands with both hands raised above head, fists closed, thumbs pointing out.</p>	<p>Same as day signal with addition of wands.</p>	
<p>⑪</p>  <p>DROOP STOPS IN</p>	<p>When droop stops, go in, marshaller turns thumbs inwards.</p>	<p>Same as day signal with addition of wands.</p>	
<p>⑫</p>  <p>REMOVE BLADE TIEDOWNS</p>	<p>Left hand above head, right hand pointing to individual boots for removal.</p>	<p>Same as day signal with addition of wands.</p>	

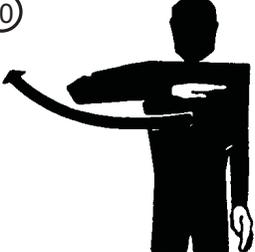
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Figure 10-16.—Helicopter hand signals (page 3 of 11).

SIGNAL	DAY	NIGHT	REMARKS
<p>⑬</p>  <p>ENGAGE ROTOR(S)</p>	<p>Circular motion in horizontal plane with right hand above head.</p>	<p>Same as day signal with addition of wands.</p>	
<p>⑭</p>  <p>HOOK UP LOAD</p>	<p>Rope climbing motion with hands.</p>	<p>Same as day signal with addition of wands.</p>	
<p>⑮</p>  <p>RELEASE LOAD</p>	<p>Left arm extended forward horizontally, fist clenched, with right hand making vertical pendulum movement with fist clenched.</p>	<p>Same as day signal with addition of wands.</p>	
<p>⑯</p>  <p>LOAD HAS NOT BEEN RELEASED</p>	<p>Bend left arm horizontally across chest with fist clenched, palm downward; open right hand pointed up vertically to center of left fist.</p>	<p>Same as day signal with addition of wands.</p>	

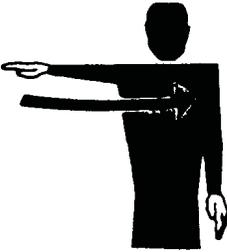
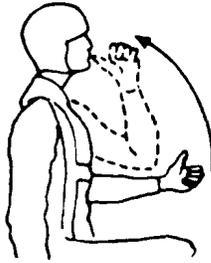
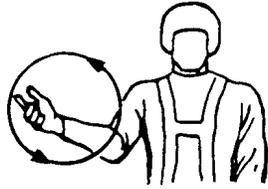
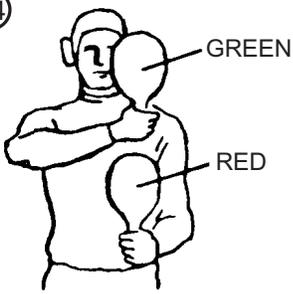
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Figure 10-16.—Helicopter hand signals (page 4 of 11).

SIGNAL	DAY	NIGHT	REMARKS
<p>17</p>  <p>WINCH UP</p>	<p>Left arm horizontal in front of body, fist clenched, right hand with palm turned upwards, making upward motion.</p>	<p>Same as day signal with addition of wands.</p>	
<p>18</p>  <p>WINCH DOWN</p>	<p>Left arm horizontal in front of body, fist clenched, right hand with palm turned downwards, making downward motion.</p>	<p>Same as day signal with addition of wands.</p>	
<p>19</p>  <p>CUT CABLE</p>	<p>Right arm extended forward horizontally, fist clenched, left arm making horizontal slicing movements below the right fist, palm downward.</p>	<p>Same as day signal with addition of wands.</p>	
<p>20</p>  <p>SPREAD PYLON</p>	<p>Bend elbow across chest, palm downward. Extend arm outward to horizontal position, keeping palm open and facing down.</p>	<p>Same as day signal with addition of wands.</p>	

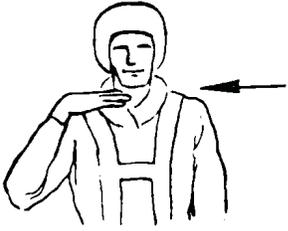
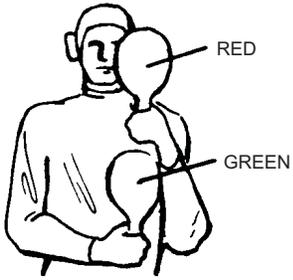
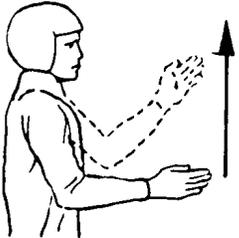
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Figure 10-16.—Helicopter hand signals (page 5 of 11).

SIGNAL	DAY	NIGHT	REMARKS
<p>(21)</p>  <p>FOLD PYLON</p>	<p>Extend right arm horizontally, palm downward. Bend arm keeping palm down.</p>	<p>Same as day signal with addition of wands.</p>	
<p>(22)</p>  <p>I DESIRE HIFR/FUEL</p>	<p>Helicopter crew member brings thumb to mouth as if drinking from glass.</p>	<p>Same except use red lens flashlight.</p>	
<p>(23)</p>  <p>COMMENCE FUELING</p>	<p>Helicopter crew member makes circular motion with right hand.</p>	<p>Helicopter crew member makes circular motion with red lens flashlight.</p>	
<p>(24)</p>  <p>AM PUMP FUELING</p>	<p>Ship's fuel crew member holds green device vertically over red device.</p>	<p>Ship's fuel crew member holds green wand vertically over red wand.</p>	

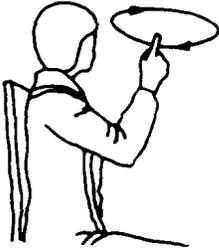
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Figure 10-16.—Helicopter hand signals (page 6 of 11).

SIGNAL	DAY	NIGHT	REMARKS
<p>(25)</p>  <p>CEASE FUELING</p>	<p>Helicopter crew member makes horizontal cutting motion of right hand across throat.</p>	<p>Helicopter crew member makes horizontal motion of red lens flashlight.</p>	
<p>(26)</p>  <p>HAVE CEASED PUMPING FUEL</p>	<p>Ship's fuel crew member holds red device over green device.</p>	<p>Ship's fuel crew member holds red wand vertically over green wand.</p>	
<p>(27)</p>  <p>DESIRE TO MOVE OVER DECK AND RETURN HOSE</p>	<p>Helicopter crew member makes vertical motion of hand.</p>	<p>Helicopter crew member makes vertical motion of red lens flashlight.</p>	
<p>(28)</p>  <p>EXECUTE EMERGENCY BREAKAWAY</p>	<p>LSE/director makes waveoff signal.</p>	<p>LSE/director makes waveoff signal with wands.</p>	<p>Signal is mandatory.</p>

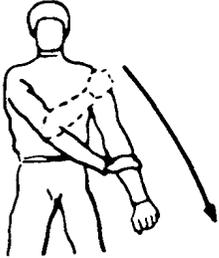
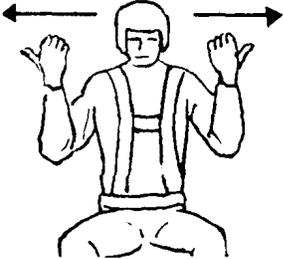
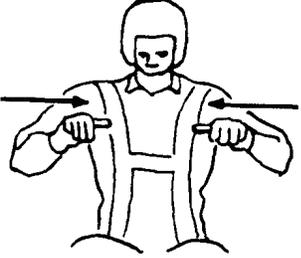
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Figure 10-16.—Helicopter hand signals (page 7 of 11).

SIGNAL	DAY	NIGHT	REMARKS
<p>29</p>  <p>READY TO START ENGINE (pilot)</p>	<p>Moves hand in a circle perpendicular to the deck; follows with a thumbs up signal. Signify by number of fingers, engine to be started</p>	<p>Turns on flashlight or moveable light and moves it in a circle perpendicular to the deck.</p>	
<p>30</p>  <p>READY TO ENGAGE ROTORS (pilot)</p>	<p>Moves hand in horizontal circle at eye level, index finger extended. Aircraft lights FLASHING BRIGHT.</p>	<p>Same as day except holds red light in hand. Aircraft lights FLASHING DIM.</p>	<p>At night, aircraft lights should be on FLASHING DIM until aircraft is declared up and ready for takeoff by the pilot.</p>
<p>31</p>  <p>READY TO ENGAGE ROTORS (LSE)</p>	<p>FACES FLY CONTROL: Holds left fist above head; gives circular motion of right hand above head, index finger extended.</p>	<p>Rotates one wand at chest level; holds other wand above head.</p>	<p>The air officer shall signal authority to engage rotors by illuminating a yellow rotating beacon.</p>
<p>32</p>  <p>READY FOR TAKEOFF (pilot)</p>	<p>Gives thumbs up signal at eye level. Aircraft lights STEADY BRIGHT.</p>	<p>Places running and formation lights on STEADY DIM. May give thumbs up signal by turning on flashlight or other moveable lights and moving it up and down.</p>	

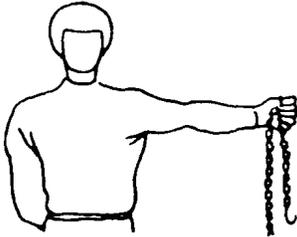
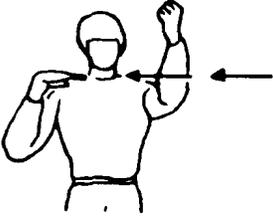
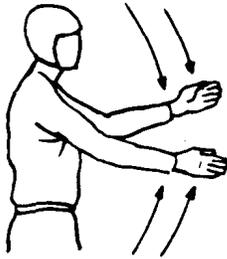
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Figure 10-16.—Helicopter hand signals (page 8 of 11).

SIGNAL	DAY	NIGHT	REMARKS
<p>33</p>  <p>READY FOR TAKEOFF (LSE)</p>	<p>FACES FLY CONTROL. Holds right thumb up at eye level; holds left fist at eye level.</p>	<p>Signal not required. Pilot's STEADY DIM indicates readiness to Fly Control.</p>	<p>The air officer shall signal authority for launch of helicopters by illuminating a green rotating beacon in addition to the rotating yellow beacon.</p>
<p>34</p>  <p>REMOVE TIEDOWNS (LSE)</p>	<p>To tiedown crew: Makes wiping motion down left arm with right hand.</p>	<p>Same as day except with addition of wands.</p>	
<p>35</p>  <p>REMOVE CHOCKS AND TIEDOWNS(pilot)</p>	<p>Swings arms apart, thumbs extended outwards.</p>	<p>Using hand held light or flashlight, gives on/off signals at 1-second intervals.</p>	
<p>36</p>  <p>INSERT CHOCKS AND TIEDOWNS (pilot)</p>	<p>Swings arms together, thumbs extended inwards. In single piloted aircraft, pilot may swing one arm alternately from each side, thumb extended inwards.</p>	<p>Moves hand held light or flashlight at eye level in a horizontal plane alternately inwards from each side.</p>	

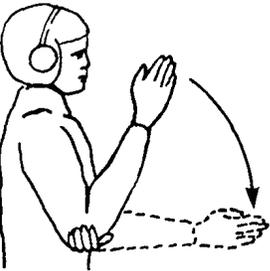
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Figure 10-16.—Helicopter hand signals (page 9 of 11).

SIGNAL	DAY	NIGHT	REMARKS
<p>37</p>  <p>TIEDOWNS REMOVED (deck crew)</p>	<p>Stands in full view of pilot and LSE and holds tiedown and chocks extended to side.</p>	<p>Same as day except illuminates tiedown with amber flashlight.</p>	
<p>38</p>  <p>INSTALL TIEDOWNS (LSE)</p>	<p>To tiedown crew: Rotates hands in circle perpendicular to and in front of his body.</p>	<p>Same as day except with amber wands.</p>	<p>Give "hold" signal as soon as first tiedown is attached.</p>
<p>39</p>  <p>DISENGAGE ROTORS (LSE)</p>	<p>Holds left fist above head; makes throat cutting action with right hand.</p>	<p>Same as day except with amber wands.</p>	<p>Give "hold" signal as soon as first tiedown is attached.</p>
<p>40</p>  <p>HOOK NOT DOWN/UP</p>	<p>Arms extended, make short up and down chopping action, alternating hands.</p>	<p>Same as day except with amber wands.</p>	

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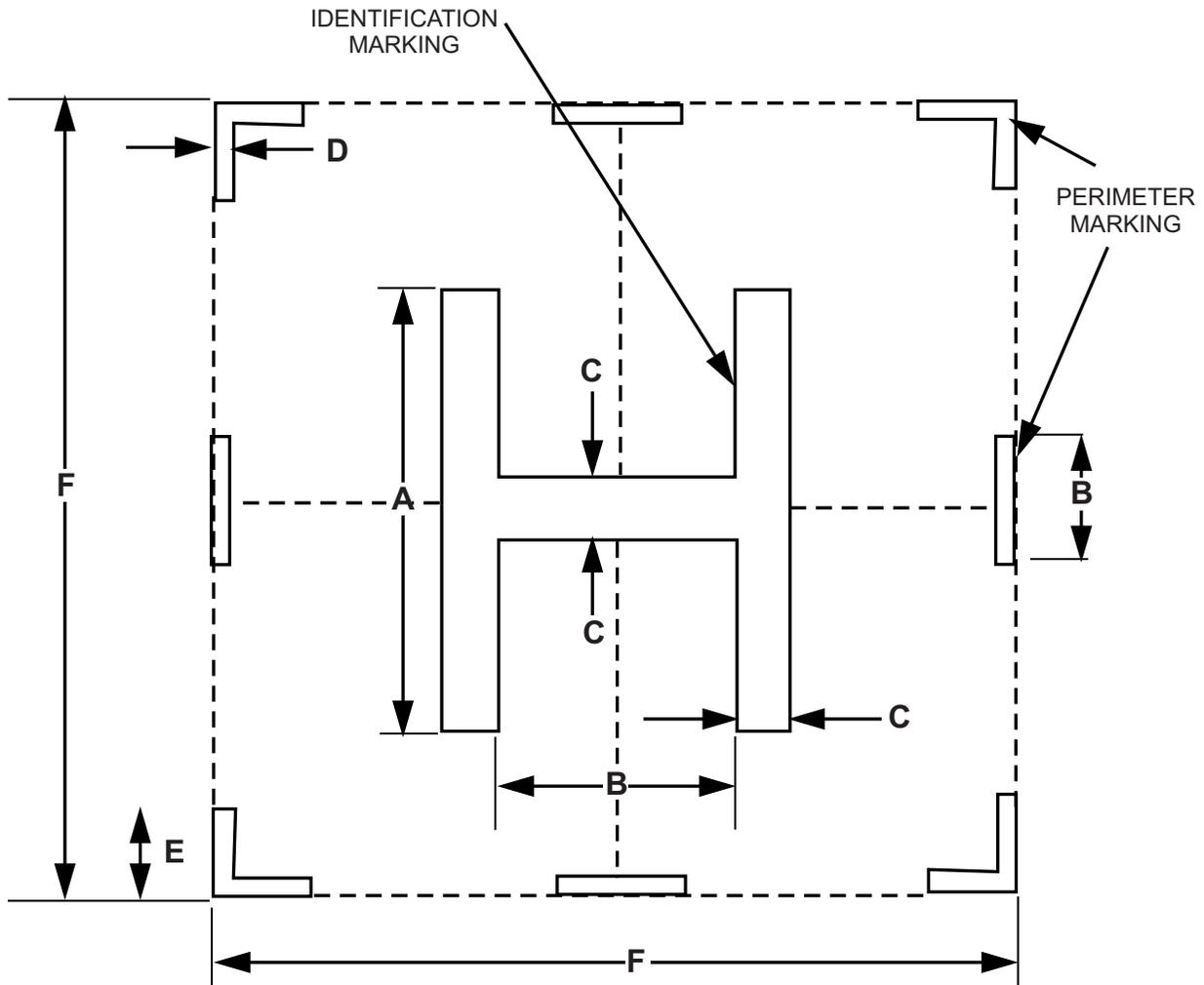
Figure 10-16.—Helicopter hand signals (page 10 of 11).

SIGNAL	DAY	NIGHT	REMARKS
<p>(41)</p>  <p>SWING TAIL LEFT</p>	<p>Use standard fixed wing turn signal, pointing with hand to wheel to be pivoted and giving "come on " with other hand.</p>	<p>Same as day except with amber wands.</p>	
<p>(42)</p>  <p>SWING TAIL RIGHT</p>	<p>Use standard fixed wing turn signal, pointing with hand to wheel to be pivoted and giving "come on " with other hand.</p>	<p>Same as day except with amber wands.</p>	
<p>(43)</p>  <p>HOLD POSITION</p>	<p>Makes clenched fists at eye level.</p>	<p>Hold crossed wands (any color) overhead.</p>	<p>Signal is mandatory.</p>
<p>(44)</p>  <p>ANTENNA IN DOWN POSITION</p>	<p>Rest elbow in left palm at waist level. Bring right hand down to horizontal position.</p>	<p>Same except with wands.</p>	

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Figure 10-16.—Helicopter hand signals (page 11 of 11).





DIMENSIONS

$A = 0.6F$  BUT 60' MAX  
 $B = 0.5A$

HELIPAD SIZE (F)	PATTERN LINE WIDTH (C)	PERIMETER EDGE WIDTH (D)	CORNER EDGE LENGTH (E)
80' - 99'	5'	24"	10' (TYP)
100' - 150'	6'	30"	12' (TYP)

COLOR: RETROREFLECTIVE AVIATION SURFACE WHITE, EXCEPT HELIPADS FOR DAY OPERATIONS ONLY MAY BE NONRETROREFLECTIVE WHITE.

ANf1018

Figure 10-18.—Air station helipad identification and perimeter markings.

- 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.

Q10-18. What is the purpose of helicopter rotor blade tie-downs?

Q10-19. What are the two mandatory helicopter hand signals?

Q10-20. Who is responsible for directing the pilot to the desired deck spot and for ensuring general safety conditions of the flight deck?

**Table 10-3.—Flight Deck Commands**

<b>EVOLUTION</b>	<b>COMMAND</b>	<b>DISPLAY</b>	<b>MEANING (HELO)</b>	<b>MEANING (AV-8)</b>
1. Prepare to start engines	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.	Red signal in flight deck area	Verify starting wind limitations chocks and tie-downs in place. Boots removed and stowed. Secure all loose gear. Man fire extinguishers.	Intake blanks clear GTS wind limits met, chocks, tie-downs in place, loose gear secured. Man fire extinguishers.
2. Start engines	Start engines	Red signal in flight deck area	Authority for responsible flight deck personnel to signal for starting engines. Ship not ready for flight operations.	
3. Engage/disengage rotors	Stand clear of rotors (20 second pause) - engage/disengage rotors	Amber signal in flight deck area	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.	Squadron personnel conduct poststart checks (i.e., controls) clear exhaust areas.
4. Removal of tie-downs	Remove all tie-downs	Not applicable Note: Emcon (Red, Green, Red)	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.	
5. Launch	Launch aircraft	Green signal in flight deck area	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.	
6. Aircraft approaching	Standby to recover aircraft, spot ____.	Red signal in flight deck area	Prepare designated landing area to land aircraft. Ship not ready to recover aircraft.	
7. Recover	Land aircraft	Green signal in flight deck area	Ship is ready in all respects to land aircraft.	

**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 10-4.—Deck Status Lights/Rotating Beacon Signals for Helicopter Operations**

<b>EVOLUTION</b>	<b>DECK STATUS LIGHTS/ ROTATING BEACON SIGNAL</b>
Start Engines	Red
Engage Rotors	Amber
Launch	Green
Recovery	Green
Disengage Rotors	Amber
Shutdown	Red

*Q10-21. What color should the deck status lights/rotating beacon signal be to engage rotors?*

*Q10-22. Is it permissible to taxi a helicopter on the flight deck?*

**SUMMARY**

In this chapter you have learned about operating SE around aircraft, afloat and ashore aircraft operations, handling and securing procedures, hand signals, aircraft handling accessories, and the related safety procedures and requirements.

# ASSIGNMENT 10

Textbook Assignment: "Line Operations and Safety," chapter 10, pages 10-1 through 10-50.

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- 10-1. What is one of the busiest, most important and dangerous divisions in a squadron?
1. Line
  2. Ordnance
  3. Maintenance
  4. Supply
- 10-2. When fueling an aircraft ashore, the refueling vehicle should be parked in what position?
1. Downwind side headed away from the aircraft
  2. Behind the aircraft wing after engine cooling
  3. Perpendicular to the aircraft close to the fueling point
  4. Forward of the aircraft and parallel to the wing
- 10-3. What is the maximum speed limit for vehicles operating on airfields within 50 feet of aircraft and hangars?
1. 2 miles per hour
  2. 5 miles per hour
  3. 10 miles per hour
  4. 12 miles per hour
- 10-4. What is the speed limit for vehicles operating on runways, taxiways, parking areas, ramps, and work areas?
1. 5 miles per hour
  2. 10 miles per hour
  3. 15 miles per hour
  4. 20 miles per hour
- 10-5. When aircraft are towed, the towing speed should NEVER be faster than the slowest person can walk or exceed 5 miles per hour.
1. True
  2. False
- 10-6. What method is used to identify handling and servicing equipment used around aircraft?
1. Identification plates
  2. Placards and reflective tape
  3. 12-inch black letters
  4. Colors and markings
- 10-7. What color is most support equipment painted?
1. Yellow only
  2. Black and yellow
  3. Yellow and white
  4. Red and white
- 10-8. On support equipment, the danger areas, such as intakes or exhausts, are painted what color?
1. Yellow
  2. Red
  3. White
  4. Black
- 10-9. What is the minimum protective clothing required for all personnel to wear while working on the flight deck?
1. Cranial impact helmet, goggles, and sound attenuators
  2. Long sleeve jerseys and trousers with steel toe flight deck boots
  3. Inflatable life preserver with distress light marker, sea dye marker, and whistle
  4. All of the above
- 10-10. Which division is responsible for handling aircraft on the flight deck?
1. V-1 division
  2. V-2 division
  3. V-3 division
  4. V-4 division
- 10-11. Which division is responsible for handling aircraft in the hangar bay?
1. V-1 division
  2. V-2 division
  3. V-3 division
  4. V-4 division
- 10-12. In addition to the director, crew leader, and safetyman, how many Airmen are normally assigned to complete the aircraft handling crew?
1. Two to five
  2. Four to seven
  3. Six to ten
  4. Eight to eleven

- 10-13. In an aircraft handling crew, what member is the only petty officer assigned to the crew?
1. Director
  2. Crew leader
  3. Safetyman
  4. Chockman
- 10-14. What member in the aircraft handling crew is responsible for informing the director about the safety of the aircraft and to prevent accidental damage and personal injury?
1. Crew leader
  2. Safetyman
  3. Tractor driver
  4. Wing walker
- 10-15. When aircraft are being moved on the flight deck or hangar bay by handling crews, what method is used to give directions?
1. Radio headsets
  2. Hand signals
  3. Whistles
  4. All of the above
- 10-16. Once the requirements for an aircraft launch are known, which of the following officers holds a brief with all the key flight deck personnel?
1. Catapult officer
  2. Flight deck officer
  3. Aircraft handling officer
  4. Flight deck safety officer
- 10-17. What color cranial, jersey, and floatation vest identifies aircraft handling officers and plane directors?
1. Green
  2. Yellow
  3. Blue
  4. Purple
- 10-18. Aircraft are assigned a spotting sequence for launch based on what criteria?
1. Aircraft type, mission, and catapult
  2. The pilot's seniority
  3. The aircraft's bureau (side) number
  4. The aircraft's fuel load
- 10-19. When aircraft launching begins, what type aircraft is normally launched first?
1. Turboprop
  2. Jets
  3. Rescue helicopter
  4. Reciprocating engine
- 10-20. What is the purpose of a foreign object damage (FOD) walkdown?
1. To check all aircraft engines for loose gear
  2. To pick up all debris from the deck
  3. To ensure all support equipment is secured and inspected for damage
  4. To check all aircraft tires for embedded objects
- 10-21. How many hours a day is crash and salvage manned and ready aboard ship?
1. During flight operations only
  2. During an aircraft crash or fire only
  3. When directed by the air boss
  4. 24 hours a day
- 10-22. Which of the following rules is extremely important to remember while directing taxiing aircraft?
1. Ensure the pilot can see the signals being given
  2. The person being signaled must thoroughly understand the signal
  3. Exercise extreme caution to prevent personnel from being caught in the jet blast
  4. Each of the above
- 10-23. Who is responsible for the movement of all aircraft on the flight deck?
1. Primary flight control (PRI-FLY)
  2. Flight deck control
  3. The air boss
  4. The mini boss
- 10-24. Who has control of all flight deck lighting, landing spot lighting, flight deck floodlights, and the flight deck rotary beacon?
1. The landing signal officer's platform
  2. Flight deck control
  3. Primary flight control (PRI-FLY)
  4. The engineering department
- 10-25. Which of the following personnel is responsible for launching aircraft?
1. Flight deck officer
  2. Catapult officer
  3. Air boss
  4. Commanding officer
- 10-26. Which of the following personnel ensures that the aft flight deck is ready for landing aircraft?
1. Arresting gear officer
  2. Air boss
  3. Flight deck officer
  4. Catapult officer

- 10-27. Which of the following personnel monitors or directs the pilot in the final approach to the ship?
1. Air traffic controller
  2. Air officer
  3. Recovery officer
  4. Landing signal officer
- 10-28. What system provides continuous glide path information and places major control of the aircraft in the hands of the pilot?
1. Air traffic control radar
  2. Frensel Lens Optical Landing System (FLOLS)
  3. Aircraft Automatic Landing System (AALS)
  4. Manually Operated Visual Landing System (MOVLAS)
- 10-29. When an aircraft fails to hook on an arresting gear cable and is required to enter the traffic pattern again, the action is known by what term?
1. Wave-off
  2. Miss
  3. Bolter
  4. Skip
- 10-30. What method is used to release the arresting cable from the aircraft tailhook if the cable does not fall free normally?
1. Pull the aircraft backwards
  2. Disconnect the tailhook
  3. Turn the aircraft
  4. Disconnect the cable
- 10-31. What is the name of the alternating red and white striped line that runs the length of the flight deck?
1. Center line
  2. Landing lineup line
  3. Lubber line
  4. Foul line
- 10-32. What is used to recover aircraft that cannot make a normal arrested landing?
1. Barricade
  2. Parachute
  3. Pendant
  4. Cables
- 10-33. What division works in conjunction with the V-2 division in the initial preparation of the barricade?
1. V-1 division
  2. V-3 division
  3. V-4 division
- 10-34. What aircraft director hand signal is mandatory at all times?
1. Emergency stop
  2. Takeoff
  3. Landing
  4. Fold wings
- IN ANSWERING QUESTIONS 10-35 AND 10-36, REFER TO FIGURE 10-4 (SHEETS 1 THROUGH 16).
- 10-35. When the director gives the hand signal "Arms crossed above the head, palms facing forward," which of the following signals is he/she giving?
1. "This way"
  2. "Slow down"
  3. "Stop"
  4. "Brakes (on/off)"
- 10-36. When the director gives the hand signal "Point right arm downward, left arm is repeatedly moved upward and backward," which of the following signals is he/she giving?
1. "Turn right"
  2. "Turn left"
  3. "Proceed to next director"
  4. "Clear for takeoff"
- 10-37. During night operations, what instruments are used by directors for taxiing signals?
1. Handheld radios
  2. Beacons
  3. Wands
  4. Chemical light sticks
- 10-38. At what intervals are the aircraft directors usually positioned along the flight deck during operations that require taxiing of aircraft?
1. 5 to 10 ft
  2. 20 to 40 ft
  3. 50 to 100 ft
  4. 100 to 200 ft

- 10-39. What class of ships embarks vertical, short takeoff and landing (V/STOL) aircraft?
1. LHD
  2. LHA
  3. LPH
  4. Each of the above
- 10-40. For which of the following reasons are aircraft secured by chocks and chains at all times when aboard ship?
1. Because heavy seas make the ship pitch and roll
  2. Because of the list of the ship caused by maneuvering
  3. Because of the close proximity of the aircraft on the flight deck and hangar bay
  4. Each of the above
- IN ANSWERING QUESTIONS 10-41 AND 10-42, REFER TO TABLE 10-2 IN THE TEXT.
- 10-41. What color wands are used by aircraft directors during night operations?
1. White
  2. Amber
  3. Blue
  4. Green
- 10-42. What color wands are used by plane captains during night operations?
1. Amber
  2. Red
  3. White
  4. Blue
- 10-43. For what reason should aircraft wheel chocks be loosened during fueling operations?
1. They will be difficult to remove because of the added weight
  2. A snug fit is not required during fueling
  3. The chocks can be removed quickly if an emergency occurs
  4. Because the tie-down chains will not prevent the aircraft from moving
- 10-44. Which of the following attachments are installed on the flight deck and hangar bay for the attachment of tie-down chain assemblies?
1. Anchor points
  2. Scuppers
  3. Pad eyes
  4. Tie downs
- 10-45. When you secure aircraft in heavy weather, how will the procedures differ from that of normal weather conditions?
1. The aircraft are parked further apart
  2. More tie-down chains are used
  3. The security watch is doubled
  4. The brake rider remains in the cockpit
- 10-46. Which department is responsible for maintaining a security/integrity watch on the flight deck and hangar bay to ensure all aircraft remain properly secured?
1. Operations department
  2. Security department
  3. Deck department
  4. Air department
- 10-47. In severe cold weather environments, aircraft canopies should not be locked in the landing area because they will freeze "closed" and prevent brake rider protection.
1. True
  2. False
- 10-48. What is the most common type of aircraft wheel chocks used aboard aircraft carriers?
1. The NWC-3
  2. Model 1509AS300-1
  3. The NWC-4 and NWC-5
  4. Model 1509AS300-5
- 10-49. What are the two available lengths of the TD-1A and TD-1B tie-down chain assemblies?
1. 5 and 10 ft
  2. 9 and 14 ft
  3. 10 and 15 ft
  4. 20 and 25 ft
- 10-50. What is the working load of the Aero full power tie-down assembly?
1. 10,000 pounds
  2. 20,000 pounds
  3. 30,000 pounds
  4. 40,000 pounds
- 10-51. How many general classes of tow bars are used in naval aviation?
1. One
  2. Two
  3. Three
  4. Four

- 10-52. What is the weight towing capacity of the universal aircraft tow bar, Model ALBAR (adjustable length tow bar)?
1. 60,000 pounds
  2. 70,000 pounds
  3. 80,000 pounds
  4. 90,000 pounds
- 10-53. Who is responsible at all times for the safety of embarked aircraft and personnel aboard ship?
1. Commanding officer
  2. Air officer
  3. Safety officer
  4. Operations officer
- 10-54. What term is used when the flight deck has unauthorized personnel in or around aircraft parked in the safe-parking area aft of the island?
1. Dirty
  2. Foul
  3. Secured
  4. Skunk
- 10-55. While taxiing the aircraft, what must the pilot do if he/she loses sight of the director?
1. Contact the tower
  2. Continue to the next director
  3. Stop immediately
  4. Continue taxiing and wait for instructions
- 10-56. If an aircraft with inoperative brakes is to be towed and respotted, the cockpit must NOT be manned, and the chockman must be in position to chock the main wheels instantly when ordered.
1. True
  2. False
- 10-57. When squadron aircraft are shore based, the area where a group of aircraft is spotted or parked is referred to as
1. the parking area
  2. the ramp
  3. the line
  4. the hole
- 10-58. Which of the following personnel has the responsibility to direct and spot aircraft ashore?
1. Maintenance crew
  2. Phase crew
  3. Operations crew
  4. Line crew
- 10-59. Upon landing ashore and clearing the runway, the pilot will be assisted to the line for parking by what means?
1. An aircraft director
  2. A "follow me" vehicle
  3. The control tower
  4. A tow tractor
- 10-60. What method is used to distinguish flight line fire extinguishers from building fire-fighting equipment?
1. The size of container
  2. 6-inch black letters
  3. Color codes
  4. Length of hose
- 10-61. What color is the 6-inch band around the top of a fire extinguisher on the line painted to identify carbon dioxide (CO<sub>2</sub>)?
1. Yellow
  2. Silver or white
  3. Purple
  4. Blue
- 10-62. What color is the 6-inch band around the top of a fire extinguisher on the flight line painted to identify Halon?
1. Blue
  2. Silver or white
  3. Purple
  4. Fluorescent yellow
- 10-63. What is a disadvantage of a multiengine aircraft equipped with nosewheel steering?
1. It limits the turning radius
  2. It is unable to back up in a straight line
  3. It increases the turning radius
  4. It has to be parked using a tow tractor
- 10-64. What signal is given by the move director to have the brakes of the aircraft and tow tractor applied simultaneously in case of an emergency?
1. Waving arms above head
  2. Blowing a whistle
  3. Yelling, "stop"
  4. Arms above head, clinched fists
- 10-65. What aircraft safety equipment should be installed before the aircraft is towed?
1. Engine intake covers
  2. Grounding straps
  3. Control surface battens
  4. Landing gear safety lockpins

- 10-66. What, if anything, will occur if an aircraft nosewheel is turned beyond its limits while towing?
1. Structural damage will occur
  2. The nosewheel tire will be damaged
  3. The landing gear strut will collapse
  4. Nothing, this is a common procedure
- 10-67. Why should you leave sufficient slack in the line when securing an aircraft with manila line?
1. To prevent damage to the tie-down points during wind gusts
  2. To make it easier to untie the knots
  3. To prevent structural damage to the wings
  4. To allow for shrinkage that occurs when the line becomes wet
- 10-68. Multiengine aircraft are usually tied down at six points.
1. True
  2. False
- 10-69. Which of the following helicopter hand signals is mandatory?
1. Wave-off only
  2. Hold only
  3. Wave-off and hold
  4. Hover
- 10-70. What is the name of the director that is responsible for visually signaling to the helicopter?
1. Landing signal enlisted (LSE)
  2. Landing signal officer (LSO)
  3. Signalman
  4. Flight deck leading petty officer

IN ANSWERING QUESTIONS 10-71 AND 10-72, REFER TO FIGURE 10-16 (SHEETS 1 THROUGH 11).

- 10-71. When the director gives the hand signal "Arms extended horizontally sideways, palms downward," which of the following signals is he/she giving?
1. Hover
  2. Land
  3. Move downward
  4. Move upward
- 10-72. When the director gives the hand signal "A circular motion in horizontal plane with right hand above head," which of the following signals is he/she giving?
1. Lower wheels
  2. Engage rotors
  3. Clear for takeoff
  4. Engine fire
- 10-73. Helicopters should NEVER be taxiied on the flight deck of a ship.
1. True
  2. False
- 10-74. What color light is displayed from the flight deck rotary beacon that indicates the ship is ready for the pilot to engage rotors?
1. Red
  2. Green
  3. Amber
  4. White